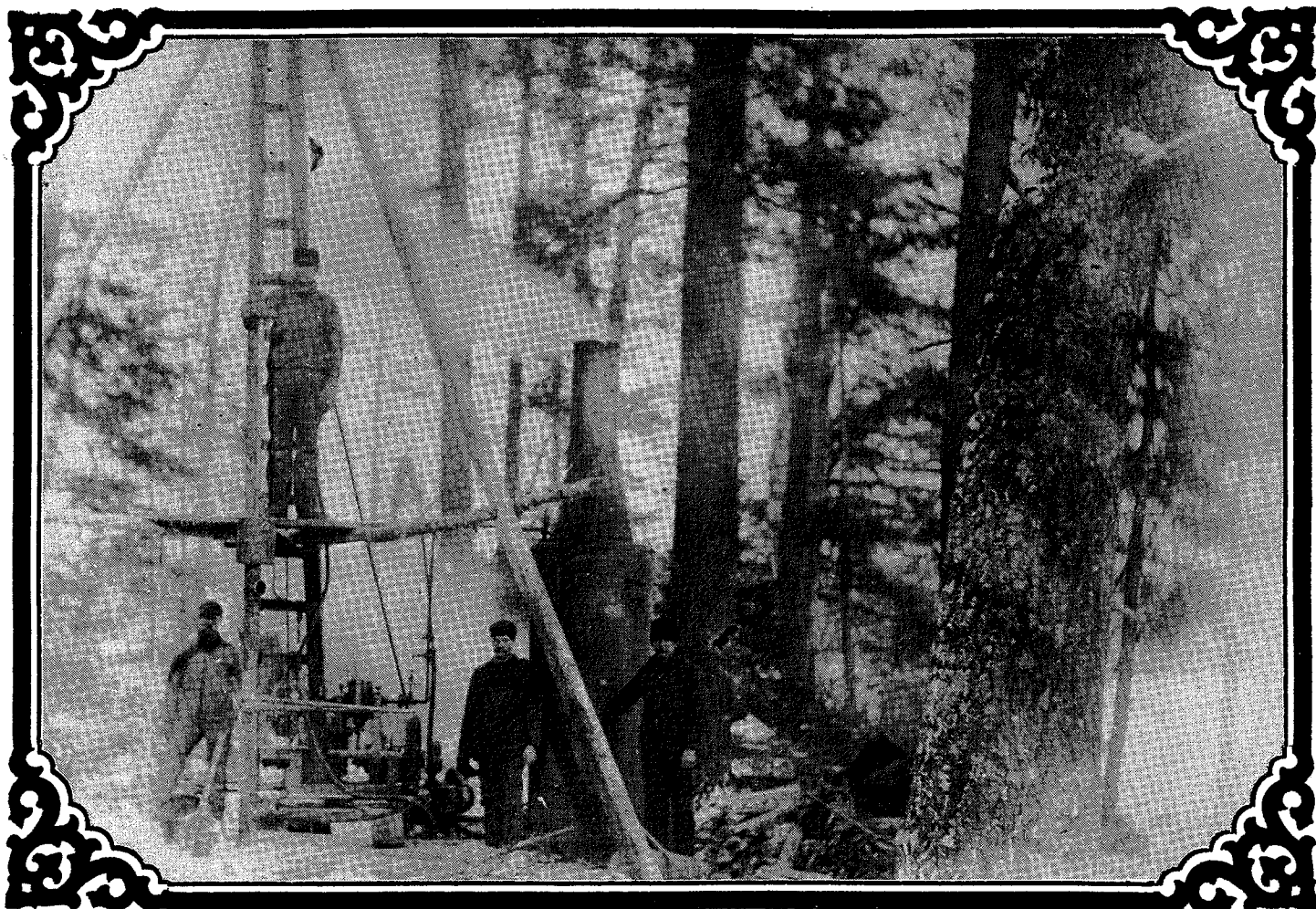


A Compilation of Ore Mineral Occurrences, Drill Core, and Testpits in the State of Minnesota



A steam-powered drill operation in Northern Minnesota,
date unknown. (Courtesy of Aubin Photo, Hibbing)

**REPORT 231
1985**

**Minnesota Department of Natural Resources
DIVISION OF MINERALS
Hibbing, Minnesota**

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Occurrences, Drill Core, and Testpits
in the State of Minnesota

Minnesota Department of Natural Resources
Division of Minerals
Hibbing, Minnesota

Report 231
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A Compilation of Ore Mineral
Occurrences, Drill Core, and Testpits
in the State of Minnesota

By: Dennis P. Martin

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Minnesota Department of Natural Resources
Division of Minerals
Hibbing, Minnesota

Report 231
1985

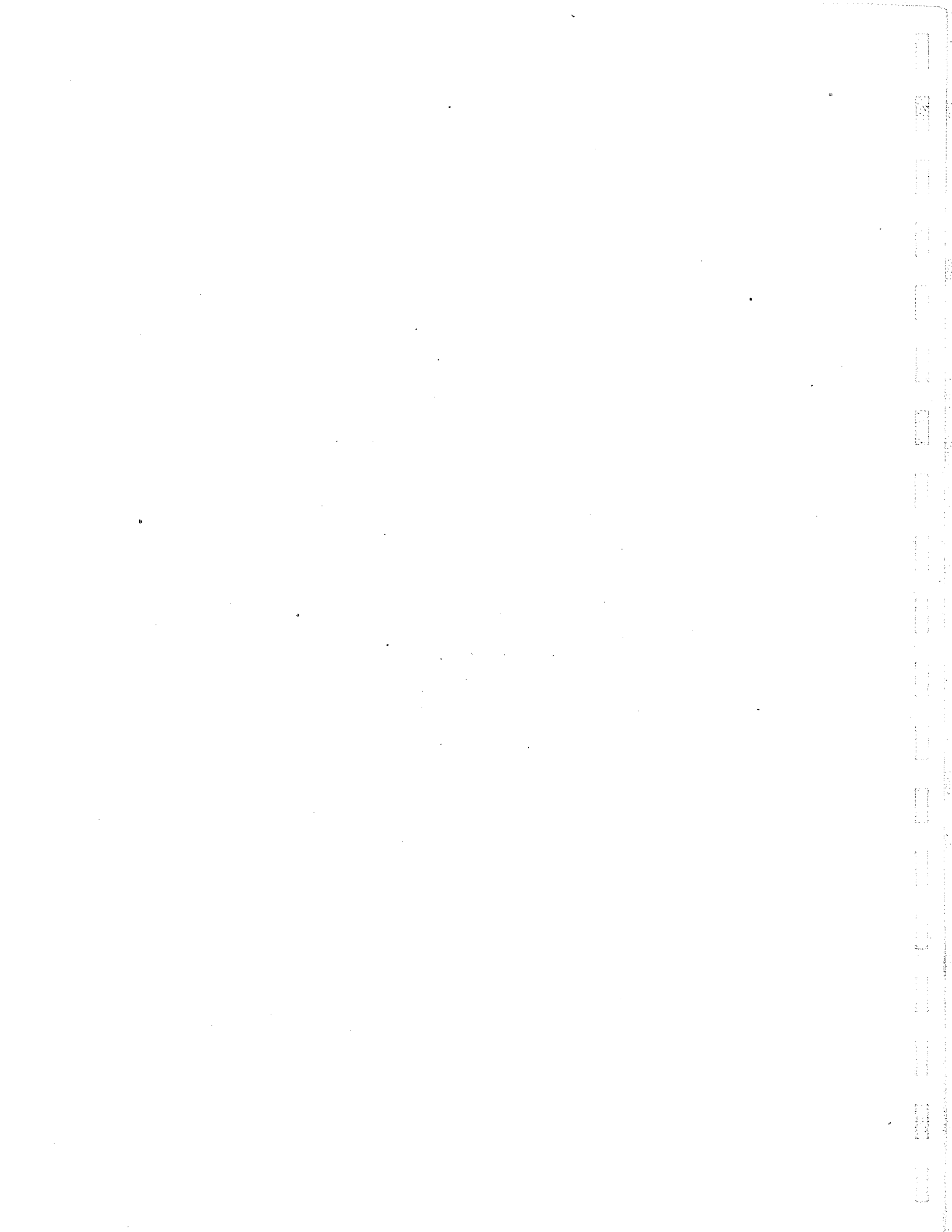


TABLE OF CONTENTS

	Page
OBJECTIVE.....	1
SUMMARY.....	1
REPORT FORMAT.....	1
CRITERIA FOR DATA SELECTION.....	2
DATA EXCLUDED.....	3
REFERENCE SOURCES SEARCHED.....	4
TOWNSHIP LISTING OF OCCURRENCES, TESTPITS AND DRILL HOLES BY COUNTY	
Aitkin.....	5
Anoka.....	9
Becker.....	9
Beltrami.....	10
Benton.....	15
Big Stone.....	16
Blue Earth.....	16
Brown.....	16
Carlton.....	17
Carver.....	24
Cass.....	24
Chisago.....	26
Clay.....	28
Cook.....	28
Cottonwood.....	72
Crow Wing.....	73
Dakota.....	77
Dodge.....	79
Douglas.....	79
Faribault.....	79
Fillmore.....	79
Freeborn.....	81
Goodhue.....	81
Hennepin.....	82
Itasca.....	83
Jackson.....	89
Kanabec.....	89
Kandiyohi.....	90
Kittson.....	90
Koochiching.....	93
Lac Qui Parle.....	102
Lake.....	102
Lake of the Woods.....	115
Le Sueur.....	120
Lincoln.....	120
Lyon.....	120
Marshall.....	123
Martin.....	126
Meeker.....	126
Mille Lacs.....	127
Morrison.....	127
Mower.....	130
Murray.....	131
Nicollet.....	131
Nobles.....	131
Norman.....	132
Olmsted.....	134

Otter Tail.....	136
Pine.....	137
Polk.....	142
Pope.....	143
Ramsey.....	143
Red Lake.....	144
Redwood.....	144
Renville.....	144
Rice.....	146
Roseau.....	147
Scott.....	149
Sherburne.....	149
St. Louis.....	149
Stearns.....	202
Steele.....	205
Stevens.....	205
Swift.....	206
Todd.....	206
Traverse.....	207
Wabasha.....	207
Waseca.....	208
Washington.....	208
Watonwan.....	210
Wilkin.....	210
Winona.....	210
Wright.....	212
Yellow Medicine.....	212

APPENDICES

Appendix A. Summaries of Selected Commodities

Clay Minerals.....	216
Garnet, Staurolite, and Tripoli.....	224
Graphite.....	226
Iron Ores (other than Biwabik, Gunflint, Cuyuna, or Vermilion)	
-Archean.....	231
-Proterozoic.....	234
Magnetite Pegmatites.....	238
Native Copper.....	239
Olivine.....	241
Titaniferous Magnetite in Duluth Complex.....	242
Zeolites.....	246
Appendix B. All Drill Core	B-1
Appendix C. All Ore Mineral Occurrences.....	C-1
Appendix D. Occurrences of Gold and Silver.....	D-1
Appendix E. Occurrences of Copper and Zinc.....	E-1
Appendix F. Occurrences of Arsenic, Fluorine, Mercury, and Molybdenum.....	F-1
Appendix G. All Testpits.....	G-1
COMPLETE BIBLIOGRAPHY.....	247

LIST OF PLATES

Plate 1: All Drill Hole and Testpit Locations.....	in pocket
Plate 2: All Ore Mineral Occurrence Locations.....	in pocket
Plate 3: All Gold and Silver Occurrence Locations.....	in pocket
Plate 4: All Copper and Zinc Occurrence Locations.....	in pocket

OBJECTIVE

The intent of this report is to compile into one practical source references on publicly reported mineral resource occurrences for the entire state of Minnesota based on a literature search. This compilation includes a list with locations for all publicly reported testpits, ore-mineral occurrences, certain indicator minerals, and all open-file (or public) drill cores. The report is directed at planners and geologists as a tool for preliminary mineral potential evaluation of land parcels. No field verification of any data location was done. The reader is encouraged to check the details of the original references, which could only be summarized here. The project was initiated as a result of funding provided to the Minnesota Department of Natural Resources, Minerals Division, by the Legislative Commission on Minnesota Resources (LCMR).

It is recognized that the first edition of any list such as this could not be totally complete. A current goal is to evaluate the usefulness of this report, and possibly update it in the future. Additions, corrections, clarifications or comments will be welcome from readers. To facilitate future revisions, the data in this report has been summarized within a computer filing system. The Land Management Information Center was utilized to computer plot all the maps in this report.

SUMMARY

Data was collected for townships from 70 counties. There are approximately 4200 drill cores cited and 214 testpits. The following 28 elements were found: Au, Ag, As, B, Ba, Be, Co, Cr, Cu, Fe, F, Hg, K, Mo, Mn, Ni, Pd, P, Pb, S, Sb, Se, Th, Ti, U, V, W, Zn. Because of the abundance of data for seventeen elements, we had to set up minimum assay values below which any values were excluded.

New data is continually accruing that will go into this report database. Contact the Minerals Division Hibbing Office for access to the most current information.

REPORT FORMAT

The data has been organized by township within each county, with the counties in alphabetical order. The townships are presented by rows of the same township north number with corresponding increasing range numbers (i.e. Itasca - 53N-22W, 53N-23W, 53N-24W, 53N-25W, 53N-26W, 53N-27W, then 54N-22W, 54N-23W, etc.)

Each township has a written listing of all the data available. The references cited are shortened versions, with the complete reference title to be found in the bibliography in the back of the report. Comments by this author are restricted within brackets, in contrast to the reference material quoted or summarized. Drill cores for which no ore-mineral occurrences could be found (see discussion in Data Excluded section) are listed under "Other Data," and are further described in the appendix listing. A set of township maps (scale 1" = 1 mile) with all the data plotted on them can be found in the back of the report. Note that only those townships that have occurrences within them will have a township map available. That is, some townships have drill cores available within them, but if no ore-mineral occurrences (see Criteria section) were found in those core, then no township scale map was drawn up.

To facilitate the use of the report, the following parts have been provided:

1. Statewide maps with certain data plotted;
2. An appendix table listing all publicly available drill holes;
3. Appendix tables listing certain commodities and their locations (i.e. all gold occurrences);
4. A complete bibliography of the references cited within the body of the report;
5. Summaries of certain commodities;
6. All the individual township maps, which are in microfiche in the back of the report, are available in paper copies from the Hibbing office. If the section location for an occurrence is unknown, it was arbitrarily plotted in section 16; similarly, any unknown 40 acre location was plotted in NW $\frac{1}{4}$ -SE $\frac{1}{4}$.

There are four different state maps. One map shows the locations of all drill holes and testpits cited. The second map shows the locations of all ore-mineral occurrences, subdivided by type (i.e. outcrop, float, DDH, or testpit). The third map shows the locations of all the gold and silver occurrences in the state. The fourth map shows all the copper of zinc occurrences in the state. Note that the occurrence symbol such as Au could only be plotted once (per element) within any 40-acre parcel, even if multiple occurrences of that element exist within that parcel.

There are 6 appendix tables, listing all the locations for the following elements or commodities: gold, silver, copper, zinc, lead, nickel, chromium, molybdenum, uranium, fluorine, titanium, phosphorus, arsenic, barium, beryllium, platinum and palladium, cobalt, vanadium, tungsten, olivine, carbonates, bauxite, clay, fuchsite, garnet, graphite, gossan, magnetite, marble, muscovite, prehnite, pyrite, pyrrhotite, staurolite, talc, tourmaline, zeolite. Tables are also presented that list: all the DDH's sorted by county, and all the testpits sorted by county.

CRITERIA FOR DATA SELECTION

The content of the report has been defined to include all publicly reported ore-mineral occurrences, testpits, and open-file drill cores in the State of Minnesota. The following guidelines were drawn up:

1. A testpit was defined to include pits, trenches, or shafts to bedrock. Even if bedrock was not indicated in the description, the testpit was included in this report.
2. The open-file drill core refers either to that drill core which is available to the public for inspection or at least a log from it exists.
3. The following guidelines were used in the search for ore minerals:
 - a) Minerals had to contain one of the following elements: Au, Ag, Pt, Pd, Ir, Os, Rh, Ru, Cu, Pb, Zn, Ni, Mo, Co, V, Cr, Ti, Sn, W, Hg, Cd, Bi, Te, Se, Ba, F, Li, U, Th, Be, Nb, Ta, P, Sb, As, B, S
 - b) The location (minimum S-T-R) had to be cited;
 - c) For the following elements, assay values greater than or equal to the following had to be cited:

	<u>(ppm)</u>
Cu, Zn, Pb, Ni, Cr	500
Co	250
Mo	30
As	20
V	1500
Ti	10%

	(ppm)
P	5000
F	5000
Ba	5000
U	50
U ₃ O ₈	100
Th	150
Au	0.1 (.003 oz/t)
Ag	1

- d) The following ore minerals, indicator minerals, and industrial minerals were sought: ankerite, arsenopyrite, argentite, apatite, asbestos, alunite, barite, bornite, bauxite, carbonates, corundum, clays, chalcocite, native copper, chromite, covellite, cubanite, chalcopyrite, diamond, fuchsite, fluorite, galena, garnets, gold, gossan, graphite, gypsum, halite, ilmenite, iron formation, magnetite, magnesite, malachite, marcasite, marble, molybdenite, muscovite, olivine, phosphates, prehnite, pyrite, pyrrhotite, scheelite, sphalerite, staurolite, sulfides, talc, tripoli, tourmaline, and zeolites. All of the above were found except: corundum, diamond, gypsum, halite, magnesite, and marcasite.
- For the indicator minerals, any combination of two of the following had to occur to be cited: pyrite, pyrrhotite and/or the above indicator minerals.
 - Ore-mineral occurrences are classified into four types (outcrop, drill core, glacial float, and testpit) on the computer files.

DATA EXCLUDED

References to past-producing iron ranges, specifically the Biwabik, Gunflint, Cuyuna, and Vermilion, were not sought out and occurrences were excluded for their iron ore, but other interesting minerals were cited when noted. However, the iron ore literature and files were not thoroughly searched. Sand and gravel resources were not compiled, nor were limestones or brick clays. Also, the copper-nickel drilling at the base of the Duluth Complex was excluded, primarily townships 57N-14W, 57N-13W, 58N-14W, 58N-13W, 59N-14W, 59N-13W, 60N-12W, 61N-12W, 61N-11W, 62N-11W, 62N-10W in St. Louis and Lake counties (see DNR Report 93, 1977, Drill Hole Location Map, Fig. 16 for details of this area).

Exploration geochemical data, such as assays from soil, water, peat, vegetation, or organic lake sediments, was excluded; however, primary glacial float occurrences are included (i.e. gold, native copper, or mineralized boulders). Exploration geophysical data was excluded. The drill core listings for Ramsey and Hennepin Counties from the USBM Core Library, mostly soil foundation borings, were excluded.

The majority of the open-file drill cores do not have written reported ore-mineral occurrences documented. However, that is perhaps misleading. The reason is that no data or logs or assays were available for the majority of the drill cores. In summary, no occurrences found means: (1) no descriptive data was available for the search; (2) limited available data contained no occurrences; (3) available high quality descriptive data contained no occurrences.

REFERENCE SOURCES SEARCHED

The search for ore-mineral occurrences and testpits has included:

1. DNR Minerals terminated lease files (Note: DDH's open-file as of January, 1985, are included; however, only those open-file as of July, 1984, could be searched for occurrences.);
2. DNR Minerals general exploration files (as of July, 1984);
3. DNR project files (as of July, 1984);
4. Annual Reports, State Lands and Minerals Division;
5. Hundreds of selected references from the 1930 Bibliography of Minnesota Geology, 1981, by G. B. Morey, N. Balaban, and L. Swanson;
6. Minnesota Geological Survey (MGS) reports, bulletins, report of investigations, information circulars, and special publications;
7. MGS newspaper clipping files;
8. MGS field notebooks;
9. Minnesota Historical Society Library (St. Paul) archives;
10. More than one hundred theses and dissertations;
11. Various references found to pertain to economic geology in Minnesota.

The search for drill core has included:

1. DNR Minerals terminated lease files (as of January, 1985);
2. DNR general exploration files;
3. DNR project files;
4. Minnesota Geological Survey "aeromag drill holes" and those from MGS publications [Note that it does not include the thousands of drill core or logs that the MGS has but which are not catalogued, that cover east-central and northern Minnesota.];
5. Department of Geology, University of North Dakota drill core from 9 holes in the Red River area of Minnesota;
6. Departments of Geology within the State University system should be considered excluded from the search.

Location: Aitkin County
Township 44N-22W, Section 5
Other Data: DDH 2019 in Sec. 5 (See Appendix)

Location: Aitkin County
Township 44N-23W, Sections 25, 26
References: A) Skillman, 1946
Other Data: DDH 251, 262 in Sec. 25 (Ref. A)
DDH 252, 254, 261 in Sec. 26 (Ref. A)

Location: Aitkin County
Township 45N-27W, Section 15
References: A) DNR General Exploration File
Other Data: DDH 1 in Sec. 15 (Ref. A)

Location: Aitkin County
Township 46N-23W, Section 2
Other Data: DDH 2022 in Sec. 2 (See Appendix)

Location: Aitkin County
Township 46N-25W, Sections 14, 15, 16, 22, 28, 29, 35, 36
References: A) Thiel, 1924; [not searched]
B) Schwartz, 1951, [not searched]
C) Pennington and Davis, 1953, [not searched]
D) Needham, 1955, [not searched]
E) Bleifuss and others, 1963, [not searched]
F) Schwartz, 1965, files of the MGS [not searched]
G) Han, 1968
H) Morey, 1972, p. 262 in Centennial Volume
I) DNR 1977 Minerals Map Set 117-1
J) DNR Minerals General Exploration File #5
K) Morey, Olsen and Southwick, 1981, Map of East-Central MN
L) DNR Open File Drill Samples List

Summary: The occurrence is within the Early Proterozoic Glen Township Formation. (Ref. K) There are several sulfide deposits with pyritic, carbonaceous shale and carbonate facies iron formation locally intruded by diorite. (Ref. H & Ref. G.) There are estimated to be 39 million tons averaging 13.8-13.9% sulfur in two bodies. (Ref. F & Ref. H) The principal ore minerals are pyrrhotite and pyrite with subordinate magnetite and marcasite, and minor sphalerite, chalcopyrite, covellite, arsenopyrite, ilmenite, hematite, and goethite. (Ref. G) Some metallurgical testing has been done by Pennington and Davis (Ref. C) and Bleifuss and others (Ref. E).

Occurrences: The highest metal values reported were: (Ref. J)
DDH #1, NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 36
- 5 feet of 0.36% zinc
- 17 feet of 0.05%-0.09% copper
- trace of gold

Other assay values are summarized in Morey, 1972 (Ref. H, p. 272)

See Ref. G, D, and J for references to 58 drill holes.

Testpits: In NW $\frac{1}{4}$, Sec. 35 (Ref. J, File 2, pp. 11-2)

Other Data: DDH G-1 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 16 (Ref. L)
 DDH 85 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 22 (Ref. L)
 DDH C.D.H.-1, 12, 13, 14, 15, 16, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 50, 52, 53, 54, 56, 58, 70, 76 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 28 (Ref. L)
 DDH 17, 18, 26, 27, 28, 48, 49, 51, 55, 57, 63 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 28 (Ref. L)
 DDH 19, 24, 25, 71 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 28 (Ref. L)
 DDH 20, 22, 23 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 28 (Ref. L)
 DDH 60, 62, 64, 66, 68 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 28 (Ref. L)
 DDH G-4, G-5, G-6, G-8, G-9 in Sec. 11 (See Appendix)
 DDH 12, 11 in sec. 14 (See Appendix)
 DDH 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 in Sec. 15 (See Appendix)
 DDH 65 in Sec. 27 (See Appendix)
 DDH 81, 73, 78, 79, 82, 21, 83 in Sec. 28 (See Appendix)
 DDH 86, 84, 87 in Sec. 29 (See Appendix)
 Iron Ores - Proterozoic in Sec. 22 and 28, see also summary in Appendix.

Location: Aitkin County
 Township 46N-26W, Section 24

References: A) DNR General Exploration File

Other Data: DDH N-1 in Sec. 24 (Ref. A)

Location: Aitkin County
 Township 46N-27W, Sections 13, 17

Other Data: DDH 101 in Sec. 13 (See Appendix)
 DDH 460 in Sec. 17 (See Appendix)

Location: Aitkin County
 Township 47N-23W, Section 12

Other Data: DDH 2023 in Sec. 12 (See Appendix)

Location: Aitkin County
 Township 47N-24W, Section 6

Other Data: DDH 589, 594, 598, 603, 605, 609, 610, 611, 612, 614, 615, 620 in Sec. 6 (See Appendix)

Location: Aitkin County
 Township 47N-25W, Sections 1, 26, 34

References: A) DNR General Exploration File

Other Data: DDH DL-1, DL-2, DL-3, DL-4 in Sec. 34 (Ref. A)
 DDH 3-Y, 509, 525, 537, 544, 549, 554, 562, 579 in Sec. 1 (See Appendix)
 DDH DL-3, DL-4, DL-5 in Sec. 26 (See Appendix)

Location: Aitkin County
 Township 47N-26W, Sections 2, 3, 4, 9, 17, 18

Other Data: DDH 1-U, 1-Y, 2-Y in Sec. 3 (See Appendix)
 DDH 246, 276, 288 in Sec. 2 (See Appendix)
 DDH 168, 172, 182, 195, S134, S14, S156, S33, S5, S7, S9,
 258, 260, 260-A, 262, S15, S15-A, 186, 186A, 192, 192A, 203,
 203-A, 206, 206-A, 210, 210-A, 215, 215-A, 220, 223, 227,
 231, 234, 234-A, 255, 265, 265-A, 266, 270, 270-A, 273, 281,
 281-A, 295, 295-A, 37, 40, 40-A, 50, 53, 53-A, 56, 56-A,
 S12, S12-A, S16, S17, S177, S18, S21, S22, S22-A, S23, S24,
 S24-A, S241, S241-A, S242, S242-A, S245, S25, S250, S250-A,
 S252, S253, S256, S24, S256-A, S26, S269, S27, S27-A, S32,
 158, 160, 163 in Sec. 3 (See Appendix)
 DDH S319, 129, S1, S10, S100, S104, S105, S108, S11, S110,
 S124, S126, S13, S132, S135, S138, S140, S144, S147, S148,
 S152, S16, S164, S167, S171, S184, S188, S19, S191, S2, S20,
 S29, S3, S30, S314, S316, S317, S318, S320, S325, S326,
 S327, S39, S4, S41, S42, S45, S47, S49, S51, S57, S6, S79,
 S8, S91, S94, S130, S38, S96, 117, S271, S275, S285, S291,
 S293, S299, S309, S313, S315, S321, S322, S323, S324, S328,
 S174, S175, S180, S280, S282, S332, S333 in Sec. 4 (See
 Appendix)
 DDH S239 in Sec. 9 (See Appendix)
 DDH S208, S216, S225 in Sec. 17 (See Appendix)
 DDH 247, 240, S257 in Sec. 18 (See Appendix)

Location: Aitkin County
 Township 48N-22W, Sections 29, 30

References: A) DNR Open File Drill Samples List

Other Data: DDH H-1 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 30 (Ref. A)
 DDH 2037 in Sec. 29 (See Appendix)
 DDH 2036 in Sec. 15 (See Appendix)

Location: Aitkin County
 Township 48N-25W, Section 30, 31

Other Data: DDH 304, S300, S330, 307, 310, 311 in Sec. 30 (See Appendix)
 DDH S236, S238, S243, S244, S248, S251, S254, S259, S261,
 S264, S268, S272, S274, S277, S279, S284, S287, S289, S294,
 S296, S222, S228, S232, S233 in Sec. 31 (See Appendix)

Location: Aitkin County
 Township 48N-26W, Sections 35, 36

Other Data: DDH 52, 52-A, 60, 60-A, 63, 63-A, 67, 67-A, 72, 72-A, 74,
 S65, S65-A, 292, 298, 301, 303, 305, 308, 55, 55-A, 61, 292,
 297, 43, 43-A, 44, 44-A, 46, 46-A, 31, 36, 48, 48-A, S28,
 S34 in Sec. 35 (See Appendix)
 DDH S81, S84, S85, S86, S89, 142, 149, 150, 151, 154, 154-A,
 S146, 106, 111, 113, 115, 118, 121, 131, 133, 155, 166, 173,
 179, 183, 187, 193, 201, 204, 207, 211, S213, 102, 62, 66,
 71, 75, 78, 127, 128 in Sec. 36 (See Appendix)

Location: Aitkin County
Township 48N-27W, Section 23
Other Data: DDH 1, 2, 2, 3, 4, 5, 6, 7, 7, 8, 9, 10 in Sec. 23 (See
Appendix)

Location: Aitkin County
Township 49N-23W, Section 26
Other Data: DDH 2021 in Sec. 26 (See Appendix)

Location: Aitkin County
Township 49N-26W, Sections 3, 21
Other Data: DDH 24 in Sec. 3 (See Appendix)
DDH 28 in Sec. 21 (See Appendix)

Location: Aitkin County
Township 50N-25W, Sections 6, 7, 8, 20
Other Data: DDH 1 in Sec. 6 (See Appendix)
DDH 5 in Sec. 7 (See Appendix)
DDH 1, 2 in Sec. 8 (See Appendix)
DDH 11 in Sec. 20 (See Appendix)

Location: Aitkin County
Township 50N-26W, Sections 15, 35
Other Data: DDH 22 in Sec. 15 (See Appendix)
DDH 16 in Sec. 35 (See Appendix)

Location: Aitkin County
Township 50N-27W, Sections 23, 33
Other Data: DDH 19 in Sec. 23 (See Appendix)
DDH LP-1, LP-2 in Sec. 33 (See Appendix)

Location: Aitkin County
Township 51N-23W, Sections 11, 23
Other Data: DDH 12 in Sec. 11 (See Appendix)
DDH 14 in Sec. 23 (See Appendix)

Location: Aitkin County
Township 51N-24W, Sections 2, 11, 15, 23, 35
Other Data: DDH 3, 3A in Sec. 2 (See Appendix)
DDH 15 in Sec. 11 (See Appendix)
DDH 6 in Sec. 15 (See Appendix)
DDH 4 in Sec. 23 (See Appendix)
DDH 8 in Sec. 35 (See Appendix)

Location: Aitkin County
Township 51N-26W, Section 35
Other Data: DDH 7 in Sec. 35 (See Appendix)

Location: Aitkin County
Township 52N-22W, Section 10
Other Data: DDH 23 in Sec. 10 (See Appendix)

Location: Aitkin County
Township 52N-23W, Sections 13, 25
Other Data: DDH 21 in Sec. 13 (See Appendix)
DDH 13 in Sec. 25 (See Appendix)

Location: Anoka County
Township 30N-24W, Section 22
Other Data: DDH T-1 in Sec. 22 (See Appendix)

Location: Anoka County
Township 31N-22W, Section 24
Other Data: DDH T-2 in Sec. 24 (See Appendix)

Location: Anoka County
Township 32N-22W, Section 36
Other Data: DDH T-1, T-2 in Sec. 36 (See Appendix)

Location: Becker County
Township 138N-37W, Sections 6, 36
References: A) Anderson, 1957, pp. 36-39, 43-44
Occurrences: DDH 1-1: Sec. 6, T138N-R37W; 97'S and 1158'E of NW Corner
Sec. 6 (NW $\frac{1}{4}$ -NW $\frac{1}{4}$).
719'-730': Interbanded green mineral and quartz; green
bears sulphides. Sulphides increase until at bottom replace
most green leaving sulphides stringers in quartz. 72 $\frac{1}{2}$
chert, very clean iron formation, much disseminated sulphide.
(Ref. A, pp. 36-39)
DDH 1-3: Sec. 6, T138-R37; 143'S and 2358'E NW corner of
Sec. 6 (NE $\frac{1}{4}$ -SW $\frac{1}{4}$).
719'-750': Relatively fresh, coarse-grained diabasic
rock, specks of sulphide, sulphides are also most abundant
in fractures but are disseminated as well. Strongly altered
along thin zone at 729'. (Ref. A, pp. 36-39)
DDH 1-4: Sec. 6, T138-R37, 95'S and 1758'E of NW corner of
Sec. 6 (NE $\frac{1}{4}$ -NW $\frac{1}{4}$).
608'-619': Dark, reddish brown pisolitic and
conglomeratic sideritic bauxite. Leached, vuggy, grades
618'-619' to gray. (Ref. A, pp. 36-39)
DDH 1-5: Sec. 6, T138-R37; 95'S and 1458'E of NW corner
Sec. 6 (NE $\frac{1}{4}$ -NW $\frac{1}{4}$).
610'-620': Dark reddish brown bauxite conglomerate.
760'-791': Dark green to gray, fine grained, dense rocks,
weathered zone, cave 764'-766'. From 766' on, veins with
epidote, calcite, sulphides, also some disseminated
sulphides.

807'-891': Basalt(?) very altered 829' to 853', less altered beyond 853', calcite vein bearing sulphides at 838'-843'. (Ref. A, pp. 36-39)

Other Data: DDH 4-1, 4-2 in Sec. 36 (Ref. A, p. 43-44)
DDH 1-6 in Sec. 6 (Ref. A, p. 39)
Iron Ores - Archean, see also summary in Appendix.

Location: Becker County
Township 138N-41W, Section 4

Other Data: Clay minerals in Sec. 4, see also summary in Appendix.

Location: Becker County
Township 139N-37W, Sections 6, 36

References: A) Anderson, 1957, pp. 37, 43-46

Occurrences: DDH 6-1: Sec. 36, T139-R37; 100'S and 530'E of NW corner Sec. 36 (SE $\frac{1}{4}$ -NW $\frac{1}{4}$) has: (Ref. A, pp. 43-45)
- 645'-648': pyrite sulphide

Other Data: DDH 6-2, 6-3 in Sec. 36 (Ref. A, p. 45-46)
DDH 1-2 in Sec. 6 (Ref. A, p. 37)

Location: Becker County
Township 139N-38W, Section 36

References: A) Anderson, 1957, p. 37

Other Data: DDH 1-2 in Sec. 36 (Ref. A)

Location: Beltrami County
Township 146N-33W, Section 21

Other Data: Clay minerals in Sec. 21, see also summary in Appendix.

Location: Beltrami County
Township 148N-32W, Section 20

Other Data: DDH TR-1 in Sec. 20 (See Appendix)

Location: Beltrami County
Township 148N-33W, Sections 3, 4

Other Data: Clay minerals in Sec. 3 and 4, see also summary in Appendix.

Location: Beltrami County
Township 150N-30W, Section 10

Other Data: Graphite in Sec. 10, see also summary in Appendix.

Location: Beltrami County
Township 150N-31W, Sections 5, 10, 14, 15, 23, 29

References: A) DNR Terminated Lease Files
B) DNR Minerals, 1976, Map 86, Sheet 2, by Meineke and Listerud
C) DNR Project File 69

- D) Ojakangas, Meineke, Listerud, 1977, MGS RI17, Table A-3
 E) DNR Open File Drill Samples List
 F) Winchell, 1899, Vol. 4, p. 142

Summary: Occurrences in Archean greenstone
 Occurrences: DDH RL 28-1 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 29, Lease Humble CN-7850 has
 (Ref. A, B, C and D)
 - traces of chalcopyrite in gabbro, also graphitic chert,
 and pyroxenite-peridotite (some serpentinized)
 - 230 ft. of 1084 ppm Ni
 - 317 ft. of 764-1127 ppm Cr
 DDH BID-3 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 29, Lease Ridge CN-7913 has:
 (Ref. A and B)
 - 1 ft. of 1500 ppm Zn, 500 ppm Cu, 3 ppm Ag
 - 1 ft. of 1450 ppm Cu, 1.1 ppm Ag and .001 Au oz/t
 (Ref. C)
 - 1 ft. of 550 ppm Cu, 1.2 ppm Ag and .001 Au oz/t
 (Ref. C)
 - andesite breccia with traces of chalcopyrite and
sphalerite

"Mr. Joseph Sombs, of Park Rapids, who has spent considerable time cruising, also some time on a claim in T150-31, says that on the south side of Black Duck lake is much limestone along the stream for six or seven miles" [Location uncertain] (Ref. F, p. 142)

Other Data: Graphite in Sec. 29, see also summary in Appendix.
 Iron Ores - Archean in Sec. 29, see also summary in Appendix.
 Clay minerals in Sec. 29, see also summary in Appendix.
 DDH SDE-1 in Sec. 5 (See Appendix)
 DDH RL-31 in SE-NE, Sec. 10 (Ref. E)
 DDH VAN-1, TIT-3, TIT-4, VAN-2, VAN-3, VAN-4 in Sec. 14 (See Appendix)
 DDH TIT-1, TIT-2, PLO-1, PLO-2, IAP-1 in Sec. 15 (See Appendix)
 DDH JAN-1 in Sec. 23 (See Appendix)

Location: Beltrami County
 Township 150N-32W, Section 13
 References: A) DNR Terminated Lease File
 B) DNR Minerals, 1976, Map 86, Sheet 2, by Meineke and Listerud
 Summary: Occurrence in Archean greenstone
 Occurrences: DDH BID-2 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 13, Lease Ridge CN-7914, has andesite with traces of native copper, and graphite (Ref. A and B)
 Other Data: Graphite in Sec. 13, see also summary in Appendix.
 Iron Ores - Archean in Sec. 13, see also summary in Appendix.

Location: Beltrami County
 Township 151N-30W, Sections 1, 2, 7, 8, 30
 References: A) DNR Minerals, 1976, Map 86, Sheet 2, by Meineke and Listerud
 B) DNR General Exploration Files

C) Ojakangas, Meineke, Listerud, 1977, MGS RI-17, Table A-3, p. 78
 D) DNR Project File 86-1
 E) DNR Open File Drill Samples List

Occurrences: DDH RL 42-1 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 7 has very minor sphalerite in graphitic metasediments (Ref. A)
 DDH RL 43-1 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 8 has: (Ref. C, p. 78)
 - .5 ft. of 1290 ppm Zn and .003 Au oz/t sample B-2672 (Ref. B), minor scattered pyrite, chalcopryite, sphalerite, pyrrhotite, in felsic tuff and lapilli tuff, graphite, metasediments and gabbroic flow
 - .5 ft. of .002 oz/ton Au sample B-2673 (Ref. D)

Other Data: DDH 1 in Sec. 2 (See Appendix)
 DDH 2 in Sec. 3 (See Appendix)
 Graphite in Sec. 7 and 8, see also summary in Appendix.

Location: Beltrami County
 Township 151N-31W, Sections 10, 12

Other Data: DDH HAD-1, HAD-2, HAD-3, COR-1 in Sec. 10 (See Appendix)
 DDH CON-1 in Sec. 12 (See Appendix)

Location: Beltrami County
 Township 151N-32W, Sections 33, 36

References: A) DNR Terminated Lease Files
 B) DNR Open File Drill Samples List

Summary: Occurrence in Archean greenstone terrane.

Occurrences: DDH RL-25 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 36, Lease Exxon CN-7864, has (Ref. A)
 - .5 ft. of 1.4 ppm Au
 - 1.4 ft. of 105-660 ppm As
 - 5 ft. of 2260 ppbillion Au
 - 7 ft. of 410 ppbillion Au

Other Data: DDH BID-1 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 33 (Ref. B)
 Graphite in Sec. 33 and 36, see also summary in Appendix.
 Iron Ores - Archean in Sec. 33 and 36, see also summary in Appendix.
 Clay minerals in Sec. 36, see also summary in Appendix.

Location: Beltrami County
 Township 151N-35W, Section 28

Other Data: DDH 1 in Sec. 28 (See Appendix)

Location: Beltrami County
 Township 152N-30W, Sections 21, 30, 31

References: A) DNR Minerals, 1976, Map 86, Sheet 2, by Meineke and Listerud
 B) DNR Terminated Lease File
 C) Grout, 1937, p. 64

Occurrences: DDH RL-39 in Sec. 30, Lease Humble Oil & Refining, CN-7841 has: (Ref. B)

Volcaniclastics, lamprophyre dike, mafic dike, graphite, diorite with traces of chalcopyrite, intermediate to felsic lava, tuff and agglomerate, mafic lava.

"At Kelliher, Beltrami County, SW $\frac{1}{4}$ Sec. 31 T. 152N., R. 30 W., Dr. Ira S. Allison collected from a gold prospect specimens indicating contact mineralization of a greenstone by a trachite porphyry. The prospect is at the west end of a series of small outcrops in a belt running a little north of east. The mineralized zone, a number of feet wide, seems to be greenstone schist modified by contact action and small replacement veins so that it is now largely brown garnet, actinolite, chlorite, epidote, carbonate, and pyrite. Much of the garnet is birefringent and it is probable that metamorphism, before the contact action, had made the greenstone largely over into chlorite, carbonate, leucoxene and other alteration products, some of which remain as patches and streaks in the ore." (Ref. C, p. 64)

Testpits: A gold prospect shaft is reported in Sec. 31 in pillowed metabasalt with quartz and granite stringers and nearby granitic porphyry. (Ref. A, Map 86, and Ref. C)

Other Data: Graphite in Sec. 30, see also summary in Appendix.
DDH CON-1 in Sec. 21 (See Appendix)

Location: Beltrami County
Township 155N-38W, Section 1

References: A) DNR Open File Drill Samples List

Other Data: DDH FT-8 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 1 (Ref. A)
DDH FT-20 in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 1 (Ref. A)
Graphite in Sec. 1, see also summary in Appendix.

Location: Beltrami County
Township 156N-37W, Section 31

References: A) DNR Open File Drill Samples List

Other Data: DDH FT-9 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 31 (Ref. A)
Graphite, see also summary in Appendix.

Location: Beltrami County
Township 157N-36W, Sections 24, 31, 36

References: A) DNR Open File Drill Samples List

Other Data: DDH FT-17 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 24 (Ref. A)
DDH FT-15, FT-16 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 24 (Ref. A)
DDH FT-6 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 31 (Ref. A)
DDH FT-18 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 36 (Ref. A)
Graphite in Sec. 24, 31, and 36, see also summary in Appendix.
Clay minerals in Sec. 24, see also summary in Appendix.

Location: Beltrami County
Township 158N-36W, Sections 7, 13, 23, 24, 25, 26

References: A) DNR Terminated Lease Files

B) DNR Open File Drill Samples List
 Occurrences in Archean greenstone terrane

Summary:
 Occurrences:

DDH FT-1 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 23, Lease Ridge CN-7886, has
 (Ref. A)
 - 10 ft. of 500-640 ppm Cu

DDH FT-2 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 23, Lease Ridge CN-7886, has
 (Ref. A)
 - 5 ft. of 700 ppm Zn
 - 5 ft. of 2 ppm Ag

DDH FT-3 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 23, Lease Ridge CN-7886, has
 (Ref. A)
 - 10 ft. of 600-980 ppm Cu
 - 5 ft. of 500 ppm Zn
 - 20 ft. of 2 ppm Ag

DDH T25A-1 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 24, Lease Humble CN-7866, has
 (Ref. A)
 - 5 ft. of 535 ppm Cu
 - 11 ft. of 535-750 ppm Zn
 - 105 ft. of 1-4 ppm Ag

DDH T25B-2 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 25, Lease Humble CN-7867, has
 (Ref. A)
 - 10 ft. of 795-810 ppm Zn
 - 4.2 ft. of 2 ppm Ag

DDH FT-12 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 7, Lease Ridge CN-7884, has
 (Ref. A)
 - 36 ft. of 100-350 ppbillion Au
 - 177 ft. of 133-640 ppm As
 - 177 ft. of 40-340 ppbillion Hg

DDH FT-4 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 26, Lease Ridge CN-7887, has
 (Ref. A)
 - 15 ft. of 565-1540 ppm Zn
 - 20 ft. of 1-2 ppm Ag
 - 30 ft. of 150-175 ppbillion Au
 - 25 ft. of 100-160 ppbillion Hg
 - 121 ft. of 103-403 ppm As

DDH FT-14 in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 13, Lease Ridge CN-7885, has
 (Ref. A)
 - 2 ft. of 2745 ppbillion Au
 - 2 ft. of 1500 ppbillion Au
 - 2 ft. of 520 ppbillion Au
 - 5 ft. of 0.70 ppm Au
 - 10 ft. of 0.18-0.19 ppm Au
 - 6 ft. 330-430 ppm As
 - 6 ft. of 80-105 ppm Hg
 - 6 ft. of 105-120 ppbillion B
 - 10 ft. of 1.0-1.4 ppm Ag
 - 24 ft. of 120-215 ppm As
 - 1 ft. of .06 oz/ton Au

DDH FT-10, in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 7, Lease Ridge CN-7884, has
 (Ref. A)
 - 5 ft. of 720 ppbillion Au
 - 79 ft. of 148-440 ppm As
 - 79 ft. of 190-770 ppbillion Hg

DDH FT-21, in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 7, Lease Ridge CN-7884, has
 (Ref. A)

- 5 ft. of 265 ppbillion Au
 - 5 ft. of 320 ppbillion Au
 - 6½ ft. of 1440 ppbillion Au
 - 14 ft. of 235-470 ppbillion As

Other Data: DDH FT-23 in SW¼-NE¼, Sec. 7 (Ref. B)
 DDH FT-22 in SE¼-NE¼, Sec. 7 (Ref. B)
 DDH FT-7, FT-13, in NE¼-SE¼, Sec. 7 (Ref. B)
 DDH T25B-1 in SE¼-NW¼, Sec. 25 (Ref. B)
 Iron Ores - Archean in Sec. 7, 13 and 23, see also summary
 in Appendix.
 Clay minerals in Sec. 7, see also summary in Appendix.

Location: Beltrami County
 Township 158N-37W, Section 19

References: DNR Open File Drill Samples List

Other Data: DDH T20-1 in SE¼-SW¼, Sec. 19 (Ref. A)
 Graphite in Sec. 19, see also summary in Appendix.

Location: Beltrami County
 Township 158N-38W, Section 24

References: A) DNR Open File Drill Samples List

Other Data: DDH FT-19 in SE¼-SE¼, Sec. 24 (Ref. A)
 Graphite in Sec. 24, see also summary in Appendix.

Location: Benton County
 Township 36N-31W, Sections 11, 25

Other Data: Clay minerals in Sec. 11, see also summary in Appendix.
 DDH T-1, T-2 in Sec. 11 (See Appendix)
 DDH T-5 in Sec. 25 (See Appendix)

Location: Benton County
 Township 37N-28W, Sections 26, 34

References: A) DNR Open File Drill Samples List

Other Data: DDH LS-10 in Sec. 26 (Ref. A)
 DDH LS-11 in Sec. 34 (Ref. A)

Location: Benton County
 Township 37N-30W, Sections 26, 27, 33

References: A) Winchell, 1888, Vol. 2, p. 436

Occurrences: "Prospecting for gold was undertaken here, some fifteen
 years ago, by Major T. M. Newson, sinking a shaft about ten
 feet. This is close southeast of the river road, near the
 centre of section 27. It is some 40 feet above the river,
 with a depression on the east, separating it from a hill
 about 75 feet high a sixth of a mile east. The vein
 explored is quartz, one to eight inches thick, dipping 80°
 S.E. The east wall of this vein is dark and tough trap; and
 its west wall is a porphyritic, reddish syenite. A small
 outcrop, twenty-five or thirty feet across and some 15 feet
 high, lies in the N.W.¼ of section 26, a short distance east
 from the railroad and highway. Beyond this, northward, the

BIG STONE-BLUE EARTH-BROWN

only other rock-exposure known in this country near the Mississippi river is a small and low outcrop in its bank, of a tough, close-grained, hornblendic rock, occurring about a mile farther north, opposite the northeast corner of section 33, Brockway, Stearns county." (Ref. A, p. 436)

Testpits: Near the center of Sec. 27, see description above.

Location: Benton County
Township 37N-31W

References: A) Skillman, 1946, Unpublished Ph.D. Dissertation,
p. 183

Occurrences: "Associated with pegmatites in T37N-R31W are veins which contain purple fluorite, pyrite, microcline, muscovite, beryl (?), and epidote" [exact location unknown], (Ref. A, p. 183).

Location: Benton County
Township 38N-28W, Sections 23, 24

Other Data: DDH T-1 in Sec. 23 (See Appendix)
DDH T-2 in Sec. 24 (See Appendix)

Location: Big Stone County
Township 121N-44W, Section 36

References: A) DNR Open File Drill Samples List

Other Data: DDH 27007 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 36 (Ref. A)

Location: Blue Earth County
Township 108N-26W, Section 5

Other Data: DDH T-1A, T-7 in Sec. 5 (See Appendix)

Location: Blue Earth County
Township 108N-27W, Sections 1, 13, 14, 25, 34

Other Data: Clay minerals in Sec. 25, see also summary in Appendix.
DDH T-1, T-100, T-4, TR-1, TR-2, TR-3, TR-4 in Sec. 1 (See Appendix)
DDH T-16 in Sec. 13 (See Appendix)
DDH T-1, T-2, T-3, T-4 in Sec. 14 (See Appendix)
DDH T-1, T-2 in Sec. 34 (See Appendix)

Location: Brown County
Township 109N-30W, Section 4

Other Data: Clay minerals in Sec. 4, see also summary in Appendix.

Location: Brown County
Township 109N-31W, Section 18

References: A) DNR Open File Drill Samples List

Other Data: DDH SQ-1 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 18 (Ref. A)

Location: Brown County
Township 109N-33W, Section 35
References: A) DNR Open File Drill Samples List
Other Data: DDH SQ-2 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 35 (Ref. A)

Location: Brown County
Township 109N-34W
Other Data: Clay Minerals, see also summary in Appendix.

Location: Brown County
Township 109N-35W, Section 26
Other Data: Clay minerals in Sec. 26, see also summary in Appendix.

Location: Brown County
Township 110N-30W, Sections 20, 31
Other Data: Clay minerals in Sec. 31, see also summary in Appendix.
DDH T-21, T-22 in Sec. 20 (See Appendix)

Location: Brown County
Township 111N-32W
Other Data: Clay minerals, see also summary in Appendix.

Location: Brown County
Township 111N-33W, Section 3
Other Data: Clay minerals in Sec. 3, see also summary in Appendix.

Location: Brown County
Township 112N-33W, Section 33
Other Data: Clay minerals in Sec. 33, see also summary in Appendix.

Location: Carlton County
Township 46N-18W, Sections 3, 16
References: A) 1940 Annual Report, Div. Lands & Minerals (DNR), pp. 18
& 296
B) DNR Open File Drill Samples List
Occurrences: "Permit B-63 N $\frac{1}{4}$ -NW $\frac{1}{4}$ Sec. 16-46-18
Lee Fall & R. J. Schwope, Prospects in Carlton County" (Ref.
A, p. 18)
Fall & Schwope Prospect: "Several samples were taken here
of a placer bed which might have been productive but careful
assays and launders concentration tests followed by assays
failed to show any gold in the 8 samples taken at various
places on the North forty of this permit. A negative
verdict was rendered on this prospect. University tests
made on the same formation were also negative. (Ref. A, p.
296)
Other Data: DDH LS-12 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 3 (Ref. B)
DDH LS-13 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 3 (Ref. B)

Location: Carlton County
Township 46N-19W, Sections 2, 7, 17, 19, 23

References: A) Weiblen, 1964, Thesis, pp. 78, 80
B) DNR Open File Drill Samples List
C) DNR General Exploration File #2

Occurrences: (Sample: M5508 a, NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 2, 46N-19W)
"This sample is from the outcrop of phyllite on the south side of County Road 6, one-quarter mile west of the Northern Pacific Railway Station at Barnum...Magnetite, ilmenite, pyrite, chalcopyrite, well-rounded grains of garnet, and euhedral tourmaline were identified in the heavy mineral separate." (Ref. A, pp. 78, 80)
DDH AW-2, NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 19 has: (Ref. C)
- a few feet of minor chalcopyrite in phyllite and graphite
- 1.5 ft. of 780 ppm V and 38 ppm U and 110 ppm Mo
DDH PS-2, SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 19 has: (Ref. C)
- 2 ft. of 1520 to 1760 ppm Cr
- 1 ft. of 610 ppm Ni and 1% Ti and 1500 ppm Cr

Other Data: DDH JA-1 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 7 (Ref. B)
DDH MM-1 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 7 (Ref. B)
DDH AG-1, AG-2, AG-3 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 17 (Ref. B)
DDH KR-6 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 19 (Ref. B)
DDH AW-1 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 19 (Ref. B)
DDH PS-3 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 19 (Ref. B)
DDH LO-1 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 19 (Ref. B)
DDH PS-1 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 19 (Ref. B)
DDH ML-46C in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 23 (Ref. B)
Clay minerals in Sec. 19, see also summary in Appendix.
Native copper, see also summary in Appendix.
Graphite in Sec. 7, see also summary in Appendix.

Location: Carlton County
Township 46N-20W, Sections 3, 7, 8, 13, 16, 17, 21, 24, 25, 28, 32, 33

References: A) DNR General Exploration File 46-20, #5 & #6
B) Winchell, 1899, Vol. 4, page 23
C) Harder & Johnston, 1918, p. 69
D) DNR Open File Drill Samples List
E) Connolly, 1981, UMD thesis, p. 86
F) Thiel, 1922, MGS Field Notebook # 93a, p. 21

Summary: Occurrences in Middle Precambrian Thomson Formation

Occurrences: DDH MG-5 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 7, has: (Ref. A)
- 2 ft. of 650-800 ppm Cu
- 4 ft. of 740-7400 ppm Zn
- 2 ft. of 30-55 ppm Mo
- 1 ft. of 170 ppm Th
DDH MG-7 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 8 has: (Ref. A)
- 3 ft. of 960-2400 ppm Zn
- 10 ft. of 1.8 ppm Ag
- 1 ft. of 55 ppm Mo
- 2 ft. of 170-190 ppm Th
- 1 ft. of 0.42% P₂O₅
DDH ML-48 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 28, has: (Ref. A)
- 1 ft. of .055 Ag oz/t from a panner concentrate

- "The next outcrop of schist to the south in the Kettle River valley is near the mouth of Silver Creek in the SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Section 16, T.46N., R.20W. About 30 feet from the mouth, in the bed of the brook, a light gray, fine-grained phyllite crops out and is cut by a quartz vein trending a little east of north and standing almost vertical. This was explored for gold about 30 years ago, and a pit 10 feet by 10 feet was sunk on it to a depth of about 30 feet" (Ref. C, p. 69).
- Testpits:** In SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 32 along the west side of the Kettle River at Outcrop number 32-47 is a prospect pit. "Associated with it [the fault] are fault breccia approximately 2 m thick and slickenslides indicating a dip slip motion. A 60-plus-year-old prospect pit (Harder and Johnson, 1918) is situated along this fault exposing breccia containing much anhedral to euhedral, fine-grained secondary quartz." (Ref. E, p. 86; and Ref. B, p. 23)
- In NW $\frac{1}{4}$, Sec. 16 in a list of old gold prospects. (Ref. B p. 23.)
- "In numerous places about the mouth of Gillespie brook this mica schist appears in the banks of the streams, and also rises elsewhere as little hills. Its quartz has attracted attention for gold, and some shafts have been sunk from 10 to 20 feet." [Location probably NW $\frac{1}{4}$, Sec. 28.] (Ref. B, p. 13)
- Testpit in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 28 with "graphitic schist and few quartz stringers and pyrite crystals". (Ref. F, p. 21, sketch map.)
- Other Data:** DDH CL-1 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 3 (Ref. D)
 DDH KR-5 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 13 (Ref. D)
 DDH MG-6 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 17 (Ref. D)
 DDH WL-1 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 21 (Ref. D)
 DDH KRCH-2 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 24 (Ref. D)
 DDH KR-4 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 25 (Ref. D)
 DDH KRCH-9 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 33 (Ref. D)
 DDH KRCH-10, KRCH-11 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 33 (Ref. D)
 DDH 1, 2, 3, 4, 5 in Sec. 7 (See Appendix)
 Iron Ores - Proterozoic in Sec. 21, see also summary in Appendix.
 Graphite in Sec. 3, 24, and 33, see also summary in Appendix.
 Clay minerals in Sec. 21 and 24, see also summary in Appendix.

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- Location:** Carlton County
 Township 46N-21W, Sections 4, 6, 9, 22, 28,
- References:** A) DNR Open File Drill Samples List
 B) DNR General Exploration File
- Other Data:** DDH KRCH-6 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 4 (Ref. A)
 DDH KRCH-7 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 4 (Ref. A)
 DDH SL-1 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 6 (Ref. A)
 DDH MG-1 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 22 (Ref. A)
 DDH MG-2, MG-4 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 22 (Ref. A)
 DDH MG-3 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 28 (Ref. A)
 DDH KR-3 in Sec. 9 (Ref. B)

Iron Ores - Proterozoic in Sec. 6, see also summary in Appendix.

Clay minerals in Sec. 6, see also summary in Appendix.

Location: Carlton County
Township 47N-17W, Section 28

References: A) Hall, 1901, p. 350
B) DNR Open File Drill Samples List

Occurrences: "Some years ago explorations for gold were prosecuted along belt of quartz veins which resulted in finding only small traces of the metal." [Locations uncertain]
(Ref. A, p. 350)

Other Data: DDH WW-1 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 28 (Ref. B)

Location: Carlton County
Township 47N-18W, Sections 4, 5, 6, 8, 10, 11, 13, 15, 17, 32

References: A) Harder & Johnston, 1918, MGS Bulletin 15
B) Hyrakas, 1982, UMD thesis, pp. 147-149
C) DNR Open File Drill Samples List
D) Winchell, 1899, Vol. 4, p. 23

Summary: The host rock for these occurrences is the Middle Precambrian Thomson formation, which is dominantly a graywacke-graphitic slate sequence and has undergone at least two periods of deformation.

Testpits: In 1980, Rocky Mountain Energy dug two pits in the NE $\frac{1}{4}$ -NW $\frac{1}{4}$ of Sec. 4 that intersected two phosphate-rich sedimentary rock units, six and ten inches thick, interbedded with recrystallized cherty beds. Phosphate-bearing boulders were found in glacial drift in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 4. The phosphate rock units contain up to 500 ppm U and 5% P (Ref. B, pp. 147-149).
Two testpits, reportedly sunk in 1908, occur in black graphitic slate in Sec. 5. They are about 250 ft. southwest of the NE corner of SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 5 and are 10 ft. by 15 ft. by about 30 ft. deep. The south pit was sunk on a quartz vein about 2 $\frac{1}{2}$ feet wide, and pyrite is abundant in the black slate (Ref. A, p. 78).
A small pit and a shallow trench were dug in the black slate in Sec. 6. The pit is on the east side of the road, about 800 ft. north and 300 ft. west of the southeast corner of Sec. 5. Much pyrite occurs in the slate along cleavage planes. About 50 ft. east of the pit, there is a shallow trench, 2 ft. wide, trending N-S, and exposing the black slate for a distance of 60 ft. (Ref. A, p. 78).
Testpits are reported in Sec. 4, 5 and 8 in a list of old gold prospects. (Ref. D, p. 23)

Other Data: DDH MLCH-9 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 4 (Ref. C)
DDH MLCH-11 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 4 (Ref. C)
DDH MLCH-14 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 10 (Ref. C)
DDH ML-47 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 13 (Ref. C)
DDH GM-1 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 15 (Ref. C)
DDH ML-24 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 17 (Ref. C)

DDH ML-25 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 17 (Ref. C)
 DDH KR-1 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 32 (Ref. C)
 DDH T-2, T-2A in Sec. 11 (See Appendix)
 Graphite in Sec. 4, see also summary in Appendix.

Location: Carlton County
 Township 47N-19W, Sections 7, 15, 21, 22, 27, 28

References: A) Hall, 1901, p. 351
 B) DNR Open File Drill Samples List

Occurrences: "Northwest of the station, in section 15, township 47, range 19, there is an exposure in which a pyrite-bearing vein and diabase dike afford lithologic diversity. The badly weathered schists possess the same general characters as the rocks beside the railway. The locality is in the bank of a stream, and so covered that directions are difficult to determine with exactness. The vein has been assayed for gold; a good trace was found." (Ref. A, p. 351)

Other Data: DDH ML-6, ML-7 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 21 (Ref. B)
 DDH ML-9 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 22 (Ref. B)
 DDH ML-8 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 27 (Ref. B)
 DDH MLCH-5 & MLCH-7 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 28 (Ref. B)
 DDH 2035 in Sec. 7 (See Appendix)
 Graphite in Sec. 21, see also summary in Appendix.

Location: Carlton County
 Township 47N-21W, Section 15

Other Data: DDH 2025 in Sec. 15 (See Appendix)

Location: Carlton County
 Township 48N-16W, Sections 1, 5, 6, 16, 28

References: A) Winchell, 1900, Vol. 5, p. 379, 370
 B) Mattson, 1959, pp. 52-54
 C) Wright, et al., 1970, MGS GM-3, p. 10
 D) Morey, 1960, M.S. Thesis, pp. 71-72
 E) Winchell, 1899, Vol. 4, p. 23
 F) DNR General Exploration File #1

Occurrences: Pyritiferous conglomerate with vein quartz (Puckwunge fm?). Location is SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 1 in the St. Louis River Valley (Ref. A, p. 370, No. 449; and Ref. D below)

"The Thomson formation contains numerous quartz veins. The quartz accounts for 99% of the vein material. The remaining 1% is composed of small amounts of pyrite, chalcopryrite, and other sulfides. Local residents report small amounts of gold from the larger veins, but none was observed in any of the samples collected by the writer." [An example of a large vein is noted to occur south of the Thomson dam in SW $\frac{1}{4}$, Sec. 5 in the St. Louis River (p. 53)] (Ref. B, pp. 52-54, or Ref. C).

"The Thomson Formation contains numerous quartz veins ranging in width from less than one inch to nearly 10 feet. The veins are predominantly crystalline milky quartz with minor amounts of pyrite, chalcopryrite, and other sulfides.

The wall rock next to the larger veins is commonly altered to sericite and/or idocrase.

The largest quartz vein observed in the area is below the Thomson dam [SW $\frac{1}{4}$, Sec. 5] and is now largely covered by the Highway 39 bridge over the St. Louis River. This large vein occupies an extension fissure near the crest of an anticline. Large veins also occupy troughs of folds, whereas small ones, generally less than six inches wide, occur along joint and bedding planes. In several places, veins that occur along bedding planes have been folded with the enclosing wall rock and now resemble ptygmatic folds.

The quartz veins were probably deposited during the late stages of the major period of folding, as indicated by the "ptygmatic" veins, the sheared texture of the quartz grains, and the occurrence of the veins in tension fractures related to the folds." (Ref. C, p. 10).

"In summary, the quartz pebble conglomerate contains pebbles of quartz, and a few pebbles of chert and slate. Pebbles are from $\frac{1}{4}$ inch to 4 inches in diameter, and fairly well sized within individual layers. They are moderately rounded, and in the coarser conglomerates tightly packed. The matrix contains abundant grains of pyrite, poorly sorted granules and silt-sized particles of quartz and feldspar, and small plates of muscovite, sericite, and chlorite...Much of the pyrite has clearly crystallized or has been recrystallized subsequent to deformation. Marcasite occurs in place of pyrite in some samples. Pyrrhotite and chalcopyrite are common, particularly in the coarser conglomerates." [NE $\frac{1}{4}$, Sec. 1] (Ref. D, pp. 71-72)

From a ridge near a quartz vein, sample number 473, in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 5 is a pyritiferous graywacke with quartz, feldspar, siderite, chlorite, sericite, opaques, and tourmaline. (Ref. A, p. 379)

Testpits: A testpit reported in Sec. 6 - an old gold prospect (Ref. E)
A testpit reported in Sec. 16 - an old gold prospect (Ref. E)
A testpit reported in NW $\frac{1}{4}$, Sec. 2 - an old gold prospect (Ref. E)
A testpit reported in Sec. 10 (on islands) - an old gold prospect (Ref. E)
Quarries are reported in Sec. 5 (Ref. F., #1)

Other Data: Clay minerals in Sec. 28, see also summary in Appendix.
DDH T-5, T-6 in Sec. 5 (See Appendix)

Location: Carlton County
Township 48N-17W, Sections 19, 32

References: A) Winchell, 1899, Vol. IV, p. 23
B) DNR Open File Drill Samples List

Occurrences: Native Copper: "at Otter Creek Station; a several hundred pound piece found in gravel pit" [Sec. 19], (Ref. A, p. 23).

Other Data: DDH KRCH-4 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 32 (Ref. B)
DDH KRCH-5 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 32 (Ref. B)
Native Copper in Sec. 19, see also summary in Appendix.

Clay minerals in Sec. 32, see also summary in Appendix.

Location: Carlton County
Township 48N-18W, Section 32, 33

References: A) Hyrakas, 1982, UMD Thesis, pp. 140-144, & map in pocket
B) Ojakangas & Matsch, 1982, p. 142 & 149
C) Ojakangas, 1976, p. 142 [not searched]
D) DNR Open File Drill Samples List.

Summary: The host rock for these occurrences is the Middle Precambrian Thomson formation, which is dominantly a graywacke-graphitic slate sequence and has undergone at least two periods of deformation.

Occurrences: DDH MLCH-3, in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 32 (Ref. D) has:
- 35 ft. of up to .014% $\frac{U_3O_8}{U}$

Testpits: The "Arrowhead Mine" occurs in the SW $\frac{1}{4}$ -NW $\frac{1}{4}$ of Sec. 32, and has anomalously high radioactivity. The mine was worked in about 1910 for graphitic slate and presumably for gold (Ref. A). For exact directions to the mine site, refer to Ref. C, p. 142. The rocks appear to be dominantly brecciated, black, radioactive, graphitic, and pyritized slate. The fractures and pore spaces in the breccia are filled with quartz and pyrite samples from the mine contain:
18 ppm $\frac{U_3O_8}{U}$
50 ppm $\frac{U_3O_8}{U}$
0.2 ppm Au
11 ppm Th (Ref. A, p. 142)

Faults and dikes in the area were located by airborne and ground E-M. The author interpreted this occurrence to relate to a metamorphic-hydrothermal unconformity vein uranium model (Ref. A, p. 146). Others have suggested that the original workings for gold here were a fraudulent stock scheme (Ref. B, p. 149).

Phosphatic phyllite cited at Arrowhead Mine in SW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 32, labelled ST-U in Table 3. (Ref. A, p. 141).

Other Data: DDH ML-1, ML-4, ML-10, ML-12, ML-13, ML-16, ML-17, MLCH-2, MLCH-3 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 32 (Ref. D)
DDH ML-18 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 32 (Ref. D)
DDH ML-2, ML-3 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 32 (Ref. D)
DDH MLCH-1 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 32 (Ref. D)
DDH MLCH-12 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 32 (Ref. A)
DDH ML-5, ML-14, ML-15, MLCH-4 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 33 (Ref. D)
DDH ML-11 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 33 (Ref. D)

Location: Carlton County
Township 48N-19W, Section 18

Other Data: DDH 2026 in Sec. 18 (See Appendix)

Location: Carlton County
Township 48N-20W, Section 20

Other Data: DDH 2027 in Sec. 20 (See Appendix)

Location: Carlton County
Township 48N-21W, Section 29
Other Data: DDH 2024 in Sec. 29 (See Appendix)

Location: Carlton County
Township 49N-16W, Sections 19, 25, 30, 31, 36
References: A) Winchell, Vol. 4, 1899, p. 23
Testpits: NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 36 (Ref. A)

"Yet there has been some excavation on a graphitic quartzose vein near the river, on the east side, on N.E. $\frac{1}{4}$ N.E. $\frac{1}{4}$ section 31, lot 1, township 49, range 16. This mineral is quite common in small quantities, often associated with calcite. At the working on section 31, the vein in which graphite is found is about 12 inches wide, and the excavation is about 20 feet deep. The vein itself is of quartz, cutting the slates, and has much disseminated plumbaginous matter, but has no promise of economic value." (Ref. A, p. 23)

Other Data: Graphite, see also summary in Appendix.
DDH SB-1, SB-2, SB-3 in Sec. 19 (See Appendix)
DDH T-1, T-1A, T-2A in Sec. 25 (See Appendix)
DDH T-1A, T-3 in Sec. 30 (See Appendix)

Location: Carlton County
Township 49N-17W, Section 25
Other Data: Native Copper, see also summary in Appendix.
DDH T-1, T-2, T-3, T-4, T-4 in Sec. 25 (See Appendix)

Location: Carver County
Township 115N-23W, Sections 1, 3
References: A) Winchell, 1888, Vol. II, p. 131
Occurrences: "Two or three small pieces of copper, brought by ice, probably from the region of Lake Superior, were found in the drift in grading the railroad between Carver and Merriam Junction." [exact location unknown, T115N-R23W], (Ref. A, p. 131).
Other Data: Clay minerals, see also summary in Appendix.
Native Copper, see also summary in Appendix.
DDH T-29, T-31 in Sec. 1 (See Appendix)
DDH T-3 in Sec. 3 (See Appendix)

Location: Carver County
Township 116N-23W, Section 36
Other Data: DDH T-1 in Sec. 36 (See Appendix)

Location: Cass County
Township 134N-29W, Section 16
Other Data: DDH 2043 in Sec. 16 (See Appendix)

Location: Cass County
Township 134N-30W, Section 11
Other Data: DDH 1995 in Sec. 11 (See Appendix)

Location: Cass County
Township 134N-31W, Section 36
Other Data: DDH 1996 in Sec. 36 (See Appendix)

Location: Cass County
Township 135N-30W, Section 10
Other Data: DDH 1914 in Sec. 10 (See Appendix)

Location: Cass County
Township 137N-30W, Sections 14, 22, 34
References: A) DNR General Exploration File
Other Data: DDH PR-1, PR-2, PR-3 in Sec. 14 (Ref. A)
DDH 1917 in Sec. 22 (See Appendix)
DDH 1915 in Sec. 34 (See Appendix)

Location: Cass County
Township 139N-26W, Sections 27, 33, 34
Other Data: DDH 28, 32 in Sec. 27 (See Appendix)
DDH 26, 27 in Sec. 33 (See Appendix)
DDH 29 in Sec. 34 (See Appendix)

Location: Cass County
Township 139N-27W, Section 20
Other Data: DDH 1883 in Sec. 20 (See Appendix)

Location: Cass County
Township 139N-28W, Sections 2, 24, 26
Other Data: DDH 1876 in Sec. 2 (See Appendix)
DDH 1884 in Sec. 24 (See Appendix)
DDH 1902 in Sec. 26 (See Appendix)

Location: Cass County
Township 139N-29W, Section 1
Other Data: DDH 1877 in Sec. 1 (See Appendix)

Location: Cass County
Township 140N-25W, Sections 9, 10
References: A) DNR General Exploration File
Other Data: DDH TL-3 in Sec. 9 (Ref. A)
DDH TL-1, TL-2 in Sec. 10 (Ref. A)

Location: Cass County
Township 140N-26W, Sections 23, 26

References: A) DNR General Exploration File
 Other Data: DDH TL-5 in Sec. 23 (Ref. A)
 DDH TL-4 in Sec. 26 (Ref. A)

Location: Cass County
 Township 140N-27W, Section 14
 Other Data: DDH 1875 in Sec. 14 (See Appendix)

Location: Cass County
 Township 141N-28W, Section 36
 Other Data: DDH 1874 in Sec. 36 (See Appendix)

Location: Cass County
 Township 143N-27W
 References: A) Skillman, 1946, p. 184
 Occurrences: "In Cass County some veins of epidote are half a foot wide and have offshoots of epidote or quartz which are a foot or two across. Epidote-quartz veins both cut and are cut by basalt and granite porphyry dikes, suggesting at least two stages of mineralization, although it seems probably that the epidote mineralization is more or less contemporaneous with the basalt injection. The marked increase in mineralization northwestward indicates that the source of the mineralizing solutions lies to the northwest. Although the veins consist principally of quartz and epidote, they also contain chlorite, pyrite, calcite, siderite (?), and chalcopryrite" (Ref. A, p. 184) [location very uncertain].

Location: Chisago County
 Township 33N-19W, Section 1
 References: A) Berkey, 1898, Unpublished Ph.D. Thesis, pp. 140, 141, 148-153
 Occurrences: "Malachite is seen in many places near a contact of the sandstone and diabase as a green, earthy coating upon quartz or in cavities among the boulders of conglomeratic phases of the rock. It is especially noticeable at the Taylor's Falls conglomerate exposure. Oxide of iron containing copper and coated with malachite was secured from Sec. 1, T33N-R19W, from the sandstone [Sec. 1], (Ref. A, p. 150).

Location: Chisago County
 Township 34N-19W, Sections 1, 25
 References: A) Winchell, 1888, Vol. II, pp. 407, 421
 B) Berkey, 1898, Unpublished Ph.D. Thesis, pp. 140, 141, 148-153
 C) Morey, and Mudrey, 1972, pp. 425-430, Centennial Volume
 D) Cordua, Bauer, Gilbertson, Koskelin, Oberli, 1979, p. 227
 Occurrences: Some native copper found in 43 ft. deep shaft by Mr.

N.C.D. Taylor. Shaft is a short distance east of Lutheran Church on the road to Franconia, MN [Sec. 25], (Ref. A, p. 407).

"Native copper was found in a shaft near the St. Croix river. Shaft was operated by Taylors' Falls Mining Co." [Sec. 25], (Ref. A, p. 407).

"Native copper and silver was found in a second shaft located on Ravine St. approximately 75' above the first. The shaft is 120' deep, last worked in 1874-75, following a vein 8'-10' wide, dipping 85°W", [Sec. 25], (Ref. A, p. 407).

"Other local veins include a 4' wide vein striking N-S, apparently metalliferous" [Sec. 25], (Ref. A, p. 407).

"Also a 18" vein, near the foot of the upper Dalles, containing bornite . . . the four inches next to the hanging wall being bornite, with about a foot of white quartz and a thin earthy layer below" [Sec. 25], (Ref. A, p. 407).

"Native copper occurs in small quantities in the epidote portions of the diabase flows. Copper is also found occasionally in the glacial drift" [probably Sec. 1], (Ref. B, p. 149).

"Most commonly, the native copper is concentrated in stratiform layers defined by the amygdaloidal portions of individual flow units. The following generalizations apply to this kind of occurrence: (1) Both the footwall and hanging-wall are composed of massive basalt; (2) fragmental amygdaloidal, the most common host rock, grades downward and laterally into nonfragmental amygdaloidal and the nonfragmental parts tend to be very lean or barren of copper; (3) the fragmental layers pinch and swell, and commonly not all parts of the fragmental layer are copper-bearing; (4) because the distribution of fragmental amygdaloidal is irregular and because copper is not uniformly distributed, it is difficult to determine either size of potential ore bodies or meaningful values of ore tenor . . . native copper is, for practical purposes, the only potential ore mineral, although other minerals of economic importance including native silver, chalcocite, and chalcopyrite, are present in trace amounts" [probably entire township: T34N, R19W], (Ref. C, p. 429).

Regarding the Mazomonie Member (quartz arenite) of the Franconia Formation, "small stratiform epigenetic chalcocite and malachite deposits occur in the quartz arenite," also, "sparse malachite is also found in the conglomerate" [probably Sec. 25], (Ref. D, p. 227).

"A mass of such drift native copper weighing seventy pounds, found near Taylor's Falls, is in the museum of the Minnesota Academy of Natural Sciences [probably Sec. 25], (Ref. A, p. 421).

"An assay of the pyritiferous shales at Taylors Falls shows traces of gold" [Sec. 25], (Ref. B, p. 149).

Hematite: "Stains, larger accumulations similar to ore, plus fissure fillings in diabase" [Sec. 1], (Ref. B, p. 150).

Azurite: "With the malachite and dolomite, also other

copper minerals have been reported but were not found by Berkey" [Sec. 1], (Ref. B, p. 151).

Apatite: "Phosphoric acid is abundant in the lower sedimentary strata of the area" [location uncertain], (Ref. B, p. 153).

Kaolin: "This mineral is present in small quantity as an accompaniment of the process of alteration. A few specimens, however, have been obtained in which Kaolin is the chief resultant of decay. This type of decay is most noticeable in the conglomerates of the Dresbach Formation" [Sec. 1], (Ref. B, p. 153).

Testpits: Two shafts [probably in Sec. 25], see above description.
Other Data: Native Copper, see also summary in Appendix.

Location: Chisago County
Township 35N-19W
Other Data: Native Copper, see also summary in Appendix.

Location: Clay County
Township 139N-47W, Sections 5, 17, 20
Other Data: DDH 56-14, 56-12, 56-13, 56-2, 56-15 in Sec. 5 (See Appendix)
DDH 56-1, 56-2, 56-6, 56-4, 56-5 in Sec. 17 (See Appendix)
DDH 56-7, 56-8 in Sec. 20 (See Appendix)

Location: Clay County
Township 140N-44W, Section 11
Other Data: DDH RRVD-25A in Sec. 11 (See Appendix)

Location: Clay County
Township 140N-47W, Section 32
Other Data: DDH 56-16, 56-19, 56-17, 56-18 in Sec. 32 (See Appendix)

Location: Clay County
Township 142N-44W, Section 29
References: A) DNR General Exploration File #1
Summary: Occurrence in Archean greenstone terrane
Occurrences: DDH SL-1, Exxon, SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 29, has: (Ref. A)
- 32 ft. of 565 to 1200 ppm Zn
- 55 ft. of 20 to 25 ppm As

Location: Cook County
Township 59N-4W, Sections 13, 14, 16, 17, 20, 28, 29, 31
References: A) Grout and others, 1959, p. 157, in: Rennebaum, 1978, p. 61
B) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39, Plate 15
Occurrences: "Malachite stain in conglomerate" [Sec. 13], (Ref. A, p. 61)
Testpits: Center Sec. 14, 59N-4W (Ref. B, Plate 15)

E $\frac{1}{4}$, Sec. 16, 59N-4W (Ref. B, Plate 15)
 N $\frac{1}{4}$, Sec. 17, 59N-4W (Ref. B, Plate 15)
 NE $\frac{1}{4}$, Sec. 20, 59N-4W (Ref. B, Plate 15)
 NW $\frac{1}{4}$, Sec. 28, 59N-4W (Ref. B, Plate 15)
 SW $\frac{1}{4}$, Sec. 29, 59N-4W (Ref. B, Plate 15)
 Center Sec. 31, 59N-4W (Ref. B, Plate 15)

Location: Cook County
 Township 60N-2W, Sections 1, 18

References: A) Hall, 1889, in Rennebaum, 1978, p. 61
 B) Foster, 1963, Vol. 58, p. 796
 C) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39, Plate 14

Occurrences: "Stringers of bornite in 4 ft. wide (calcite?) vein near mouth of Cascade River" [Sec. 1], (Ref. A, p. 61).
Native Copper: "Field reconnaissance of some Precambrian, Keewenawan rocks in Cook County, Minnesota, revealed several areas of interesting mineralization. Detailed laboratory study and chemical analyses corroborated these findings" [probably for entire township, T60N-R2W], (Ref. B, p. 796)

Testpits: SE $\frac{1}{4}$, Sec. 18, 60N-2W (Ref. C, Plate 14)

Other Data: Native Copper, see also summary in Appendix.

Location: Cook County
 Township 60N-3W, Sections 20, 25, 27, 31, 33, 34

References: A) Grout and others, 1959, p. 157, in: Rennebaum, 1978, p. 61
 B) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39, Plate 13

Occurrences: "Malachite stain in test pits" [Sec. 31], (Ref. A, p. 61).
"Malachite stain in amyg. basalt" [Sec. 34], (Ref. A, p. 61).
"Malachite stain in basalt along Lake Superior shore" [Sec. 25], (Ref. A, p. 61).

Testpits: SE $\frac{1}{4}$, Sec. 20, 60N-3W (Ref. B, Plate 13)
 SE $\frac{1}{4}$, Sec. 27, 60N-3W (Ref. B, Plate 13)
 NW $\frac{1}{4}$, Sec. 34, 60N-3W (Ref. B, Plate 13)
 Center Sec. 33, 60N-3W (Ref. B, Plate 13)
 SW $\frac{1}{4}$, Sec. 33, 60N-3W (Ref. B, Plate 13)

Location: Cook County
 Township 61N-1E, Sections 12, 13, 19, 21

References: A) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39, Plate 11
 B) Marmaduke, 1941, Thesis, pp. 19-20

Occurrences: Probable malachite, azurite, and chalcopryrite are scattered through the altered rhyolite along a joint. Location is in SW $\frac{1}{4}$ of Sec. 12 where a small stream flowing from the north joins the Devils Track River, on the north side of the river gorge (Ref. B, pp. 19-20)

Testpits: SW $\frac{1}{4}$, Sec. 6, 61N-1E (Ref. A, Plate II)
 S $\frac{1}{2}$, Sec. 12, 61N-1E (Ref. A, Plate 11)

S $\frac{1}{2}$, Sec. 12, 61N-1E (Ref. A, Plate 11)
 SE $\frac{1}{4}$, Sec. 12, 61N-1E (Ref. A, Plate 11)
 NW $\frac{1}{4}$, Sec. 13, 61N-1E (Ref. A, Plate 11)
 NW $\frac{1}{4}$, Sec. 19, 61N-1E (Ref. A, Plate 11)
 NW $\frac{1}{4}$, Sec. 21, 61N-1E (Ref. A, Plate 11)

Location: Cook County
 Township 61N-2E, Sections 8, 9
 References: A) Green, 1972, pp. 294-332
 B) Rennebaum, 1978, p. 99
 C) Grout, Sharp and Schwartz, 1959 MGS Bulletin 39, Plate 12
 Occurrences: Regarding native copper: "Similar disappointing results were obtained from diamond drilling in 1969 by the New Jersey Zinc Company in similar rocks east of Grand Marais." [Sec. 8], (Ref. A, p. 331).
 "Malachite-stained brecciated amyg. basalt; sample 74 (150 ppm copper)" [Sec. 9], (Ref. B, p. 99).
 Testpits: SW $\frac{1}{4}$, Sec. 10, 61N-2E (Ref. C, Plate 12)

Location: Cook County
 Township 61N-1W, Sections 24, 26, 27, 33, 34
 References: A) Foster, 1962, p. 119, in: Rennebaum, 1978, p. 61
 B) Hall, 1889, pp. 105-111
 C) Foster, 1963, Vol. 58, pp. 798-800
 D) Winchell, 1899, Vol. IV, p. 332, No. 200
 E) Green, 1972, MGS Guidebook, Series 3, p. 30
 F) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39, Plate 10
 Occurrences: "0.5 miles up Cutface Creek; chalcocite and chalcopyrite with calcite in vesicles and matrix of andesite breccia" [Sec. 27], (Ref. A, p. 61).
 "In Town 61, Range 1 West, Section 24, native copper has been found. This location is in the bed of the Rosebud river, one and one-half miles from the lake shore and three miles west from Grand Marais. In the year 1876 two men named Johnson and Maquire worked here and secured some hundreds of pounds of copper. The rock is coarse-grained, dark green gabbro or gabbroid. Since there is felsite or felsite porphyry both above and below this exposure the copper bearing rock may be regarded as a dike. The copper is found in thin sheets and bands in the massive rock." [Sec. 24], (Ref. B, pp. 110-111).
 "On the right limit of Cutface Creek (T61N-R1W) a fragmental volcanic amygdaloid crops out and is composed of angular fragments of vesicular and amygdaloidal flow material cemented by massive calcite. Chalcocite with an associated malachite alteration product and chalcopyrite occur within this rock unit. Subhedral, non-brecciated, quartz crystals (less than 1 mm in length and width) fill almost all the amygdules and form layers on the fragmental surfaces. The remaining amygdaloidal and intrafragmental volumes are composed of calcite. All the primary copper

minerals are associated with the calcite, indicating a later (post breccia solidification and post quartz formation) hydrothermal introduction of material." [probably the entire township], (Ref. C, pp. 798-800).

"No. 200. Samples of copper-bearing greenstone (gabbro) from NW $\frac{1}{4}$, Sec. 24, T61-1W, up Fall River. This heavy-bedded rock has slickensided seams, or thin filling between layers. These seams contain much chloritic mineral (delessite?), some layers of it being one-half inch thick, with stilbite closely mixed with it, and also small quantities of calcite; the copper occurring in the massive, hard greenstone, or doleryte, in the form of thin spangling sheets once or twice the thickness of paper, or even one-quarter inch thick. The sheets sometimes embrace three or four square inches in area." [NW $\frac{1}{4}$, Sec. 24], (Ref. D, p. 332).

"The Terrace Point basalt is predominantly a massive, fine grained, black, ophitic basalt that characteristically contains thomsonite in amygdules, but in its lengthy exposure (including in this cut) several flow units and breccia zones of various character show complex relations with the major, massive, basal part of the flow. Traces of native copper have been found here." [Sec. 24], (Ref. E, p. 30).

Testpits: Center Sec. 26, 61N-1W (Ref. F, Plate 10)
NE $\frac{1}{4}$, Sec. 34, 61N-1W (Ref. F, Plate 10)
Testpit in Sec. 24, see above description

Other Data: Zeolites in Sec. 24 and 34, see also summary in Appendix.
Native Copper in Sec. 24 and 34, see also summary in Appendix.

Location: Cook County
Township 61N-2W, Section 35

References: A) Foster, 1963, Vol. 58, p. 796
B) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39, p. 157

Occurrences: Native Copper: "Field reconnaissance of some Precambrian, Keeweenawan rocks in Cook County, Minnesota, revealed several areas of interesting mineralization. Detailed laboratory study and chemical analyses corroborated these findings" [probably for entire township, T61N-R2W], (Ref. A, p. 796).

Testpits: Testpits are reported in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 35 (Ref. B, p. 157)

Other Data: Native Copper, see also summary in Appendix.

Location: Cook County
Township 62N-1E, Sections 12, 13, 22

References: A) Marmaduke, 1941, thesis

Occurrences: The tops of individual basalt flows, along shore from the center of Sec. 13 to the north center of Sec. 22 and inland to the northwest, are generally amygdaloidal and the fillings are usually a zeolite (Ref. A, p. 10).

Other Data: Zeolites, see also summary in Appendix.

Location: Cook County
Township 62N-2E, Section 32

References: A) Grout, Sharp and Schwartz, MGS Bulletin 39,
Plate 12

Testpits: SW $\frac{1}{4}$, Sec. 32, 62N-2E (Ref. A, Plate 12)

Location: Cook County
Township 62N-3E, Sections 14, 26, 27, 31, 33, 34

References: A) Grout, Sharp and Schwartz, 1959 MGS Bulletin 39,
Plate 8

B) Grout, 1950, Appendix F, p. 113

Occurrences: Titaniferous magnetite described in Sec. 26. On shore of
Lake Superior. Some black sands in beach sands, extend SW
about a mile past mouth of Brule River. (Ref. B, p. 113)

Testpits: SW $\frac{1}{4}$, Sec. 14, 62N-3E (Ref. A, plate 8)
SE $\frac{1}{4}$, Sec. 26, 62N-3E (Ref. A, plate 8)
SW $\frac{1}{4}$, Sec. 26, 62N-3E (Ref. A, plate 8)
SE $\frac{1}{4}$, Sec. 27, 62N-3E (Ref. A, plate 8)
NW $\frac{1}{4}$, Sec. 34, 62N-3E (Ref. A, plate 8)
W $\frac{1}{2}$, Sec. 33, 62N-3E (Ref. A, plate 8)
SE $\frac{1}{4}$, Sec. 31, 62N-3E (Ref. A, plate 8)
SW $\frac{1}{4}$, Sec. 31, 62N-3E (Ref. A, plate 8)

Other Data: Titaniferous Magnetite, see also summary in Appendix.

Location: Cook County

Township 62N-4E, Sections 12, 16, 20

References: A) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39,
Plate 9

Testpits: W $\frac{1}{2}$, Sec. 16, 62N-4E (Ref. A, Plate 9)
Center Sec. 16, 62N-4E (Ref. A, Plate 9)
In Sec. 12 (Ref. A, Plate 9)
In Sec. 20 (Ref. A, Plate 9)

Other Data: Titaniferous Magnetite, see also summary in Appendix.

Location: Cook County
Township 62N-5E, Section 6

References: A) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39
Plate 7

Testpits: Two pits in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 6 (Ref. A, Plate 7)

Other Data: Titaniferous Magnetite, see also summary in Appendix.

Location: Cook County
Township 62N-1W

References: A) Foster, 1963, Vol. 58, p. 796

Occurrences: Native Copper: "Field reconnaissance of some Precambrian,
Keeweenawan rocks in Cook County, Minnesota, revealed
several areas of interesting mineralization. Detailed
laboratory study and chemical analyses corroborated these

findings" [probably for entire township, T62N-R1W], (Ref. A, P. 796).

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- Location: Cook County
Township 62N-2W, Section 36
- References: A) Foster, 1962, Unpublished M.A. Thesis, Univ. Mo., [not searched] p. 118, in: Rennebaum, 1978, p. 61
B) Foster, 1963, p. 796, in: Rennebaum, 1978, p. 61
C) Foster, 1963, Vol. 58, pp. 796-803
- Occurrences: "7.5 miles from mouth of Cascade River; native copper in ash-flow tuff" [Sec. 36], (Ref. A, p. 61).
"7 miles from mouth of Cascade River; native copper associated with prehnite in amygdaloidal (basalt?)" [Sec. 36], (Ref. B, p. 61).

The Keweenawan terrane in the study area is composed of extrusive flows, pyroclastics, ash-flow tuff deposits, breccias, interflow sedimentary rocks, and intrusive igneous rocks. The course of the Cascade River is approximately normal to the strike of the regional structure, and it offers the most extensive continuous bedrock exposures available in the country. The zones of interest described below were found in stream canyons but due to extensive glacial cover were not worked laterally along the strike. Therefore, they are merely indications of possible similar and/or associated more extensive mineralization in the surrounding area which might warrant future detailed field and geochemical examination." [probably entire township], (Ref. C, p. 796).

Table 1

Assay results of Grab Samples from the Cascade River (CC) and Cutface Creek (CF) Prospects (Ref. C, p. 796).

	<u>% Cu</u>		<u>% Cu</u>
CF2 - - -	2.16	CC5 - - -	0.24

"samples were collected from a hydrothermally altered amygdaloidal extrusive igneous rock unit about seven river miles (north) from the mouth of the Cascade River (T62N-R2W). The mineral of the amygdules (less than 2 cm in diameter) is prehnite, and the zone appears to be several feet thick. The groundmass of this aphanitic extrusive rock is composed of plagioclase laths partially replaced by prehnite, hydrated alteration products, microcrystalline quartz, anhedral chlorite, subhedral epidote, and subhedral magnetite extensively altered to hematite . . . The occurrence of prehnite and the possibility of a regional prehnite zone could be an indirect indication of a favorable stratigraphic horizon for copper mineralization in the Portage Lake Lava Series in Michigan have been described by Stoiber and Davidson (1959). [Probably Sec. 36]

Approximately 0.5 of a mile farther upstream (north) ash-flow tuff contains native copper (T62N-R2W). The rock unit in which this mineralization occurs consists of both welded and non-welded tuffs. Native copper occurs as disseminated grains; dendritic masses; minute thread-like stringers; and flat blade-like, cleavage-controlled masses

in kaolinized and resorbed moth-eaten appearing potash feldspar and sodic plagioclase feldspar phenocrysts; and in the devitrified nearly opaque, hematitic groundmass. The non-welded and more porous portions of the ash-flow deposit with its devitrified pumice and shard structures, appear to have been the most conducive zones for copper precipitation. This mode of occurrence indicates that the non-welded, less compact tuffs were somewhat permeable to the mineralizers, in contrast to the more compact welded tuffs. Thus, it appears that this prehnite-native copper association could be helpful in future mineral exploration in the area." [probably Sec. 36] (Ref. C, pp. 796-798).

Other Data: Native Copper, see also summary in Appendix.

Location: Cook County

Township 62N-3W

References: A) Foster, 1963, Vol. 58, p. 796

Occurrences: Native Copper: "Field reconnaissance of some Precambrian, Keewenawan rocks in Cook County, Minnesota, revealed several areas of interesting mineralization. Detailed laboratory study and chemical analyses corroborated these findings" [probably for entire township, T62N-R3W], (Ref. A, p. 796).

Location: Cook County

Township 62N-4W, Sections 4, 9

References: A) Grout, 1937, MGS Field Notebook #300, pp, 37, 39

B) Grout, 1950, Appendix F, p. 113

Occurrences: Titaniferous magnetite described in: (Ref. B, p. 113)
 - "Sec. 4 at SW corner. Test pit on the corner, but very lean ore. (D) About 200 to 600 paces N. and 1900 paces W. of SW corner. Some segregated ore in a series of small exposures in a belt running north. No exposures indicate it is more than 5 feet thick. (C)"
 - "Sec. 9. 1400 paces N. and 1700 paces W. of SE. corner. (West of Burnt Lake, and about 200 to 300 paces E. of W. $\frac{1}{4}$ corner.). Several thin segregations in a thickness of 4 feet gabbro. Belt may be 150 paces long. (D)"

Testpits: In NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 4 a testpit in oxides in gabbro is shown on a sketch map (Ref. A, p. 37).

In Sec. 9, a testpit in oxide had "3, 2-inch ore beds in 5 feet and one, two-foot lean ore bed above" shown on a sketch map (Ref. A, p. 39).

Other Data: Titaniferous Magnetite in Sec. 4 and 9, see also summary in Appendix.

Location: Cook County

Township 62N-5W

Other Data: Titaniferous Magnetite, see also summary in Appendix.

Location: Cook County
Township 63N-1E, Sections 1, 2, 3, 10, 11, 15-18, 21-26

References: A) Davidson, 1977, Pine Mountain Quad, MGS Misc. Map Series M-31

Occurrences: Unit Olg: "Early mafic series; olivine gabbro, medium-to-coarse-grained. Contains 60-70% cumulus plagioclase (An₅₅₋₆₀) 5-10% cumulus olivine (Fo₅₅), 15-20% poikilitic augite, and 5-10% interstitial iron oxides. Contact relations of this unit are not known in the map area. Unit has sparse disseminated sulfides." [Sec. 1, 2, 3, 10, 11, 15-18, 21-26] (Ref. A, Map)

Location: Cook County
Township 63N-3E

Other Data: Titaniferous Magnetite, see also summary in Appendix.

Location: Cook County
Township 63N-4E

Other Data: Titaniferous Magnetite, see also summary in Appendix.

Location: Cook County
Township 63N-5E, Sections 1, 2, 6, 14, 17, 22, 24, 25

References: A) Grye, 1942, Thesis, pp. 53-54
B) DNR General Exploration File, Mountbracken Corporation's Cu-Ni prospect near Mineral Center, MN pp. 1, 2
C) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39 Plate 7

Occurrences: "A grain of native copper was found in a thin section of basalt from an outcrop just south of the center of Section 17, T63N-R5E. Although the calcite veins, pyrite veinlets, green stain, and native copper indicate that there has been some mineralization, no mineral deposits of commercial importance are known." [Sec. 17], (Ref. A, p. 54).

"The breccia along the shore in Section 25, near the center of the section was stained green, but no copper was detected." [Sec. 25], (Ref. A, p. 53).

"Surface trenching in Canada and diamond drilling in the United States on the dike has disclosed the presence of spotty copper-nickel mineralization in discontinuous zones of sulfides near both margins. Assays of chip samples from up to 40' of width average from .05% - .20% copper, and from .05% - .15% nickel. Grab samples of heavy sulfides have run over 1% combined copper-nickel... Geochemical sampling of rock outcrops has located anomalies that carry over 1000 ppm of Cu and Ni." [Sec. 1, 2] (Ref. B)

Testpits: NW $\frac{1}{4}$, Sec. 14, T63N-R5E (Ref. C, plate 7)
W $\frac{1}{4}$, Sec. 22, T63N-R5E (Ref. C, plate 7)
SE $\frac{1}{4}$, Sec. 24, T63N-R5E (Ref. C, plate 7)

Other Data: Native Copper in Sec. 17, see also summary in Appendix.
Titaniferous Magnetite; see also summary in Appendix.

Location: Cook County
Township 63N-6E, Section 6

References: A) Grout & Schwartz, 1933, MGS Bull 24, pp. 92-94
B) Gruner, 1926, Field Notebook #144, MGS, pp. 48-50

Occurrences: "An unusually good exposure of the contact of a dike with slate was observed on the high ridge in SW $\frac{1}{4}$ Sec. 6. The typical granular texture of the metamorphosed slate hornfels grades within 100 feet to little-altered slate. A shear zone in the diabase near the contact contains chalcOPYrite and pyrrhotite. The fact that dikes tend to drag up the sediments during intrusion is clearly shown near the end of Hat Point." [SW $\frac{1}{4}$, Sec. 6] (Ref. A, pp. 92-94)

"From the North 1/16 corner on the east section line a large dike of diabase forms a very high ridge. About 6 $\frac{1}{2}$ west and 6 tallies south of the northeast corner of Sec. 6 is a prominent rounded hill with steep diabase cliffs facing north and east and a more gentle slope facing south.

At about point located above is a shear zone in the diabase which strikes N.60°E. This shows many spots of limonite and on breaking the fresh diabase near these spots chalcOPYrite and pyrrhotite may be seen. This is much like other occurrences in the region". [Sec. 6] (Ref. B, pp. 48-50)

Other Data: Titaniferous Magnetite, see also summary in Appendix.
Olivine, see also summary in Appendix.

Location: Cook County
Township 63N-7E, Sections 4, 5

References: A) Mudrey, 1977, MGS Map M-36

Occurrences: On Susie Island, in Sec. 5 (see data for T64N-7E)

Testpits: On Magnet Island, in Sec. 4, there is a "prospect". (Ref. A)

Location: Cook County
Township 63N-1W, Sections 3, 7-10, 13-18, 23-26

References: A) Foster, 1963, Vol. 58, p. 796
B) Grout, 1950, Appendix F, p. 113
C) Davidson, 1977, MGS Misc. Map Series M-32

Occurrences: Native Copper: "Field reconnaissance of some Precambrian, Keewenawan rocks in Cook County, Minnesota, revealed several areas of interesting mineralization. Detailed laboratory study and chemical analyses corroborated these findings" [probably for entire township, T63N-R1W], (Ref. A, p. 796).

Titaniferous magnetite described in: (Ref. B, p. 113)

- "Sec. 7. SW. $\frac{1}{4}$ of SW. $\frac{1}{4}$ (=Lot 8). Lean ore segregation 75 to 150 paces N. of Brule River on the Range line between 1 and 2 W. Not well exposed but strong magnetics. Assays 33.07 percent Fe., 10.04 percent TiO₂. (C)"
- "1850 paces N. and 1000 paces W. of SE. corner. (150 paces N. of Brule River) is magnetite gabbro and strong

magnetics. 60 paces long in a bluff; 7 to 10 feet thick."

(D)"

- "1100 paces N. and 2000 paces W. on Range line, south of a pond, is a bluff of magnetite gabbro, and strong magnetics.

(D)"

Unit olg: "Early mafic series. Olivine gabbro, medium-to-coarse-grained. Contains 60-70% cumulus olivine (FO₅₅), 15-20% poikilitic augite, and 5-10% interstitial iron oxides. Contact relations of this unit are not known in the map area. Unit has sparse disseminated sulfides." [Sec. 3, 7-10, 13-18, 23-26], (Ref. C)

Location: Cook County
Township 63N-2W, Sections 7, 12, 13, 14, 15, 16

References: A) Foster, 1963, Vol. 58, p. 796
B) Burnell, 1976, Thesis, p. 37
C) Grout, 1950, Appendix F, p. 113

Occurrences: Native Copper: "Field reconnaissance of some Precambrian, Keewenawan rocks in Cook County, Minnesota, revealed several areas of interesting mineralization. Detailed laboratory study and chemical analyses corroborated these findings" [probably for entire township, T63N-R2W], (Ref. A, p. 796).
Sample 9-12, unit I-2, a porphyritic gabbro in SW $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 7 (Ref. B, p. 37) has:
- 0.82% apatite (mode, vol %)
- 4.72% ilmenite
Titaniferous magnetite described in: (Ref. C, p. 113)
"Reports of 'Iron' in secs. 4 and 5; could not be found."
- "Sec. 12. SE $\frac{1}{4}$ SE $\frac{1}{4}$, about 150 paces N. of SE. corner. (100 paces N. of Brule River) lean magnetite gabbro exposed, but suggest better ore concealed. The ore belt extends into sec. 7, T.64 N., R.1 W., across the Range line. (C)"
- "Secs. 13, 14, 15 and 16. Show magnetite gabbro but no rich segregations. Southwest bay of Norman (Vernon) Lake shows the rock, but if there is ore, it is concealed. Some anorthosite. (D)"

Other Data: Native Copper, see also summary in Appendix.

Location: Cook County
Township 63N-3W, Sections 22, 23, 30, 31, 32, 33

References: A) Foster, 1963, Vol. 58, p. 796
B) DNR General Exploration File
C) Grout, 1950, Appendix F, p. 112

Occurrences: Native Copper: "Field reconnaissance of some Precambrian, Keewenawan rocks in Cook County, Minnesota, revealed several areas of interesting mineralization. Detailed laboratory study and chemical analyses corroborated these findings." [probably for entire township, T63N-R3W], (Ref. A, p. 796).
Titaniferous magnetite described in: (Ref. C, p. 112)
"Elftman reported a magnetite belt in the south central part of this township."

- "Sec. 30. Near west $\frac{1}{4}$ corner. Some magnetite in olivine gabbro reported. Segregated in gabbro. (D)"
- "Sec. 31. Near center. Magnetite gabbro, possibly lean ore. (D) 1900 paces N. and 1300 paces W. of SE. corner Area 100 paces each way includes 4 small rich streaks in much leaner gabbro. (D)"
- "Sec. 32. 1500 paces N. and 1200± W. of SE. corner. Lean thin ore outcrops 25 paces each way, magnetics extend it east and west. 1200 paces N. and 500± W. of SE. corner. Between arms of Vern Lake, 800± paces NW. of tip of point. Lean ore is 6 feet thick, crops out 10 x 25 paces. (C) On point dividing Vern Lake, about 500 paces from end of point. 2-foot layer exposed. (D)"
- "Sec. 33. The gabbro near, for about 10 feet, has magnetite but in 2-inch segregations? From 700 p. No. and 600 p. W. of SE. cor., scattered to 850 p. N. and 1950 p. W. Rich gabbro segregated ore beds up to 4 inches thick. (C)"

Other Data: DDH CC-1, CC-2, CC-3, G-1 in Sec. 22 (Ref. B)
 DDH G-2, G-3, G-4, G-6 in Sec. 23 (Ref. B)
 DDH G-5, G-7 in Sec. 23 (See Appendix)
 Staurolite and Garnet in Sec. 30, see also summary in Appendix.
 Titaniferous Magnetite, see also summary in Appendix.

Location: Cook County
 Township 63N-4W, Sections 2, 13, 16, 21, 22, 24, 25, 26, 27, 28, 29, 32, 33, 35

References: A) Grout, Sharp, Schwartz, 1959, pp. 84, 87-88, 157
 B) Lister, 1966, Econ Geol., Vol. 61, No. 2, pp. 292-293
 C) Grout, 1950, Appendix F, pp. 111-112

Occurrences: Titaniferous Magnetite: Data from Table 10: Analyses and Test Data on Cores From the 1947 Drilling of Titaniferous Magnetite Deposits. [Sec. 2] (Ref. A)

Site & Depth in feet	Approx. %			Grade of Concentrate	
	%Fe	%TiO ₂	Gravity Conc	%Fe	%TiO ₂
Hole 8					
49-64	27.14	24.10	25	37.48	43.78
64-70	24.64	22.32	20	37.71	44.77
130-141	33.53	19.41	25+		
141-146	24.28	14.89	15+		
157-168	30.14	16.53	20		
Hole 9					
126-136	21.11	11.93	20		
206-230	27.46	12.02	15	53.24	22.55
262-268	32.66	13.90	30+		

"There are two main bands or ranges of magnetite-ilmenite deposits in the Duluth gabbro. The North Range is discontinuous along a 30-mile length, mainly within two miles of the base of the gently-dipping gabbro. The South Range, 12 miles from the North Range, extends over a five mile length that is apparently within a few miles of

the roof of the gabbroic body. There are several belts of magnetite-ilmenite lenses in each range, the longest belts more than a mile in length. In parts of each range there is more than one belt; these belts are closely spaced, each one at a slightly higher position in the gabbro. Each belt is made up of magnetite-ilmenite lenses arranged end to end but the lenses are separated by up to several hundred feet of gabbro. The ranges, belts and individual lenses parallel the layering of the gabbro.

Each lens is commonly less than 15 feet thick and up to several hundred feet in length and width. Contacts between magnetite-ilmenite rich lenses and their host rock are gradational across several inches. The upper contact of most lenses is sharper than the lower contact and the upper part of most lenses contains a greater amount of oxide minerals than the lower part. The lenses contain from 20 to 70 percent oxide minerals and their host rock contains about 5 to 10 percent oxide minerals.

Locations of samples used for detailed work in the present investigation are shown in graphic logs of the drill holes in Figure 6. Detailed work was restricted to 15 samples from 2 drill holes. The rock in and near the deposits of both the North and South Ranges is composed of plagioclase (An₅₂₋₅₆), olivine (hortonolite), augite, hypersthene, magnetite-ilmenite, and accessory apatite, biotite and alteration products of olivine and pyroxene." [Exact location uncertain] (Ref. B, pp. 292-293)

"Sec. 35. 50 paces N. and 800 paces W. of SE corner. Tunnel, known as 'old silver mine'." (Ref. C, p. 112; Ref. A, p. 157)

Titaniferous magnetite described in: (Ref. C, pp. 111-112)

- "Sec. 16. Mag. gabbro, thin layers 1500 paces N. of SE. corner. (D)"

- "Sec. 21. SW. $\frac{1}{4}$. 50 paces N. and 1850 paces W. of SE. corner. Magnetite stringers in gabbro. No magnetics. (D)"
 "900 to 1000 paces N. and 450 to 500 paces W. of SE. corner near shanty, lean ore thin bands in gabbro? gneissoid. (D)"
 "800+ paces N. and 600+ paces W. of SE. corner. Test pits and outcrops, rich segregated band, not more than 2 feet thick and 25 feet long. Fair sized area sampled -- 51.16 percent Fe, 2.62 percent TiO₂. Visible chalcopyrite. Several textural varieties. (D) and (C)"

- "Sec. 23. Near SE. corner. Gabbro has magnetite veins or segregations in layers 1 to 3 inches thick. (D)"

- "Sec. 25. Est. 1300 paces N. and 1400 paces W. of SE. corner. East of Temperance River, some small segregated ore belts. (D)"

"1000 paces N. and 1200 paces W. of SE. corner. One outcrop lean segregated ore and fair magnetics. (D)"

"600 paces N. and 50 paces W. of SE. corner. Segregated ore bands in gabbro. 2-5 feet thick. (D)"

"S. $\frac{1}{2}$ NE. $\frac{1}{4}$ and N. $\frac{1}{2}$ SE. $\frac{1}{4}$ have many small areas of strong magnetics, but not continuous long belts. Ore segregations 2 to 5 feet thick, pinch out or grade to gabbro. (D)"

- "Sec. 26. 1300 paces N. and 700 paces W. of SE. corner near Temperance River, a 25-foot bluff, strong magnetics, 200 paces long--medium ore. Extends to 1200 paces N. and 450 paces W. (A)"
- "1400 paces N. and 1100 paces W. of SE. corner. Medium ore outcrops. (B)"
- "About 1500 paces N. and 1700 paces W. of SE. corner. 30-foot cliff, 15-foot belt of ore, small outcrops, extended by magnetics. (B)"
- "From NE. corner, south to Jack Lake, no ore, only mag. gabbro. (D)"
- "Ore bluff, magnetite segregation about 1100 to 1300 paces N. and 950 to 1000 paces W. of SE. corner dips south. (Granite sill south.) (A)"
- "About 1400 to 1600 paces N. and 700 paces W. 3-inch segregations of magnetite. Too small and lean to be of interest. (D)"
- "1400 paces N. and 1050 paces W. of SE. corner ore lenses and outcrops. Magnetics indicate belt. (C)"
- "(NW. $\frac{1}{4}$ NW. $\frac{1}{4}$) 1600 paces N. and 1700 to 1900 paces W. of SE. corner. Belt of magnetics and many outcrops of medium ore. (C)"
- "1100 paces N. and 200 paces W. of SE. corner. Small segregated ores at Jack Lake. (D)"
- "Sec. 27. 300 paces E. of NW. corner lean ore in a few spots in magnetite gabbro. (D)"
- "Test pit 300+ paces N. of $\frac{1}{4}$ corner secs. 28 and 27. Gneissoid segregated ore runs S. and SW. (C)"
- "NE $\frac{1}{4}$ lean ore belt 30 paces wide. 8-12 foot scarp 300 paces long. Dips 30° SE. Strong magnetics nearly 800 paces long, E.-W. across $\frac{1}{4}$ sec. (B)"
- "1400 paces N. and 1800 paces W. of SE. corner. Iron ore band crops out in E.-W. magnetic belt. To the east only 6-inch belts exposed. Connects with belt in NE $\frac{1}{4}$. (C)"
- "SW. of the last, to the sec. line, several good outcrops lean ore with magnetite segregations in bands 1 to 2 feet thick. (C)"
- "Near the NW. corner, 2 drill holes near the wreck of old cabin. (C)"
- "SW. $\frac{1}{4}$ magnetite gabbro has a few thin segregations, no magnetics. Brandt's assay, 43.9 percent Fe, 15.06 percent TiO₂. (D)"
- "Sec. 28. Best belt is from test pit (in sec. 27) 300 paces N. or E. $\frac{1}{4}$ corner, extending southwest, along SE. edge of pond, and $\frac{1}{4}$ mile beyond. Magnetics and outcrops, and a 15-foot cliff, 250 feet long, with a few rich thin streaks. (B) and (C)"
- "NW. $\frac{1}{4}$ and N. $\frac{1}{4}$ NE. $\frac{1}{4}$ has magnetite gabbro but no magnetics. (D)"
- "Sec. 29. 1300 paces N. and 1350 paces W. of SE. corner on a point in Sawbill Lake. 'Iron rich bands in gabbro' are probably not rich ore, but some magnetite made the gabbro 'iron rich'. (D)"
- "Sec. 32. Mixed rich and lean ore runs 300 paces N. from NE. bay of Smoke Lake. (B)"
- "450 paces N. and 250 paces W. is the belt of ore Grout

drilled in 1947. (C)"

"NE. $\frac{1}{4}$ NE. $\frac{1}{4}$. Ore deposit claimed by John Blackwell (not seen by Survey party). Some magnetics. (A?)"

- "Sec. 33. 60 paces SW. of the N. $\frac{1}{4}$ corner 7 ft. cliff lean ore segregation in gabbro. (B)"

"About 1900 paces N. and 1500 paces to 1600 paces W. of SE. corner. 15 ft. ridge ore. Runs SW. $\frac{1}{4}$ mile. 'Best seen in Cook Co.' 25 foot scarp for 200 to 300 paces. Assays 30 percent Fe. (A)"

"1800 paces N. and 1850 paces W. of SE. corner. Magnetite in gabbro. (C)"

"S. $\frac{1}{4}$ NW. $\frac{1}{4}$ magnetite gabbro and magnetics. (B)"

Other Data:

DDH 9, 10 in SE $\frac{1}{4}$, Sec. 32 (See Appendix)

Olivine, see also summary in Appendix.

Staurolite and Garnet in Sec. 25, see also summary in Appendix.

Titaniferous Magnetite in Sec. 13, 21, 22, 24, 26, 27, 28, 33, see also summary in Appendix.

Location:

Cook County

Township 64N-1E, Sections 8, 29-32, 34, 35

References:

A) Phinney, 1972, p. 352, in Centennial Vol.

B) Davidson, 1977, Pine Mountain Quad, MGS Misc. Map Series M-31

C) Grout, 1950, pp. 106-117

Occurrences:

Outcrop samples from "traverse one" contain (Ref. A, Table V-18, p. 352) [location uncertain]:

- 12.2% (vol. mode) olivine, 3.6% apatite, 12% magnetite

- 3.4% apatite

- 3.2% apatite

Unit Olg: "Early mafic series; olivine gabbro, medium-to-coarse-grained. Contains 60-70% cumulus plagioclase (An₅₅₋₆₀) 5-10% cumulus olivine (F0₅₅), 15-20% poikilitic augite, and 5-10% interstitial iron oxides. Contact relations of this unit are not known in the map area. Unit has sparse disseminated sulfides." [Sec. 29-32, 34, 35] (Ref. B, Map)

"Sec. 8 North of Crocodile Lake the contact has a little magnetite-ilmenite, and a little sulphide. Hardly enough to be ore (D)." (Ref. C, p. 110)

Other Data:

Titaniferous Magnetite, see also summary in Appendix.

Location:

Cook County

Township 64N-2E, Sections 5, 8, 10

References:

A) Gruner, 1926, MGS Field Notebook #144, pp. 25-27

B) Phinney, 1972, p. 352 in Centennial vol.

C) Winchell, Vol. 4, 1899, p. 499

D) Grout, 1937, p. 63

E) Grout, 1913-1914, Field Notebook #0, MGS Library

F) Grout & Schwartz, 1933, MGS Bulletin #24, p. 83

G) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39

H) Grout, 1950, Appendix F, p. 110

I) Morey, 1965 Thesis, pp. 176-239

Summary:

The host rock is the Middle Precambrian Rove Formation with Logan (?) diabase. Mr. William P. Spalding had a mine prospect for native silver in Sec. 5 on the south side of Lake Miranda ("which is a long lake next north of Lake Fanny") in a vein 6 or 8 feet wide. The vein is in breccia of trap or quartzite. (Ref. C for above). Grout (1914) notes the Spalding Mine had slate in the mineshaft dump and that diabase in the tunnel just west of the shaft is full of quartz veins (Ref. E).

Occurrences:

"The Spalding [silver] Mine exploration is spread nearly half a mile along the S side of the east half of Miranda Lake. The workings seem to be in a shattered zone running E-W . . . The breccia is partly of diabase fragments, partly of slate graywacke fragments. The cement is quartz and carbonate (some Fe) and not much else is seen. Now rusty. Pyrite is noted only in the diabase, disseminated." [The locations as marked on sketch map show one shaft and three testpits in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 5 and one shaft and two testpits in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 5 and one trench in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 5.] (Ref. A, pp. 25-27)

"Two veins prospected for silver in northeastern Minnesota were reported to contain gold also. The old "Spalding Mine"...opened more definite veins, south of the east end of Lake Miranda in Sec. 5, 64N-2E." (Ref. D, p. 63)

Outcrop sample from "Traverse two" contains (Ref. B, Table V-19, p. 352) [location uncertain]:

- 2.9% apatite (mode, vol. %)

"The Spalding mine, as it is locally known, consists of a series of pits and shafts on the south shore of Lake Miranda in Section 5. N. H. Winchell gives considerable data on this work in the Seventh Annual Report of the Minnesota Geological and Natural History Survey, pages 18 to 21. The work has been long abandoned. The exploration is spread along the south side of the lake for nearly half a mile and seems to have opened a shattered zone running nearly east-west. The bluff at the west is diabase to the water's edge, but slate probably was encountered in the shafts. Farther east the workings probably started in slate. The shattered zone passed through both the diabase and slate. The cement of the breccia is quartz and carbonate -- probably some iron carbonate, since the material is now rusty. Disseminated pyrite occurs in the diabase only. Winchell reported the vein as 6 to 8 feet wide. Mr. Spalding reported traces of native silver, but none has ever been observed by either Winchell or members of the present survey. The location had been thought to be the site of ancient diggings, but Winchell considered that improbable." (Ref. F, p. 83)

Titaniferous magnetite described in: (Ref. H, p. 110)

- "Sec. 10. N. of center. Farthest east of the titaniferous ores. A few inches rich, mostly ilmenite, not more than three feet, surrounded by very lean gabbro. (D)"

Black Argillite; contains pyrrhotite:

- 2700 ft. E., 100 ft. S.; Sec. 8 (Ref. I, pp. 176-239)

Testpits: A shaft and tunnel are noted in Sec. 5. (Ref. E and H)
 SE $\frac{1}{4}$, Sec. 5, 64N-2E (Ref. A)
 See shafts and testpits described above.
 Many in Sec. 5, see above and Ref. G.

Other Data: Titaniferous Magnetite in Sec. 8, see also summary in
 Appendix.

Location: Cook County
 Township 64N-3E, Sections 3, 5, 6, 9, 10, 12, 17

References: A) Phinney, 1972, p. 353 in Centennial Vol.
 B) Grout, 1937, Vol. 32, p. 63
 C) Grout & Schwartz, 1933, MGS Bulletin #24, p. 86
 D) Winchell, 1899, Vol. 4, p. 500
 E) Winchell, 1878, p. 20
 F) DNR General Exploration File
 G) Schwartz, MGS 1925 Field Notebook #141, pp. 49, 51
 H) Grout, 1933, p. 61
 I) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39

Occurrences: Outcrop samples from "Traverse four" contain (Ref. A, Table
 V-21, p. 353) [location uncertain]:
 - 3.8% (vol. mode) apatite, 18% magnetite
 - 3.0% apatite
 - 5.1% apatite, 4.7% magnetite
 Outcrop sample from "Traverse three" contains (Ref. A, Table
 V-20, p. 353) [location uncertain]:
 - 3.9 % apatite (vol. mode)
 On McFarland Lake in Sec. 6 near a portage that runs
 north from the west end of the lake, is a breccia zone
 between diabase and slate, cemented by quartz and carbonate
 with some pyrite. Vein prospected for silver and reported
 to contain gold also. (Ref. B, p. 63)
 "Considerable exploration has been carried on at a
 prospect on the shore of McFarland Lake in Sec. 5. The
 mineralization is along a shear zone where slate has been
 faulted down against diabase. The relative movement is
 clearly shown by the drag of the slate. Much of the dump is
 chloritic slate and slate breccia with a quartz-calcite
 matrix. The slate strikes N.70°W. and dips 20° to 25° S.
 The fault zone can be traced a short distance east and west
 and is well exposed in a small creek bed about 300 feet west
 of the shaft. The strike of the fault appears to coincide
 with the strike of the bedding. This is probably the vein
 referred to by Winchell in the Seventh Annual Report, page
 20, where he notes the occurrence of pyrite, galena and
native silver." (Ref. C, p. 86)
 John McFarland's location [a silver prospect?] is on
 Sec. 9 and Sec. 10. He has two veins and one place thought
 to be a site of ancient mining...(Ref. D, p. 500)
 "In the NW $\frac{1}{4}$ of Sec. 3, along the south side of Pine
 River, just below the outlet of John Lake, are outcrops of
 brecciated diabase with much coarse calcite, quartz, and
 some pyrite. The diabase is much altered and slickensided
 with chlorite. In one place the diabase was observed to
 transgress the bedding of the slate diagonally for a

distance of 6 feet. This was apparently not a post diabase fault, for the diabase was dense all along the offset, as if chilled. (See Figure 11D.) Similar transgression on a somewhat larger scale was noted also on the big bluff in NE $\frac{1}{4}$, Sec. 10, where the slate was cut across by the diabase for full 25 feet." (Ref. C, p. 86)

Testpits: Probably in Sec. 5, 6, 9, and 10 (see above references) but locations uncertain.

Also in Sec. 12, "about 200 feet south of the dam at the outlet of South Fowl Lake on the Minnesota side of the Pigeon River is a small exploration pit on a calcite vein. The calcite occurs along fractures and has apparently replaced the diabase as masses. One mass as exposed in place is about 1 x 2 x 2 feet. A short distance north of the dam on a bluff overlooking the lake a later dense diabase dike cuts across the usual coarse diabase. This later intrusive is very rarely found in the Rove area of Minnesota." (Ref. C, p. 86)

In NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 5, "Shaft in quartz vein". (Ref. H, p. 61, Ref. B and Ref. I, p. 157)

"About 200' below dam is a small exploration pit on a calcite vein. This seems to be along fractures but has replaced diabase in masses . . . Diabase is much weathered to limonitic material." [Location on sketch map is NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 12] (Ref. G, pp. 49-51)

Other Data: DDH WS-1, WS-2, WS-3 in Sec. 17 (Ref. F)
Titaniferous Magnetite, see also summary in Appendix.

Location: Cook County

Township 64N-5E, Sections 28, 29, 31, 32, 35, 36

References: A) Schwartz, 1923, MGS Field Notebook #102, pp. 11 & 73
B) Schwartz, 1927, Field Notebook #142, MGS, pp. 61, 62, 66-70
C) Grout and Schwartz, 1933, MGS Bulletin #24, pp. 67-68, 92, 94
D) Mudrey, 1972, a Centennial Volume, p. 411
E) Grout, 1933, p. 69
F) Grout, 1937, p. 65
G) Schwartz, 1925, p. 261-265
H) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39 Plate 6
I) Schwartz, 1924, p. 32-33, Vol. 9
J) Grout, 1950, Appendix F, p. 110
K) Grout, 1927, MGS Field Notebook, pp. 75, 77

Occurrences: Prospect in slate, sulphides noted at this location.
[NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 36] (Ref. B, p. 61)

"About 250 paces west of the center of the section is a test pit on a sulphide zone. Considerable pyrrhotite and chalcopyrite appear in some specimens. M3158 consists of numerous specimens of this zone. Just west of the center of the same 40 is a test pit on a calcite vein in rhyolite porphyry. A calcite-rhyolite vein breccia is abundant."
[NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 35] (Ref. B, pp. 66, 68)

"A small stream drains a swamp to south, over diabase forming a small falls and gorge. There is no slate exposed

in the gorge indicating that diabase may be a dike. In gorge is small vein with calcite, quartz, probably laumontite and sulphide (pyrite) in the diabase as well as in the vein." [SE₄-SE₄, Sec. 35] (Ref. B, pp. 69-70)

"In NW₄-NE₄ Sec. 36 found inclusions of graphitic slate in rhyolite or red rock. The graphite seems to have been taken up by the red rock. Pyrite is also present and the abundance of limonite indicates much of this originally. Specimen M3153 from here. The exposure is small and not easily found. It is about 100 paces north and 60 paces east of N1/16 corner of center line (N-S) of section. [NW₄-NE₄, Sec. 36] (Ref. B, pp. 61, 62)

"The Green prospect---Very different is the xonotlite-chalcopyrite deposit in diabase in a shallow pit in SW₄-SE₄, Sec. 35, T.64N., R.5E. It is but a short distance from State Highway No. 1 and was discovered by the owner, Mr. Melvin Green. Other occurrences of sulphides in diabase resembling the deposit on the Green homestead were observed in several places as shown on page 61.

The testpit followed vertical fractures and replacement veins in a diabase dike near the contact with slate. Specks of sulphides may be seen disseminated through the diabase, but along the fractures are masses consisting principally of sulphides with residual fragments of diabase, much of the original rock having been replaced by sulphides. The sulphides are most extensive where fractures intersect and include in places masses of xonotlite ($5\text{CaO}\cdot 5\text{SiO}_2\cdot \text{H}_2\text{O}$) and prehnite. The manner in which the silicates are embedded in the sulphides indicates that they were deposited at the time the vein was formed. The sulphides in the diabase are not confined to the deposit at this particular pit but are found in places over an area of several miles. They are apparently near the contact of diabase and slate but have not been found directly at the contact or in the slate.

A study of thin sections and polished surfaces of the wall rock outside the fractured zone and of sulphides and fragments of diabase found in the fractured zone reveals a remarkable contrast.

Thin sections of the rock a foot and more from the vein show a well-developed diabasic texture. (See Figure 32) The essential minerals are plagioclase (labradorite), olivine, and augite, with accessory pyrrhotite, chalcopyrite, magnetite and biotite. The only alteration products are small amounts of serpentine in cracks in olivine and an occasional grain of chlorite. Plagioclase makes up from 50 to 60 percent of the diabase and occurs as euhedral crystals apparently free from alteration products of any kind. Olivine, augite, magnetite, and the sulphides fill in around the lath-shaped feldspars. Magnetite is small in amount and in some cases is intergrown with the sulphides, which are somewhat more abundant than magnetite.

An examination of polished surfaces of the diabase shows that the sulphides in the diabase consist of pyrrhotite and chalcopyrite, the former predominating. The sulphides obviously crystallized later than the feldspar, as is shown by their matrical position and by occasional stringers

cutting feldspar crystals.

A study of polished surfaces shows that the sulphides consist of pyrrhotite and chalcopyrite, with subordinate amounts of pentlandite and violiarite.

Magnetite was seen but rarely in the polished ore except in the diabase fragments, where it is a normal constituent. The following partial analysis shows the amount of several elements in selected material: Fe, 32.63 percent; Cu 18.26 per cent; Ni 0.52 per cent; S, 26.21 per cent." [SW $\frac{1}{4}$ -SE $\frac{1}{4}$ Sec. 35] (Ref. C, pp. 67-69, see also Ref. A; Ref. B, pp. 67-69; Ref. G; Ref. I)

"Several tabular gabbroic bodies, previously thought to belong to the Logan intrusions, contain copper-and nickel bearing sulphides that were segregated near the base as primary magmatic phases. Most of the known sulfide bearing rocks are olivine-bearing dikes that are in the so-called island belt in Ontario; Guel (1970) assigned these rocks to the Pigeon River intrusions. This geologic terrane extends southwestward from Pigeon River into Minnesota for a distance of at least 10 miles, and in this area scattered occurrences of copper and nickel sulfides have been reported from the Green prospect...At the Green prospect there is a primary sulfide-bearing olivine diabase that has been so highly fractured and altered that it superficially resembles a fissure vein deposit (Schwartz, 1924, 1925). The primary sulfides consist of pentlandite, pyrrhotite, and chalcopyrite, and judged from the textural observations of Schwartz (1925, p. 263) clearly the sulfides crystallized contemporaneously with the silicates.

The primary sulfide-bearing diabase is fractured, and brecciated fragments of diabase within the "vein" are markedly altered. The gangue minerals are principally xonotlite ($\text{Ca}_5\text{Si}_5\text{O}_{14}(\text{OH})_2$) and prehnite. Secondary copper sulfides, particularly chalcopyrite, in the "vein" are most abundant at fracture intersections. In addition, supergene chalcopyrite and violiarite replace some of the pentlandite in the unaltered diabase. A sulfide concentrate from this locality assayed 32.63 percent iron, 18.26 percent copper and 0.52 percent nickel." [SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 35] (Ref. D, p. 411)

"In NW $\frac{1}{4}$ Sec. 31 a small waterfall and gorge expose a calcite vein in sandstone and graywacke. The vein is about 3 feet wide. Quartz lines the walls and pyrite occurs along joints. The calcite is very coarse and forms a breccia with rock fragments, suggesting a possible fault." (Ref. C, p. 94)

"A prominent dike ridge ends rather abruptly to the east near the northeast corner of Section 31. At the east end of this ridge is a mineralized zone from 4 to 8 feet wide with diabase containing chalcopyrite and pyrrhotite on either side. A calcite-quartz vein which crosses the sulphide zone apparently is of later age and not connected with the sulphide mineralization, which appears to have been at least in part truly magmatic. Some analcite occurs in the wall of the carbonate vein." (Ref. C, p. 94)

"In NW $\frac{1}{4}$ of Sec. 29, a calcite vein crosses the Pigeon River just below Hairpin Turn in Split Rock Canyon between the artificial log chute and the natural falls. The vein is variable and complex in a shattered zone. The main vein is two feet wide in places. It crosses with little change from the quartzite walls to a diabase dike and up the other quartzite wall of the gorge. There is pyrite and limonite in the walls, but little in the calcite." (Ref. C, p. 94)

"In Sec. 28, just north of the logging road in the northeast quarter of the section, a 6-inch calcite vein strikes N.10°E. and is about vertical. The walls are graywacke quartzite. It has been reported that galena was found in this vein, but none was observed by the members of the survey. A little oxidized sulphide and quartz are the only minerals besides calcite." (Ref. C, p. 92)

"Several veins and prospects are found in Sec. 35 in addition to the one described in the section on economic geology. In SE $\frac{1}{4}$ -SE $\frac{1}{4}$ Sec. 35 a small stream drains the large swamp to the south and east. Where it passes over the diabase dike a small falls and gorge are formed that expose a small vein with calcite, quartz, laumontite, and pyrite." (Ref. C, p. 94)

"A calcite vein with a breccia of rhyolite fragments was found in a pit in NE $\frac{1}{4}$ -SW $\frac{1}{4}$ Sec. 35. In the northern part of this same forty a test pit shows a sulphide zone in diabase with pyrrhotite and chalcopryrite." (Ref. C, p. 92)

"In Section 36 a similar zone of sulphide diabase is exposed on the cliff just south of the beaver pond near the east quarter corner. In the SW $\frac{1}{4}$ -NE $\frac{1}{4}$ of the same section, graphitic slate and pyrite were found with rhyolite or red rock. The graphite seems to have been taken up by the red rock in such a way that small bunches occur in the igneous rock without the characteristic form of inclusions." (Ref. C, p. 94)

"Small outcrops in NW $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 36 show graphite nodules in a red rock. These are somewhat unusual in having the graphite in igneous rocks but seem to be in too small amounts to be commercially valuable." (Ref. C, p. 69)

"Prospect pits in Secs. 35 and 36, T.64 N., R.5E., in the Rove-slate area, were opened for nickel and copper but are said to carry some values in gold also. The main ore is a chalcopryrite-pyrrhotite segregation in a diabase intrusive, with local replacements at high temperatures forming masses of xonotlite, prehnite and sulphide. Thin and polished sections of the diabase near the masses also show sulphides widely disseminated in the rock. They include pyrrhotite, chalcopryrite, with subordinate cubanite, pentlandite and violarite. These in the fresh diabase seem as clearly primary as the augite, magnetite, olivine and biotite, though all these are later than the labradorite laths. The more massive replacement ores are perhaps hydrothermal rearrangements of the material of the same magma source as the primary sulphides." (Ref. F, p. 65)

Titaniferous magnetite described in: (Ref. J, p. 110)

- "Reports of copper and nickel ore in diabase (Melvin Green) in Sec. 25 and elsewhere. See Minn. Geol. Survey

Bull. 24 for assays.

In the NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 21: "A calcite vein crosses the Pigeon River just below the Hair Pin turn at Cascade Falls between the artificial log shoot and the natural falls. It is variable and complex in a shattered zone. The main vein is up to 2 feet wide . . . Much pyrite and gossan in the wall, but less in the calcite. No other sulfides were found." (Ref. K, pp. 75, 77)

Testpits:

The following five testpits are marked on the sketch map (Ref. A, p. 73):

- SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 35
- SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 35 "calcite veins in rhyolite"
- NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 35
- NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 35 "xonotolite, Cu-Ni sulfides"
- SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 35 "sulfides"
- N $\frac{1}{2}$, Sec. 36, T64N-R5E (Ref. H, Plate 6)
- SE $\frac{1}{4}$, Sec. 35, T64N-R5E (Ref. H, Plate 6)
- SW $\frac{1}{4}$, Sec. 35, T64N-R5E (Ref. H, Plate 6)
- SW $\frac{1}{4}$, Sec. 35, T64N-R5E (Ref. H, Plate 6)
- NW $\frac{1}{4}$, Sec. 35, T64N-R5E (Sulfides in diabase) (Ref. H, Plate 6)
- NE $\frac{1}{4}$, Sec. 28, T64N-R5E (Sulfides in diabase) (Ref. H, Plate 6)
- NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 35, T64N-R5E (calcite veins)(Ref. H, Plate 6)
- NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 35, T64N-R5E (calcite veins)(Ref. H, Plate 6)
- NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 36, (Ref. B, p. 61)
- NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 35, (Ref. A, pp. 66, 68 and NE $\frac{1}{4}$ -SW $\frac{1}{4}$)
- SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 35, (Ref. A, pp. 67, 69 and Ref. B, pp. 67-68)
- NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 35, two pits, see above

Other Data:

Graphite in Sec. 32 and 36, see also summary in Appendix.
Titaniferous Magnetite, see also summary in Appendix.

Location:

Cook County

References:

- A) Schwartz, 1923, MGS Field Notebook #102, p. 73
- B) Schwartz, 1927, MGS Field Notebook #142, pp. 55-59
- C) Grout and Schwartz, 1933, MGS Bulletin #24, p. 94
- D) Kendall, 1928, Thesis, pp. 42-43
- E) Wells, 1927, MGS Field Notebook #147, pp. 6 & 7
- F) DNR General Exploration File
- G) Grout, 1933, p. 61

Occurrences:

"Calcite vein in sandstone and graywacke at falls. Very coarse calcite and calcite breccia. Vein about 3 feet wide. Quartz lines wall and pyrite occurs along joints. Seems to strike about N-S." [SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 31] (Ref. B, pp. 55-56)

"Vein on east end of ridge in NE NE Sec. 31. This was blasted by Green, Harvey and Schwartz in 1924. Vein or mineralized zone is 4 to 8 feet wide. Seems to be a sulphide diabase as well. Pyrrhotite and chalcopyrite are easily seen. A calcite-quartz vein crosses mineralized zone which strikes about N 65° E. Specimens M3156 from here. Zone is

exposed for only 20 feet±." [NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 31] (Ref. B, pp. 57-59)

"In the majority of cases the sulphides were found in olivine diabase, being the latest minerals to crystallize and showing their late origin by the universal inclusion of other minerals by them. The texture in the disseminated deposits of the diabase is strictly primary, no replacement boundaries, fissures or alterations occurring. In the veins, on the contrary, the typical texture is irregular replacing structure in which the metallic minerals are found to have less respect for the boundaries of those rocks forming minerals present, although not cutting across crystals, and having borders that are much less sharply defined than in the sulphide diabases."

"Mineralogically, the samples collecting after those included in Schwartz's description were found very similar to those on which he worked. The best sample is a piece of sulphide from the east line of Sec. 28, T.64 N, R.6E., about five hundred paces north of the east quarter corner. This sample contains pyrrhotite, chalcopyrite, pentlandite, a mineral corresponding to polydynite as identified by the Davy-Farnham tables, and secondary limonite." [Sec. 28] (Ref. D, pp. 42-43)

"50 paces North 16 paces west of S.E. corner of Sec. 29 a gossan of sulphide diabase has been worked. Show pyrite and chalcopyrite." (Ref. E, p. 6-7)

Mountbracken Corporations Cu-Ni prospect near Mineral Center, Minnesota: (pp. 1, 2)

"Surface trenching in Canada and diamond drilling in the United States on the dike has disclosed the presence of spotty copper-nickel mineralization in discontinuous zones of sulfides near both margins. Assays of chip samples from up to 40' of width average from .05-.20% copper, and from .05%-.15% nickel. Grab samples of heavy sulfides have run over 1% combined copper-nickel . . ."

"Geochemical sampling of rock outcrops has located anomalies that carry over 1000 ppm of Cu and Ni." [Sec. 27-29, 31-34] (Ref. F, p. 61)

"On the east section line of Section 28, about 750 paces south of the northeast corner, is a zone of sulphide diabase with much pyrrhotite." (Ref. G, p. 61)

"Along a cliff about 200 paces east of the southwest corner of Section 29 is a zone of weathered sulphide diabase. This contains pyrite, pyrrhotite, chalcopyrite, and weathered products, limonite, and native copper. The zone appears to be about 2 feet wide and extends along the face of the bluff for 20 feet. Most of the zone was probably removed by erosion." (Ref. G, p. 61)

"A few paces northwest of the southwest corner of Section 29 a test pit shows pyrite and chalcopyrite in a sulphide diabase." (Ref. G, p. 61)

Testpits: SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 30 (Ref. C, p. 94)

SW $\frac{1}{4}$, Sec. 29 (Ref. G)

The following testpits are marked on the sketch map (Ref. A, p. 73):

- SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 19, "Sulfide in diabase"
 - SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 19, "Sulfides in calcite vein at contact slate & diabase"
 - NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 31, "Sulfides and gossan"
- In SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 29, "Pit in sulfide diabase" (Ref. G, p. 61).

Other Data:

SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 29 (Ref. E, pp. 6, 7)
 Native Copper in Sec. 29, see also summary in Appendix.
 Olivine, see also summary in Appendix.

Location:

Cook County
 Township 64N-7E, Sections 27, 28, 29, 30, 31, 32 (called Susie Island or Governor Island)

References:

- A) Winchell, 1900, Vol. 5, pp. 293, 294, 295, 300, 417, 799
- B) Hall, 1889, pp. 105-111
- C) Winchell, 1899, Vol. 4, p. 520
- D) Schwartz, 1928, pp. 762-772
- E) Grout, 1933, pp. 61, 64, 69
- F) Grout & Schwartz, 1933, MGS Bull. 24, pp. 64 & 98-99
- G) Emmons & Grout, 1943 [not searched]
- H) Grout, Sharp, Schwartz, 1959, MGS Bull. 39, p. 157
- I) Franklin, 1970 [not searched]
- J) Mudrey & Morey, 1972, pp. 407-410, in Cent. Vol.
- K) Mudrey, 1973, Ph.D. dissertation, pp. 254-255
- L) Coyner, 1974, abs.
- M) Mudrey, 1976, pp. 877-888
- N) Mudrey, 1977, MGS Map M-36
- O) Schwartz, 1927, Field Notebook, MGS, pp. 41-43
- P) Weiblen, Morey, Mudrey, 1971, Guidebook, pp. 97-123

Summary:

At Susie Island, the veins occur in near vertical, north-northwest trending fractures that cut both the Rove Formation and four diabase dikes of Logan and undetermined affinity (Mudrey, 1976; Mudrey, 1977; Schwartz, 1928). Schwartz (1928) postulated a buried granite contact based on beach gravel and cited Winchell (1900) as stating that the shaft near shore reached granite. The most abundant ore mineral is bornite, followed by chalcocite, chalcopyrite, pyrite, covellite, and malachite (see Grout, 1933, for description of ore minerals). The ore minerals have a crustiform, concentric, or scalloped (accretionary) texture. The gangue minerals were calcite, quartz, and barite. A few tons of ore assaying 6.22% copper and a "small amount of silver" were removed from an incline and drift before operations ceased (Schwartz, 1928).

A number of ore deposit models have been proposed for these fissure vein deposits. Franklin (1970) proposes for the Mainland Belt veins of the Thunder Bay, Ontario, district that Keweenawan intrusives provided the energy to mobilize the metals in the Rove Formation. These metals would migrate laterally to a low pressure (fracture) zone and crystallize in veins as a result of decreasing temperature. Mudrey and Morey (1972) suggest that the Canadian Mainland Belt and Island Belt lineaments are fracture zones that appear to define hinge lines that are related to the subsidence of the Lake Superior syncline. They conclude that the differences

in mineralization at various localities imply a complex paragenetic history for the vein material in the district. They cited Tanton (1931, 1935) for the interpretation that Keweenaw igneous rocks were the source of these mineral deposits. Coyner (1974) suggests that after homoclinal foldings and subsequent fracturing, the veins at Loon Lake were mineralized by fluids from the Duluth Complex layered series just to the south. Another model should be considered. These prospects, especially Loon Lake, have characteristics very similar to Cobalt-type ores, for which the Cobalt, Ontario, district is the type locality. The evidence of worldwide association cited by Stanton (1972) seems to indicate this ore type is affiliated with granitic rocks. Thus a potential source of metals and hydrothermal fluids of the veins in Cook County is the bright red, granitoid rock such as that which occurs as a sill on Pigeon Point and that which occurs on Susie Island. These felsic rocks were emplaced after the Logan intrusions and have normal polarity, so they are classed as Middle Keweenaw (Mudrey, 1977; see Keweenaw late felsic intrusions of Geul, 1970). These felsic rocks were emplaced in time and space near the vein mineralization.

Occurrences:

"A mass of two minerals - chalcopyrite and calcite." [Note: location uncertain, probably S $\frac{1}{2}$, Sec. 31] (Ref. A, p. 293)

"Several veins on Pigeon Point deserve brief mention. On the shore of Pigeon Bay at the center line of Section 28 is a calcite-barite vein in a cliff at the water's edge. This is about 30 inches wide and cuts slate near a dike. The abundance of barite is noteworthy. To the east a short distance is a series of dip joints and shear zones in slate, along which calcite veins have formed. Winchell reported some work on a vein three-fourths of a mile east of the point that encloses Clark's (Mark's) Bay. The minerals were calcite, barite, amethyst, pyrite, sphalerite, galena, and chalcopyrite." (Ref. F, p. 99) [Location probably Sec. 27].

"In Section 27 on the south shore of the point in a small bay in the western part of the section is a similar calcite-barite vein in slate that is about 8 feet wide near the shore, where it is well exposed. This is the widest of the calcite veins observed. The main vein strikes northwest-southeast, and a branch about 2 feet wide extends to the southwest." (Ref. F, p. 98)

"In Section 32 small calcite veins are visible along shore and under water, but these do not contain any metallic minerals." (Ref. F, p. 98)

[In NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 32] "Just west of Morrison's Bay is a series of pits in a graphitic, pyritic quartzite 20 feet wide. About 100 paces west of the pits is a calcite vein with more or less barite and quartz. The pit farthest north exposes the vein to a width of 6 feet, mainly calcite, with a vug on the hanging wall containing amethystine quartz.

Winchell reported galena and malachite from a vein that corresponds with this one in location. A short tunnel also cuts the vein. The strike is about N.15°W., dip 60°S. The

vein shows a breccia in some places and also banding, which suggests successive opening and filling." (Ref. F, p. 99) [Location in NE $\frac{1}{4}$, Sec. 32]. The pits were owned by Mr. Eben Falconer and were "reported to assay gold." (Ref. O, pp. 41-43)

"On the shore at about the center line of Section 31 is another series of calcite veins along joint planes in quartzite. These are mainly under water and follow strike joints, occasionally cutting across from one strike joint to another along dip joints. The main vein is about a foot thick." (Ref. F, p. 98)

"Some wider veins have been reported in the drift east of the incline shaft of the Susie Island mine. The older exploration on the south side of the east point of the island is a shaft said to be 150 feet deep on a vein 12 inches wide. A drift to the south from the bottom of the shaft is reported to have followed a vein 7 feet wide. A drift to the north followed a narrower vein. Ore was piled on the dock . . . , wrecked by a storm . . . , and now is found as peculiar white boulders containing fairly fresh copper sulfides.

The inclined shaft of the more recent exploration was sunk from the high point of the island, on the breccia zone between two dikes. From a depth of 210 feet a drift ran 60 feet, N70°E, to a vein that runs about N20°W. The few tons of ore sacked for shipment . . . contained 6.22% Cu and a little silver." (Ref. E, p. 64) [Location probably Sec. 32]

"Several pits in SE $\frac{1}{4}$ of Sec. 32 on Pigeon Point have followed graphitic disseminations in graywacke quartzite. Examination by the U.S. Bureau of Mines shows this to be of the amorphous type and to be present in such small amounts with siliceous material that it seems doubtful if this material could be utilized commercially even under the most favorable conditions" (Ref. E, p. 69; also Ref. H, p. 157).

Small island west of Lucille Island has calcite-barite veins (Ref. H, p. 157).

Southern end of Susie Island and small island off point has calcite-barite veins (Ref. H, p. 157).

"Calcite-barite veins, some of them several feet wide, are found in several places on Pigeon Point." (Ref. E, p. 61, 64; Ref. N)

- Shore of Pigeon Bay, Sec. 28, outcrop

- Shore of Lake Superior, Sec. 27, pit

- SE $\frac{1}{4}$ of Sec. 32, pit

- Small island west of Lucille Island

- Southern end of Susie Island and small island off point

A barite-calcite quartz vein on SW $\frac{1}{4}$ of Sec. 32 on Pigeon Point (Ref. C, p. 520).

A shaft in diabase in vein, "probably SE $\frac{1}{4}$ of Sec. 28," called Baker and Kindred's location on Pigeon Point has barite with specks of chalcopryrite, sphalerite, and pyrite. (Ref. A, p. 300)

Deep shaft sunk by Maj. T. M. Newsom; he found a little copper ore and less silver; other minerals were calcite, barite, amethyst, pyrite, sphalerite, galena, chalcopryrite, and "gray copper." (Ref. B) [Location Probably Sec. 32]

Calcite-barite veins and a pit are reported on shore in Sec. 27. (Ref. H, p. 157)

Testpits: See above descriptions of shafts on Susie Island.
 Pits in SE $\frac{1}{4}$ of Sec. 32 (see above and Plate 15 of Ref. E). Three mineshafts are indicated on it also.
 In 1973, Mudrey still cited two mine shafts on Susie Island. (Ref. K, pp. 254-255) (See also Mudrey, 1977)
 The Pigeon Point U.S.G.S., 1976, 7.5' topographic map shows the shaft location on Sec. 32, Susie Island.
 "At the mine (shaft) of Pigeon Point Silver and Copper Mining Company." (Ref. A, p. 799) [Location uncertain]
 NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 27, 64N-7E (Calcite-barite veins; shore of Lake Superior) (Ref. B and E)
 SE $\frac{1}{4}$, Sec. 32, 64N-7E (Calcite-barite veins) (Ref. B & E)
 See above shaft by Maj. Newson, location uncertain

Other Data: Graphite, see also summary in Appendix.
 Olivine, see also summary in Appendix.

Location: Cook County
 Township 64N-1W, Sections 5, 6, 7, 8, 14, 25-30, 33, 34, 36

References: A) Schwartz, 1927, MGS Field Notebook #142, pp. 19, 21
 B) Davidson, 1977, MGS Misc. Map Series M-32
 C) Grout, 1950, Appendix F, p. 110

Occurrences: In NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 5, [Sample] "M2560. Incrustation on the bluff of diabase facing south about 500 paces north of the center of Sec. 5. Looks like MnO₂." (Ref. A, see sketch map., p. 19, 21)
 "Early mafic series. Olivine gabbro, medium-to-coarse-grained. Contains 60-70% cumulus plagioclase (An₅₅₋₇₀), 5-10% cumulus olivine (Fo₅₅), 15-20% poikilitic augite, and 5-10% interstitial iron oxides. Contact relations of this unit are not known in the map area. Unit has sparse disseminated sulfides. [Sec. 25-30, 33, 34, 36] (Ref. B, see map unit olg)
Titaniferous magnetite described in: (Ref. C, p. 110)
 - "Sec. 5. 100 paces NE. of MC., secs. 5 and 6, belt runs N. of road near Poplar Lake. Strong magnetics for about 300 paces. (C)"
 - "Sec. 6. Near SE corner (Lot 11) lean ore outcrop 25 x 20 x 15 feet. Small outcrop good ore 100 paces NW. of MC. $\frac{1}{2}$ ton sample worked up by Mines Exp. Station. (C)
 "SW. $\frac{1}{4}$ lean ore about 500 paces N. and 1800 to 1950 paces W. of SE. corner. Strong magnetics. (D)"
 "Where center line of sec. 6 (N. and S.) meets shore of Poplar Lake, 50 paces N. of Lake, ore is 5 feet thick, 115 feet long. Trench on shore; Bradt assayed; 29.49 per cent Fe and 19.48 per cent TiO₂. (C)"
 "Belt along shore west of last place for $\frac{1}{2}$ mile. Patches of lean ore and magnetite gabbro. (D)"
 "About 700 paces N. and 1950+ paces W. of SE. corner. Magnetite gabbro and strong magnetics. (D)"

- "Sec. 7. Island west of corner secs. 5, 6, 7 and 8 (Lot 12). Assay 42.92 per cent Fe and 30.32 per cent TiO_2 . (B)"
- "Secs. 7 and 8. South shore Poplar Lake near MC., secs. 7 and 8. Small outcrops of magnetite gabbro or lean ore. (D)"

Other Data: Titaniferous Magnetite in Sec. 14, see also summary in Appendix.

Location: Cook County

Township 64N-2W, Sections 1, 2, 3, 4, 6, 8, 11, 22, 26, 31

References:

- A) Grout, 1950, p. 28, in Ruotsala & Tufford, 1965, p. 82
- B) Edwards, 1915, MGS Field Notebook #12, p. 77
- C) Nathan, 1966, Ph.D., p. 190
- D) Jensen, 1959, Econ. Geol., Vol. 54, No. 3, p. 383
- E) Grout, 1950, Appendix F, pp. 109-110

Occurrences:

#17 magnetite-ilmenite, east of Benning Lake, in Sec. 1 has: (Ref. A, p. 82)

- FeO = 35.68
- TiO_2 = 20.27

"Perhaps related to that mineralization are two unmapped dikes of very (up to twenty percent) chalcopyrite-rich coarse-grained pyroxene-plagioclase rock that intruded Unit C two hundred yards north of northernmost Poplar Lake."

[Sec. 1] (Ref. C, p. 190)

"Chalcopyrite in coarse-grained gabbro from basal zone of Duluth Gabbro lopolith. Collected 1,000 feet north of intersection of Gunflint Trail and South Lake foot trail in T64N, R2W, Section 1, Minn." [Sec. 1] (Ref. D, p. 383)

Titaniferous magnetite described in: (Ref. E, pp. 109-110)

- "Sec. 1. See Plate VI. NW. $\frac{1}{4}$ SW. $\frac{1}{4}$ (Lot 6) at end of bay (and belt runs into sec. 2), lean ore; and another belt 300 paces N. (C)"

"Near center sec. 1. Close to Poplar Lake (Lot 8). Open cut 25 x 6 feet. (C)"

"Lean ore on island. (D)"

- "Secs. 1 and 2. N. of MC. on Poplar Lake between secs. 1 and 2, about 700 paces and another about 900 paces. Exposed ore 10 x 10 paces. (E)"

"Belt 600 paces long, 20 paces wide on Poplar Lake shore. Variable grade, dips north. Strong negative magnetics. (C)"

- "Sec. 2. Ore and magnetics $\frac{1}{4}$ mile N. of $\frac{1}{4}$ corner, secs. 1 and 2; could not follow E.-W. (E)"

"At MC. secs. 1 and 2, lean ore of a belt along N. shore, to the west. (C)"

"Belt from 1200 paces N. and 600 paces W. to 1300 paces N. and 1250 paces W. of SE. corner, lean ore outcrops and magnetic attraction. (C)"

"1550 paces N. and 100+ paces W. of SE. corner. Ore in trench, grades into gabbro. (D)"

"From 1250 paces N. and 800 paces W. of SE. corner. Belt of lean ore, grades to gabbro at ends. (C)"

"N. $\frac{1}{2}$, north of portage west of Poplar Lake, continuation of shore belt at shanty. Ore. (C)"

"Center and W. $\frac{1}{4}$ corner and SW $\frac{1}{4}$, magnetic belts, not strong; outcrops magnetite gabbro. (D)"

- "Sec. 3. North of portage west of Poplar Lake on west line sec. 2. Gnessoid ore 15 x 30 feet. (C)"

"NW. of $\frac{1}{4}$ corner, secs. 2 and 3, some magnetics. Some lean ore. (D)"

- "Sec. 4. Winchell says belt runs S. of Portage Lake (but some is exposed North). It may be a wide belt of lean ores. (D)"

- "Sec. 6. Ore sample 1700 to 1717 paces N. and 975 to 1000 paces W. of SE. corner. (C)"

"Ore segregation in gabbro 1700 paces N. and 500 paces W. of SE. corner. (D)"

"1100 paces N. and 50 paces W. of SE. corner. Test pit. (D)"

- "Sec. 8. 1800 paces N. and 1600 paces W. of SE. corner patches of ore and lean ore and magnetite gabbro, not good belts. (D)"

- "Sec. 26. W. of center NW. $\frac{1}{4}$. Magnetite gabbro or hornfels 10 ft. test pit. (D)"

Testpits: On sketch map in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 26, a testpit is marked along with the notes "olivine, magnetite" (Ref. B, p. 77).

Other Data: DDH R2-W in NW $\frac{1}{4}$, Sec. 1 (See Appendix)
Titaniferous Magnetite in Sec. 1, 2, 3, 4, 6, 11, 22, 26, and 31, see also summary in Appendix.

Location: Cook County

Township 64N-3W, Section 1, 2, 3, 4, 5, 6, 7, 8, 25
28, 29, 30, 31, 33, 34, 35, 36

References: A) Singewald, 1913, USBM Bull. 64, p. 106, in Ruotsala & Tufford, 1965, pp. 79-80
B) Weiblen, Papike, and Anderson, 1981, MGS Map M-46
C) Nathan, 1966, Ph.D. thesis, p. 190
D) Weiblen, Morey, Mudrey, 1971, Inst. on Lake Superior Geology, 17th Annual Meeting, p. 115
E) Morey, Weiblen, Papike and Anderson, 1981, MGS Misc. Map Series M-46, Geol. Map of Long Island Lake Quad., p. 2
F) Lister, 1966, Econ. Geol., V. 61, no. 2, pp. 292-293
G) Bayley, 1895, in Ruotsala, Tufford, 1965, MGS Information Circular 2, p. 87
H) DNR General Exploration File
I) Grout, 1950, Appendix F, pp. 108, 109
J) Grout, Sharp and Schwartz, 1959, pp. 87-88
Magnetite ore at Iron Lake in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 1 has: (Ref. A, pp. 79-80)

OCCURRENCES: - #12; core at 75' depth:

FeO	= 32.4 wt %
$\frac{\text{TiO}_2}{\text{Cr}_2\text{O}_3}$	= 8.25
$\frac{\text{Cr}_2\text{O}_3}{\text{V}_2\text{O}_5}$	= 2.05
$\frac{\text{V}_2\text{O}_5}{\text{FeO}}$	= 1.03

- #13; same core as #12, 85' depth:

FeO	= 24.05 wt %
$\frac{\text{TiO}_2}{\text{Cr}_2\text{O}_3}$	= 5.75
$\frac{\text{Cr}_2\text{O}_3}{\text{V}_2\text{O}_5}$	= 1.50
$\frac{\text{V}_2\text{O}_5}{\text{FeO}}$	= 2.60

- #14; same core as #12, 65' depth: $\frac{\text{FeO}}{\text{TiO}_2} = 21.53$
 $\frac{\text{Cr}_2\text{O}_3}{\text{V}_2\text{O}_3} = 1.01$
 $\frac{\text{FeO}}{\text{TiO}_2} = \text{none}$
 $\frac{\text{V}_2\text{O}_3}{\text{FeO}} = 0.91$

- #15; same core as #12, 55' depth $\frac{\text{FeO}}{\text{TiO}_2} = 30.00$
 $\frac{\text{Cr}_2\text{O}_3}{\text{V}_2\text{O}_3} = 1.11$
 $\frac{\text{TiO}_2}{\text{V}_2\text{O}_3} = 6.50$
 $\frac{\text{V}_2\text{O}_3}{\text{FeO}} = 1.01$

A gossan occurs in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 6 in gabbro (iga on map). (Ref. B)

Table 10: Analyses and Test Data on Cores from the 1947 Drilling of Titaniferous Magnetite Deposits. [Sec. 2] (Ref. J, pp. 87-88)

Site & Depth In Feet	%Fe	%TiO ₂	Approx. Gravity Conc	% Grade of Concentrate %Fe	%TiO ₂
Hole 6					
12-156	19.96	10.71	15	44.44	33.93
156-175	23.63	12.38	20	44.67	31.30
210-231	24.95	13.17	20-	42.28	35.79
294-302	27.68	11.60			
302-310	35.17	14.39	20+		
310-325	31.97	10.15	20		
325-342	36.26	18.64			
342-368	28.69	13.28	25	47.88	27.91

"Minor and local chalcopyrite in Unit F near the base of the Duluth Complex can be seen along the Gunflint Trail northeast of East Dawkins Lake and south of central Birch Lake." [Sec. 5] (Ref. C, p. 190) (East Dawson Lake located in T65N-2W, Sec. 35)

"Discontinuous areas of gossan and visible sulfide mineralization... Similar isolated exposures have been found in unit tta (see below), at the contact with anorthositic gabbro. The sulfide assemblage, consisting of chalcopyrite, pyrrhotite, and minor pentlandite occurs interstitially to plagioclase and olivine." [Sec. 6, 7, 8] (Ref. D, p. 115) (see gossans and sulfides above): "Interlayered anorthositic gabbro and troctolite. These two rock types are interlayered on a scale of several feet. Contacts between layers are sharp; where contacts can be traced they are undulatory with wave lengths of ten to twenty feet and amplitudes of two to three feet. The general dip of the layering is flat. This unit is a transitional zone between underlying troctolite and overlying anorthositic gabbro. It may be less than two hundred feet thick, but due to the flat dip it has considerable areal extent. [Sec. 6, 7, 8] (See map unit ttf, Ref. E, p. 2)

Unit tta (See gossans and sulfides above):

"Interlayered anorthositic gabbro and troctolite. These two rock types are interlayered on a scale of several inches to several feet. Contacts between layers are sharp; where contacts can be traced they are undulatory with wave lengths of ten to twenty feet and amplitudes of two to three feet. The general dip of the layering is flat. This unit is a transitional zone between underlying troctolite and overlying anorthositic gabbro. It may be less than two hundred feet

thick, but due to the flat dip it has considerable areal extent." [Sec. 6, 7, 8] (See map unit tta, Ref. D, p. 2)

"There are two main bands or ranges of magnetite-ilmenite deposits in the Duluth gabbro. The North Range is discontinuous along a 30-mile length, mainly within two miles of the base of the gently-dipping gabbro. The South Range, 12 miles from the North Range, extends over a five mile length that is apparently within a few miles of the roof of the gabbroic body. There are several belts of magnetite-ilmenite lenses in each range, the longest belts more than a mile in length. In parts of each range there is more than one belt; these belts are closely spaced, each one at a slightly higher position in the gabbro. Each belt is made up of magnetite-ilmenite lenses arranged end to end but the lenses are separated by up to several hundred feet of gabbro. The ranges, belts and individual lenses parallel the layering of the gabbro. Each lens is commonly less than 15 feet thick and up to several hundred feet in length and width. Contacts between magnetite-ilmenite rich lenses and most lenses is sharper than the lower contact and the upper part of most lenses contains a greater amount of oxide minerals than the lower part. The lenses contain from 20 to 70 percent oxide minerals and their host rock contains about 5 to 10 percent oxide minerals.

Locations of samples used for detailed work in the present investigation are shown in graphic logs of the drill holes in Figure 6. Detailed work was restricted to 15 samples from 2 drill holes. The rock in and near the deposits of both the North and South Ranges is composed of plagioclase (An_{52-56}), olivine (hortonalite), augite, hypersthene, magnetite-ilmenite, and accessory apatite, biotite and alteration products of olivine and pyroxene." [Exact location uncertain] (Ref. F, p. 292-293)

Magnetite ore (same core as no. 12, 85' depth) Location Iron Lake, NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 1, 64N-3W)

Location 13:	$\frac{Cr}{2-3}O_3$	1.50%
Location 14:	$\frac{Cr}{2-3}O_3$	1.01%
Location 15:	$\frac{Cr}{2-3}O_3$	1.11%

[Sec. 1] (Ref. G)

Titaniferous Magnetite described in: (Ref. I, pp. 108-109)

"See Tucker Lake Map, Plate VIII. The exposures are numerous and the best ore outcrops are shown black on the map, (B). Magnetic belts show that many ore bodies are continuous under glacial drift. Drilling indicates a great deal more than is shown in outcrops and test pits, but some is very lean, (D)."

- "Sec. 1. 1750 paces N. and 50 paces W. of SE. corner. Magnetite gabbro, some magnetics. (D)"

"1600 paces N. and 200 paces W. of SE. corner. Ore in 10 ft. bluff. Strong magnetics, but not more than 100 paces long. (B)"

"1600 paces N. and 240 paces W. of SE. corner. Exposure of lean ore 8 x 16 ft. at old drill hole. Some magnetics for 200 paces West. (B)"

- "1650 paces N. and 350 paces W. of SE. corner. Magnetite gabbro and lean ore beds a few inches thick. (D)"
- "1400 paces N. and 1000 paces W. of SE. corner. Ten-foot ridge of fair ore, and Magnetics (B)"
- "1450 paces N. and 980+ paces W. of SE. corner. Magnetite gabbro with lean ore beds a few inches thick. Some magnetics. (D)"
- "1350 paces N. and 1400 paces W. of SE. corner. 'Iron ridge'. Gneissoid segregated ore several feet thick and 120 feet long. (A)"
- "1500 paces N. and 1550 paces W. of SE corner. Probably another ore body. (B)"
- "1580 paces N. and 1700 paces W. of SE. corner. Lean ore with some sulphide. (D)"
- "1500 to 1600 paces N. and 2000 paces W. of SE. corner. Magnetics and test pits, lean gabbro ore. (C)"
- "1780 paces N. and 2000 paces W. of SE. corner. Test pit north of portage Iron to Tucker Lakes. Extends into Sec. 2. (C) or (D)"
- "Sec. 2. 1550 paces N. and 0-300 paces W. of SE. corner. Small outcrops lean gabbro ore. Two test pits? (D)"
- "1800+ paces N. and 0-100 paces W. of SE. corner. North of portage. Open cut 25 ft. long, local irregular magnetics. Several kinds and grades or ore. (C) or (D)"
- "1750 paces N. and 300 paces W., to 1700 paces N. and 500 paces W. of SE. corner. Lean ore and gabbro along N. side of N. arm Tucker Lake. (C)"
- "1650 paces N. and 450 paces W. of SE. corner. Bluff and point on south shore of N. arm Tucker Lake. Segregated gabbro ore, small patches and stringers, lean. (C)"
- "1600 paces N. and 700 paces W. of SE. corner. Bluff on South shore of N. arm Tucker Lake, magnetics and small lean ores. (C)"
- "1300 paces N. and 550 paces W. of SE. corner. Old drill hole. Magnetite gabbro, very small segregations. (D)"
- "1350 paces N. and 600 to 700 paces W. of SE. corner. Two small outcrops lean ores or magnetite gabbro. (D)"
- "1000 paces N. and 800 paces W. of SE. corner. On S. shore of pond is a cliff of lean ore or magnetite gabbro 20 feet high and 50 feet long. (B)?"
- "Sec. 3. Lot 3, N. shore Tucker Lake SW. of the outlet. Doubt of origin? (D)"
- "About 1100 paces N. and 1200 paces W. of SE. corner south shore Tucker Lake. Lean ore, thin rich bands. (D)"
- "Est. 1800 paces N. and 1000 paces W. of SE. corner, ten feet lean ore, with 6-inch rich bands. (C)"
- "S. of a Pond about 1000 paces N. and 800 paces W. of SE. corner. Doubtful location. Lean ore in bluff. (D)"
- "1150 paces N. and 0 paces W. of SE. corner. Small exposure of ore. (D)"
- "Sec. 4. NW. $\frac{1}{4}$ NE. $\frac{1}{4}$ (Lot 3). Lean. (D)"
- "2000 paces N. and 1500 paces W. of SE. corner. Small and lean ore, associated with hornfels. (D)"
- "Sec. 5. SW. $\frac{1}{4}$ NW. $\frac{1}{4}$. Ore outcrop on a point north of the portage from a pond. Segregated ore in gabbro, small. (D)"

- "Sec. 6. NE. $\frac{1}{4}$ SE. $\frac{1}{4}$, 250 paces S. of portage on Tucker River. Gneissoid. Magnetite segregation 2 $\frac{1}{2}$ feet thick, 50 feet long. (D)"
 - "NW $\frac{1}{4}$ -NW $\frac{1}{4}$. Some ore, one excavation 30x4x4 feet. (D)"
- Testpits: On a sketch map from the Johnson Nickel Mining Company (blueprint) iron ore property: (Ref. B, p. 69)
- in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 1, there are six testpits shown
- Other Data: DDH LI-1 in Sec. 2 (Ref. H)
- DDH 1, 2, 3A, 7, 8 in SE $\frac{1}{4}$, Sec. 1 (See Appendix)
 - DDH LI-3W in NW $\frac{1}{4}$, Sec. 1 (See Appendix)
 - DDH LI-5W in NE $\frac{1}{4}$, Sec. 1 (See Appendix)
 - DDH 4, 5, 6, in SE $\frac{1}{4}$, Sec. 2 (See Appendix)
 - DDH LI-2 in NE $\frac{1}{4}$, Sec. 2 (See Appendix)
- Titaniferous Magnetite in Sec. 1, 2, and 3, see also summary in Appendix.
- Olivine, see also summary in Appendix.

- Location: Cook County
Township 64N-4W, Sections 1-5, 8-15, 24
- References: A) Morey, Weiblen, Papike, and Anderson, 1981, MGS Map M-46, p. 2
- B) Weiblen, Morey, Mudrey, 1971, Inst. on Lake Superior Geology, 17th Annual Meeting, p. 115
- C) Grout, 1950, Appendix F, p. 108
- Occurrences: A gossan is reported in (Ref. A, map):
- NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 1 in gabbro
 - SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 11 in anorthositic gabbro & troctolite
 - SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 11 in anorthositic gabbro & troctolite
 - SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 9 in anorthositic gabbro & troctolite
 - NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 9 in anorthositic gabbro
- "Discontinuous areas of gossan and visible sulfide mineralization...Similar isolated exposures have been found in unit tta (see below) at the contact with anorthositic gabbro. The sulfide assemblage, consisting of chalcopyrite, pyrrhotite, and minor pentlandite occurs interstitially to plagioclase and olivine." (Sec. 1-5, 8-12, 14, 15) (Ref. B, p. 115)
- "Interlayered anorthositic gabbro and troctolite. These two rock types are interlayered on a scale of several inches to several feet. Contacts between layers are sharp; where contacts can be traced they are undulatory with wave lengths of ten to twenty feet and amplitudes of two to three feet. The general dip of the layering is flat. This unit is a transitional zone between underlying troctolite and overlying anorthositic gabbro. It may be less than two hundred feet thick, but due to the flat dip it has considerable areal extent." [Sec. 1-5, 8-12, 14, 15] (See map unit tta, Ref. A, p. 2).
- Titaniferous magnetite described in: (Ref. C, p. 108)
- "Sec. 1. NE. $\frac{1}{4}$ NE. $\frac{1}{4}$, 1650 paces N. and 0 paces W. of SE. corner. Hornfels with 4-inch intrusion of gabbro ore containing 50 percent magnetite. The gabbro nearby for a few feet is magnetite-rich. (D)"
 - "Near center, west tip of Dawkins Lake. Magnetite gabbro has a few magnetite stringers, not more than 4 inches

thick. Belt 30 paces long, strikes and may run 600 paces NE. to outcrop in hornfels, 1700 paces N. and 400 paces W. of SE. corner. (D)"

- "Sec. 5. NE. $\frac{1}{4}$ NE. $\frac{1}{4}$. Segregated ore, up to 50 paces long, 1 foot thick. (D)"
"50 paces N. and 600 W. of SE. corner, 4 inch magnetite stringers in magnetite gabbro. (D)"
- "Sec. 8. Center of SE. $\frac{1}{4}$, small ore outcrop (D)"
- "Sec. 9. East end of portage from Tuscarora about 1100 paces N. and 1800 paces W. of SE. corner. Segregated bands. Gneissoid. Dips west. Lean ore escarpment, 3 to 18 feet thick, 170 paces long, W. of creek. (C)"

Other Data: Titaniferous Magnetite in Sec. 1, 2, 4, 5, 9, 12, 13, and 24, see also summary in Appendix.

Location: Cook County

Township 64N-5W, Sections 1, 7, 12, 13, 26

References: A) Grout, 1950, Appendix F, p. 107

Occurrences: Titaniferous magnetite described in: (Ref. A, p. 107)

- "Sec. 1. Near center, some stringers of magnetite and some segregations in gabbro up to 8 inches, not rich. Probably extends to 1850 paces N. and 1000 paces W. of SE. corner. (D)"
- "Sec. 7. NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ (Lot 4) $3\frac{1}{2}$ foot bed probably Gunflint (possibly some magnetite gabbro). Assay 51.1 percent Fe and 21.54 percent TiO_2 . [Bradt's (A) Grout's (E)]"
- "Sec. 12. NE. $\frac{1}{4}$ on shore of Tuscarora Lake, magnetite gabbro. (D)"

Other Data: Titaniferous Magnetite in Sec. 1, 7, 12, 13, and 26, see also summary in Appendix.

Location: Cook County

Township 65N-2E, Sections 31, 32

References: A) Grout and Schwartz, 1933, MGS Bulletin #24, p. 82

B) Grout, Sharp and Schwartz, 1959, MGS Bulletin #39, p. 157

C) Winchell, 1899, Vol. 4, p. 500

Occurrences: "Some exploration for ore has been carried on in this township, but results have been disappointing. Near the shore of Pine LAKE, IN SE $\frac{1}{4}$, Section 31, a pit exposes fragments of a slate breccia cemented with calcite. A similar breccia is exposed in a pit very close to shore just east of the meander corner between Sections 31 and 32 on Pine Lake. This is evidently the work referred to by Winchell, who noted that the gangue was principally calcite and quartz, with some pyrite, galenite, sphalerite, and chalcopyrite." [SE $\frac{1}{4}$, Sec. 31 and Sec. 32], (Ref. A, p. 82)

"McFarland, Rice and Ramsey have a very conspicuous and strong vein near the shore of Pine Lake, on S.E. $\frac{1}{4}$ sec. 31, township 65 north, range 2 east. This has not been worked, but slightly uncovered in two places. It has an irregular direction, width and appearance, large white masses of calcite and quartz lying about promiscuously, apparently in

place, over a width of several rods north and south. Where it has been uncovered it is also mixed with a breccia of quartzite and has a width of ten or twelve feet. It seems to have trap on the north side, but it is not well exposed. A trap bluss rises abruptly toward the northwest, facing east and south, and the vein is in a lower level, having a zigzag course, governed, apparently, in direction and deflected by that upheaved trap and slate along its western extent, so far as it is visible; but further east it has a more uniform course in consonance with the general trend of the hills; yet this, like Spalding's second and one of McFarland's, is on the southward slope of the mail hillside. The calcite and quartz, not mentioning the breccia, are the most abundant gangue-rock. The ores are pyrites (said to be auriferous), galenite, sphalerite and chalcopryrite. These, with the exception of the galenite, can be made out of examining the pieces in the dump." (Ref. C, p. 500)

Testpits: SE $\frac{1}{4}$, Sec. 31, see above (Ref. A)
Calcite-sulfide veins and pits are reported in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 32 and SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 31 (Ref. B, p. 157)

Location: Cook County
 Township 65N-3E, Section 32

References: A) Winchell, 1878, p. 20
 B) Winchell, 1899, Vol. 4, p. 500

Occurrences: "Johnson's working is on a vein situated, as nearly as could be ascertained, on SE $\frac{1}{4}$, sec. 32, T.65-3E. This is also on the south slope of a hill, but has trap on the north side and slate on the south side, being really in a fault like the rest; but the slate is here brought up like the south vein at Spalding's on a line nearly parallel with the upper surface of the trap. This vein shows mainly calcite, but has also quartz, pyrite, galenite and native silver. These can be seen in the dump near the shaft. There is also, as in nearly all the other veins seen, a large amount of brecciated quartzite and siliceous slate. This is here mainly on the south side of the vein, while the north side is in a similar manner filled with breccia of trap. This appears to be a strong vein, and one that promises well." (Ref. A, p. 20; and Ref. B, p. 500)

Testpits: In SE $\frac{1}{4}$ of Sec. 32, see reference A or B above.

Other Data: Titaniferous Magnetite, see also summary in Appendix.

Location: Cook County
 Township 65N-1W, Sections 22, 33, 35

References: A) Davidson, 1926, M. S. Thesis, p. 4
 B) Morey, 1965 Ph.D. dissertation, pp. 176-239
 C) Grout and Schwartz, 1933, MGS Bulletin 24, p. 75
 D) Grout, 1933, p. 61

Occurrences: "The MGS systematically prospected the Rove slate for silver deposits during the summer of 1925. The most encouraging prospect seen by the writer was that located on Moss Lake just west of the portage to Hungry Jack Lake [Note: probably SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 33]. A calcite vein about 8 to 10 feet wide outcrops, striking due north and dipping

nearly 90°. Due to a covering of drift and vegetation along the strike, its extent could not be ascertained accurately. It is said to have been prospected for silver and the remains of a shaft with a small dump are still in evidence. No signs of ore minerals were seen either in the vein or in the dump." (Ref. A, p. 4)

"The only evidence of mineralization, aside from a little pyrite, occurs in an old exploration pit a few paces from Moss Lake on the portage to Hungry Jack Lake, where an old hearth still remains. A pit was sunk on a calcite vein in diabase. The extension of the vein cannot be followed because of the cover of glacial drift. There is no evidence that any metallic minerals were discovered in the course of the work. This calcite vein is the westernmost of the several large veins found in the Rove slate area. Veins of this type are more abundant in the region near Pigeon Point." [Location probably SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 33] (Ref. C, p. 75)

Testpits: In SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 33, "Pit in calcite vein."
(Ref. D, p. 61; Ref. A; Ref. C) (see above)

Location: Cook County
Township 65N-2W, Sections 5, 19, 20, 30, 31, 32, 33, 34, 35, 36

References: A) Nathan, 1969, PhD. Thesis, pp. 189-190
B) Morey, 1965, PhD. Thesis, pp. 176-239
C) Weiblen, Morey, Mudrey, 1971, Inst. on Lake Superior Geology, 17th Annual Meeting, p. 116
D) Johnson, 1970, PhD. Thesis, pp. 87, 88, 99, 100, 104
E) Grout, 1950 [not searched]
F) Rogers and Jaster, 1962 [not searched]
G) Grout, 1950, Appendix F, p. 107
H) Winchell, 1900, Vol. 5, p. 500
I) DNR General Exploration File

Occurrences: "Minor and local chalcopyrite in Unit F near the base of the Duluth Complex can be seen along the Gunflint Trail northeast of East Dawkins Lake and south of central Birch Lake." [Sec. 35] (Ref. A, p. 190), (Birch Lake located in T64N, R3W, Sec. 5)

"The copper mineralization of warmest potential is the widespread chalcopyrite and minor bornite mineralization associated with the deuteric alteration of Unit S. The observed mineralization is lean. Sulfides commonly comprise only a trace in the rocks, but extensive, chalcopyrite being visible in most specimens from western Little Iron Lake to East Pope Lake. Perhaps the northern and western shores of Little Iron Lake are the best examples of that mineralization." [Sec. 30, 31, 32, 33, and 36]

(Ref. A, p. 189-190)

In: Black Argillite; contains pyrrhotite: (Ref. B, pp. 176-239)

- 1400' E, 0' S; Sec. 19
- 1200' E, 4400' S; Sec. 30
- 5000' E, 4100' S; Sec. 20

"The largest titanium concentrations however are in units dt and du (see description below) at Little Iron Lake in the Gunflint Lake quadrangle and other isolated exposures in the South Lake quadrangle. Unfortunately, most of these occurrences at the surface do not exceed about 35 feet in maximum dimension.

A large low-grade titanium resource also is contained within unit dg (see description below). Oxide-rich layers as much as 5 feet thick are common, although individual layers seem too thin and discontinuous to be mined separately. Unit dg should be considered in its entirety for commercial evaluation with the potential of developing a very large tonnage of low-grade ore. The unit is very heterogeneous and field exposures are scarce and discontinuous, so only widespread systematic drilling will reveal which parts have the greatest promise. [Sec. 31] (Ref. C, p. 116)

"The titanium content of unit "dg" has given it a status as one of the largest concentrations of titanium in the United States (Grout, 1950; Rogers and Jaster, 1962), but the grade is low and the technological problems involved in separating titanium from iron make the resource unexploitable at the present time. The mechanism of iron and titanium oxide concentration in unit "dg" appears to have been accumulation as cumulus grains during crystallization, with considerable postcumulus growth to give an interstitial appearance. Technological advances at several currently operating properties, such as the processing of iron and titanium-rich anorthosite at Allard Lake, Quebec, with the Sorel process developed by the New Jersey Zinc Company (Zwickey, 1969), reveal that the solutions to the technological problems are possible. These properties, however, operate on ore with considerably higher initial titanium and iron content than the rock of the "dg" unit in the Gunflint district, and it seems likely that many other large deposits will have to be exhausted before attention can be turned to the enormous low-grade reserves in this portion of northeastern Minnesota.

"Nathan (1969) envisioned an open-pit operation centered on a nucleus of the composite stocks of units "dt" and "du" on central Little Iron Lake (Base Map 4, Appendix A), with unit "dg" being taken as well as the pit expands and deepens. Electron microprobe analyses of unit "dt" by Nathan indicated a content of 14 to 19 percent TiO_2 by weight, and unit "du" analyses ran approximately 7² percent TiO_2 by weight. Were the Gunflint district titanium resource ever to be developed, this locale would be a logical starting point, with expansion planned laterally and downdip toward the south. Coproducts of the extraction of titanium would be iron, vanadium, and chromium. The Gunflint Trail, undoubtedly, would have to be rerouted along the north shore of Loon Lake in order to maintain the scenic beauty and sense of isolation that has so long been associated with the Gunflint Trail."

Unit dg: Coarse-grained foliate ilmenite titanomagnetite-augite-olivine-plagioclase rock. [Sec. 31] (Ref. D,

pp. 87, 88, 100, 104).

Titaniferous magnetite in gabbro, with a small amount of probable chalcopyrite (p. 500, No. 701, Ref. H). Location is the north shore of Mayhew Lake near the center of S $\frac{1}{2}$, Sec. 30.

Titaniferous magnetite described in: (Ref. G, p. 107)

- "Sec. 31. SW. $\frac{1}{4}$, Lot 3, NW. $\frac{1}{4}$, on north shore Iron Lake, up to 10 ft. thick. Part dike-like. (C)"
 - "In the SE. part of SE. $\frac{1}{4}$ NE. $\frac{1}{4}$ gabbro with small segregations. (D)"
 - "On Range line 3 and 2 west, ore bands intrude hornfels. Ore averages lean for 170 paces N. of Iron Lake. Selected specimens assayed more than 50 percent Fe and 2.23 to 12.09 percent TiO₂. (D)"
- "Sec. 32. N. $\frac{1}{2}$ SW. $\frac{1}{4}$ (at NW. corner Lot 7) ore crops out 15 ft. thick and runs under cover at N. shore Iron Lake. (C)"
 - "NE. $\frac{1}{4}$ SW. $\frac{1}{4}$ (Lot 6) ore 50 ft. long, 50 ft. thick, on ridge SE. of Creek into Iron Lake. (C)"
 - "SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ (Lot 12) where east line of section meets South shore Iron Lake, 20+ ft. high, rather lean. (C) or (D)"
- "Sec. 33. S. $\frac{1}{2}$ SW. $\frac{1}{4}$ (Lots 13 & 14) on S. shore of Iron Lake, magnetite gabbro or lean ore. (D)"
 - "SE. $\frac{1}{4}$, north shore of Portage Lake several small segregations in gabbro. At south end of portage from Iron Lake. (D)"
 - "(Location lost.) Ore, gabbro and hornfels 75 paces long 15 ft. wide."

Other Data: DDH ML-1 in Sec. 34 (Ref. I)
Titaniferous Magnetite in Sec. 35 and 36, see also summary in Appendix.

- Location: Cook County
Township 65N-3W, Sections 25, 30, 31, 32, 33, 34, 35, 36
- References:
- A) Winchell, 1900, Vol. 5, p. 495, 496
 - B) Sims, Morey & Green, 1969, 42nd Annual AIME meeting at Duluth, pp. 75-87.
 - C) Winchell & Winchell, 1891, MGS Bull. 6, p. 141 in Ruotsala & Tufford, 1965, p. 78
 - D) Mudrey, 1977
 - E) DNR Open File Drill Samples List
 - F) DNR General Exploration File
 - G) Grout, Sharp and Schwartz, 1959, MGS Bulletin 39, p. 84, 87-88
 - H) Jensen, 1959, E.G. Vol. 54, p. 383
 - I) Johnson, 1970, Ph.D., p. 87, 88, 89, 99, 100, 104
 - J) Coyner, 1974, LSI abstract, p. 10
 - K) Crosscombe, 1943, [not searched] in Johnson 1970
 - L) Grout, 1950, Appendix F, pp. 106-107
 - M) Nathan, 1969, Ph.D. Thesis, p. 190
 - N) Morey, 1965, Ph.D. thesis, pp. 176-239
 - O) Sims, Morey, Green, 1969, Mining Symposium, p. 79
 - P) Weiblen, Morey, Mudrey, 1971, Inst. on Lake Superior

- Geology, 17th Annual Meeting, pp. 115, 116
- Q) Morey, Weiblen, Papike and Anderson, 1981, MGS Misc. Map Series M-46, Geol. Map of Long Island Lake Quad., p. 2
 - R) Vadis & Meineke, 1982
 - S) Nathan, 1969
 - T) Geul, 1970
 - U) Rogers and Jaster, 1962 [not searched]
 - V) Franklin, 1970
 - W) Stanton, 1972 [not searched]

Summary:

"At Loon Lake, the veins on the Blankenburg-Whiteside property occur at the base of a 150 foot thick Logan diabase sill. The veins have been traced over an area 400 feet wide by 1200 feet long. One mineralized vein system is 10 feet wide, but it consists of at least three veins (Coyner, 1974; and pers. comm., 1978). In Canada, Franklin (1970) notes that most veins pinch out before reaching 500 feet in depth. Those veins contain cobalt, copper, silver, gold, arsenic, and a trace of nickel in the ore minerals arsenopyrite, chalcopyrite, pyrrhotite, pyrite, magnetite, and ilmenite. The gangue minerals include calcite, quartz, and chlorite. Wall rock alteration has not been described.

Coyner (1974) suggests that after homoclinal folding and subsequent fracturing, the veins at Loon Lake were mineralized by fluids from the Duluth Complex layered series just to the south. Another model should be considered. These prospects, especially Loon Lake, have characteristics very similar to Cobalt-type ores, for which the Cobalt, Ontario, district is the type locality. The evidence of worldwide association cited by Stanton (1972) seems to indicate this ore type is affiliated with granitic rocks. Thus a potential source of metals and hydrothermal fluids of the veins in Cook County is the bright red, granitoid rock such as that which occurs as a sill on Pigeon Point and that which occurs on Susie Island. These felsic rocks were emplaced after the Logan intrusions and have normal polarity, so they are classed as Middle Keweenawan (Mudrey, 1977; see Keweenawan late felsic intrusions of Geul, 1970). These felsic rocks were emplaced in time and space near the vein mineralization.

Occurrences:

Titaniferous magnetite with minor probable (?) chalcopyrite in cumberlandite (p. 495, sa. No. 695, Ref. A). Location is the north shore Mayhew Lake, E $\frac{1}{2}$ -SE $\frac{1}{4}$, Sec. 36.

Titaniferous magnetite deposits in the Duluth Complex south of the Gunflint Trail, on Little Iron Lake consist of two grades: a higher-grade medium-grained granular olivine tironals rock and a lower-grade medium-grained granular plagioclase tironals olivine rock. The higher grade rocks are: (Ref. B)

- 1200 ft. long and 100-200 ft. wide
- 57-72% by volume Fe-Ti oxides
- 65-80% by weight Fe-Ti oxides
- 9-10% Ti & 40-49% Fe

The lower grade rocks are:

- 200 ft. wide
- 4% Ti and 19% Fe Township 65N-3W

#5 Magnetite ore at Iron Lake in SE $\frac{1}{4}$, Sec. 36 has: (Ref. C p. 78)

- Fe (total?) = 80.78

- TiO₂ = 12.09

- Cr₂O₃ = 2.40

A gossan is reported in (Ref Q):

- NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 31 in gabbro (map unit iga)

- SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 30 in troctolite (map unit ttf)

"At an early date a shallow shaft was sunk at the head of a small bay at the west end of Loon Lake on a vein which was explored for gold. In recent years, in this same area, Mr. R. E. Blankenberg and associates have explored along the strike of the same vein by test pit and diamond drill. The veins lie at or near the contact of diabase and slate and contain abundant arsenopyrite. The arsenopyrite contains cobalt in addition to iron, arsenic, and sulphur. Thus far the veins discovered are narrow and the tonnage insufficient for a mining operation, although the cobalt content is as much as 3 per cent." (Ref. G, p. 88)

[Location in Sec. 34]

"Minor gold values have been reported from secondary sulfide mineralization in a sheared diabase sill at the base of the Loon Lake peninsula (Johnson, 1968)." (Ref. I, p. 89)

[Location in Sec. 34 probably]

Titaniferous magnetite described in: (Ref. L, pp. 106-107)

- "Sec. 32. SE. $\frac{1}{4}$ SE. $\frac{1}{4}$, 25 paces N. of a pond. Segregated ore, one foot thick. Others farther east on shore of lake, and 20 paces north, five to seven feet wide. (D) or (C)"

- "Sec. 34. SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ (100 to 130 paces N. and 400 to 450 paces W. of SE. corner) Ore about 5 to 7 feet thick, 30 feet long. Stringers in gabbro, dike-like. (C)"

- "Sec. 35. SW. $\frac{1}{4}$ - SW. $\frac{1}{4}$, 70 to 100 paces N. and 1500 to 1580 paces W. of SE. corner. Trench 70 feet long. (200 tons blasted loose.) Strong magnetics. Grade variable. (B)"

- "Sec. 36. Lot 4 north of Iron Lake on a point 400 paces N. and 100 paces W. of SE. corner. Lean ore. (D)"

"Lean ore on the Range line, N. of Iron Lake, 150x25 paces. (D)"

"SE. $\frac{1}{4}$ SW $\frac{1}{4}$, on portage from Loon to Iron Lakes. Ore belt 200 feet E. and W. and 20-30 feet wide in gabbro. (D)"

"Se. $\frac{1}{4}$ Se. $\frac{1}{4}$, South shore Iron Lake on a point 400 paces N. and 100 paces W. of SE. corner. Lean ore. (D)"

"On island $\frac{1}{2}$ mile from west end Iron Lake, probably SE. $\frac{1}{4}$ SW. P, magnetite gabbro and lean ores. (C)"

Titaniferous magnetite with olivine, serpentine, augite, and biotite has: (Ref. A, p. 496) [E $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 36]

- Sample No. 177G had 0.41% Ni

(Other assays given.)

Measured Sections: Black argillite, contains pyrrhotite:

5100' E., 2200' N., Sec. 29

4100' E., 1700' S., Sec. 29

4700' E., 2100' S., Sec. 28

0' E., 100' S., Sec. 25

800' E., 1800' S., Sec. 30

2600' E., 1600' S., Sec. 30

½ " layer very high pyrrhotite
 2200' S., 100' E., Sec. 35
 4100' S., 2100' E., Sec. 25
 (Ref. N, pp. 176-239)

"Older Unit G on westernmost Little Iron Lake has been altered and some chalcopyrite introduced by fluids from the underlying Unit S, suggesting that other epigenetic sulfide concentrations could be sought in lower Unit G where it overlies Unit S." [Sec. 36] (Ref. M, p. 190)

"The body of iron-and titanium-rich rocks is on Little Iron Lake (65N-3W), just south of the Gunflint Trail in Cook County (Figure 6). The body is interpreted from the field relations to intrude the adjacent rock units of the Duluth Complex.

The iron-and titanium-rich intrusion consists of two probably intergradational facies, a higher-grade medium-grained granular olivine-tironals (Tironals are titanium-iron oxides) rock and a lower-grade medium-grained granular plagioclase-tironals-olivine rock. The higher grade rock (OT in Figure 6) crops out on the shores of Little Iron Lake; much of it is covered by water. The body is inferred to be about 1,200 feet long and 100-200 feet wide at the surface; its dip and configuration at depth are not known. The lower grade material extends westward as a dike-like body, about 200 feet thick, across a peninsula, and connects with small bodies of rich material on islands in the lake. The primary titanium-iron oxide in each facies was ferrulvospinel of about magnetite-ulvospinel composition, which has undergone a complicated history of exsolution and oxyexsolution and now is an intimate intergrowth of titanomagnetite, ferrulvospinel, and ferrilmenite. The higher grade material (Olivine-tironals rock) has an olivine content of 15-36 percent by volume and a tironals content of 57-72 percent by volume and 65-80 percent by weight; this corresponds to tenors of 9-10 percent Ti (14-16 percent TiO₂) and 40-49 percent Fe (51-64 percent as FeO) without considering the unrecoverable iron in the olivine...

If the body has an appreciable vertical extent, which could be determined by drilling through the ice in winter, the body has the potential to be of commercial significance." [Sec. 36] (Ref. O, p. 79)

"Discontinuous areas of gossan and visible sulfide mineralization within unit ttf (see below) have been mapped across the Long Island quadrangle...The sulfide assemblage, consisting of chalcopyrite, pyrrhotite, and minor pentlandite occurs interstitially to plagioclase and olivine." (Sec. 30, 31] (Ref. P. p. 115)

"Troctolite, fine-to medium-grained. Similar in mode and composition to the overlying troctolite but finer-grained. The upper contact is gradational and has been drawn where the grain size of the overlying troctolite is roughly twice that of the lower part of this unit. Locally, disseminated intergrowths of chalcopyrite, pyrrhotite, and pentlandite occur as interstitial grains and as blebs in plagioclase and augite." [Sec. 30, 31] (See map unit ttf, Ref. Q, p. 2)

"The largest titanium concentrations however are in units dt and du at Little Iron Lake in the Gunflint Lake quadrangle and other isolated exposures in the South Lake quadrangle. Unfortunately, most of these occurrences at the surface do not exceed about 35 feet in maximum dimension.

A large low-grade titanium resource also is contained within unit dg (see description below). Oxide-rich layers as much as 5 feet thick are common, although individual layers seem too thin and discontinuous to be mined separately. Unit dg should be considered in its entirety for commercial evaluation with the potential of developing a very large tonnage of low-grade ore. The unit is very heterogeneous and field exposures are scarce and discontinuous, so only widespread systematic drilling will reveal which parts have the greatest promise." [Sec. 36] (Ref. P, p. 116)

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Unit du: medium-grained granular plagioclase-ilmenite olivine rock

Unit dt: medium-grained granular ilmenite-olivine rock.
Unit dg: coarse-grained foliate ilmenite-titanomagnetite-
 augite-olivine-plagioclase rock.

[Sec. 36] (Ref. I, pp. 87, 88, 99, 100, 104)

"Duluth Gabbro, Minnesota (Specimens and descriptions from Paul Bailly). Massive chalcopyrite and cobalt-bearing arsenopyrite in a shear zone in Logan diabase sill.

Collected from Blakenberg prospect on the South arm of Loon Lake north of the Gunflint Trail, T65N, R3W., Section 34, Minn." (Ref. H, p. 383)

"Chalcopyrite in altered gabbro in the basal zone of Duluth Gabbro lopolith. Collected in road cut on north side of the Gunflint Trail, T65N, R3W, Section 33, Minn." (Ref. H, p. 383)

"Blebs of chalcopyrite and pyrrhotite in olivine gabbro at base of Duluth Gabbro lopolith. Collected in road cut along Gunflint Trail, T65N, R3W, Section 30, Minn." (Ref. H, p. 383)

"The veins on the Blankenburg-Whiteside Property are located in the base of a 150 foot thick diabase sill at or near the contact with the Rove Formation. The diabase sills and Rove Formation increase in dip from 25° to 60° as they near the Duluth Complex. This forms a monoclinial hinge line along which the fracturing occurred that localized the sulfide mineralization. Sulfides include abundant arsenopyrite, minor chalcopyrite, some pyrite, pyrrhotite, and iron oxides. The cobalt occurs in the arsenopyrite.

A test pit on the east end of the property shows a 20 foot mineralized zone. Selected samples contain up to 5.04% copper and 1.08% cobalt. Studies are being made to show the distribution of Cu, Ni, Zn, and Co in the veins and country rock." (Ref. J, p. 10) [Location in Sec. 34]

Testpits:

Sec. 3, 65N-3W

Shaft and testpit (see above) in Sec. 34.

In Sec. 34, see Ref. G and above description.

Other Data:

DDH GF-8 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 36 (Ref. E)

DDH 10, 11, 12, 12A, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32 in Sec. 33 (See Appendix)

DDH LL-4W, LL-6W in SW $\frac{1}{4}$, Sec. 33 (See Appendix)

DDH LL-3W, LL-5W in SE $\frac{1}{4}$, Sec. 32 (See Appendix)

DDH LI-4W in SE $\frac{1}{4}$, Sec. 36 (See Appendix)

DDH 1, 2, 3, 4, 5, 6, 7, 8, 9 in Sec. 34 (See Appendix)

DDH ELL-1 in Sec. 25 (Ref. F)

DDH HC-1 in Sec. 30 (Ref. F)

DDH LL-1, LL-2 in Sec. 34 (Ref. F)

A recent geochemical survey (Ref. R) showed anomalous amounts of Cu, Ni, Co, Pb, Zn, and As in lake sediments underlain by the Rove Formation and Logan intrusions. Titaniferous Magnetite in Sec. 36, see also summary in Appendix.

- Location: Cook County
Township 65N-4W, Sections 24, 25-31, 33-36
- References: A) DNR General Exploration File
B) Morey, 1965, Ph.D. Thesis, pp. 176, 177
C) Weiblen, Morey, Mudrey, 1971, Inst. on Lake Superior Geology, 17th Annual Meeting, p. 115
D) Morey, Weiblen, Papike, and Anderson, 1981, MGS Misc. Map Series M-46, Geol. Map of Long Island Lake Quad., p. 2
E) Bayley, 1895, Journal Geology, v. 3, pp. 1-20, in Ruotsala, Tufford, 1965, MGS, Information Circular 2, p. 87
- Occurrences: A gossan is reported in (Ref. D):
- SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 27 in troctolite (Map unit ttp)
- SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 27 in troctolite (Map unit ttp)
Measured Sections: located in Long Island Lake Quadrangle; T65N, R4W, Sec. 24; 4000 ft. E., 5200' S:
Rove Formation
"Argillite, black (Ni), thin-and wavy bedded, fine-grained, graded: unit carbonaceous and contains pyrrhotite.
Argillite, black (Ni), very fine-grained; fresh surface shows thin graded laminae of alternating silt-size and micaceous material; unit highly carbonaceous and contains pyrrhotite." [Sec. 24] (Ref. B., pp. 176-177)
"Discontinuous areas of gossan and visible sulfide mineralization within unit ttf (see below) have been mapped across the Long Island quadrangle. Similar isolated exposures have been found in unit tta (see below) at the contact with anorthositic gabbro. The sulfide assemblage, consisting of chalcopyrite, pyrrhotite, and minor pentlandite occurs interstitially to plagioclase and olivine."
[Sec. 25-29, 33-36] (Ref. C, p. 115)
Gossans: "Troctolite, fine-to medium-grained. Similar in mode and composition to the overlying troctolite but finer-grained. The upper contact is gradational and has been drawn where the grain size of the overlying troctolite is roughly twice that of the lower part of this unit. Locally, disseminated intergrowths of chalcopyrite, pyrrhotite, and pentlandite occur as interstitial grains and as blebs in plagioclase and augite." [Sec. 25-29, 33-36] (See unit ttf, Ref. D, p. 2)
Gossans: "Interlayered anorthositic gabbro and troctolite. These two rock types are interlayered on a scale of several inches to several feet. Contacts between layers are sharp; where contacts can be traced they are undulatory with wave lengths of ten to twenty feet and amplitudes of two to three feet. The general dip of the layering is flat. This unit is a transitional zone between underlying troctolite and overlying anorthositic gabbro. It may be less than two hundred feet thick, but due to the flat dip it has considerable areal extent." [Sec. 25-29, 33-36] (See unit tta, Ref. D, p. 2)
Location 11., Granulitic diallage-hyperstene-gabbro
Location NE Minnesota (Akeley Lake vicinity):
- $\frac{P_2O_5}{2-5}$ - 0.67% [Location uncertain] (Ref. E)

Location 12., Granulitic hypersthene-gabbro
 Location NE Minnesota [Ackeley Lake vicinity]
 - NiO - 0.06% [Location uncertain] (Ref. E)
 Other Data: DDH PM-1 in Sec. 27 (Ref. A)
 DDH CR-1 in Sec. 35 (Ref. A)
 DDH 1, 11, 12, 13, 14, 15, 16, 17, 2, 3, 5 in Sec. 28 (See
 Appendix)
 DDH 21, 23, 25 in Sec. 29 (See Appendix)
 DDH 37 in Sec. 30 (See Appendix)
 Titaniferous Magnetite in Sec. 29, 30 and 31, see also
 summary in Appendix.

Location: Cook County
 Township 65N-5W, Sections 13, 34
 References: A) Sleight, 1933, Ph.D. Dissertation, p. 26
 Occurrences: "In the NW $\frac{1}{4}$ of section 13, an intrusive mass of granodiorite
 occurs which is known as the Townline Lake granodiorite. At
 one time it was prospected for gold, but the deposit was
 evidently of no value for it has long since been abandoned.
 Numerous, shallow trenches still exist to give evidence of
 the former test pits...The rock has been sheared and altered
 by carbonation as have the other rocks near and in the shear
 zone." (Ref. A, pp. 26-27)
 Testpits: NW $\frac{1}{4}$, Sec. 13, (Ref. A, pp. 26-27)
 Other Data: Titaniferous Magnetite in Sec. 34, see also summary in
 Appendix.

Location: Cook County
 Township 66N-4W, Section 14
 References: A) Bauernschmidt, 1926, p. 27, U of M Thesis
 Occurrences: There is a fluorite-bearing granite in Sec. 14. "It is
 no different in general appearance from other pink granites
 of the region except that small grains of amethystine
 fluorite may be seen...Nearly all are coarse pegmatite dikes
 which contain large grains of the same amethystine fluorite.
 These dikes were prospected for gold but have never been
 commercially productive." (Ref. A, p. 27)

Location: Cook County
 Township 66N-5W, Section 14
 References: A) Grout, 1929 [not searched]
 B) Grout, 1937, p. 64
 C) Hanson, 1972, p. 104, in MGS Cent. Vol.
 D) Bauernschmidt, 1926, Thesis, pp. 27-28
 E) Winchell, 1900, Vol. 5, p. 315, p. 829
 F) Winchell, 1899, Vol. 4, p. 322
 Summary: These occurrences are within the Archean Saganaga batholith.
 Occurrences: "In Saganaga Lake a granite mass 15 by 25 miles has locally
 on "Gold Island" in Sec. 14, T.66N., R.5W., a fluorite zone
 with some fluorite pegmatite and quartz masses, bearing
gold. The purple fluorite in the pegmatite seems to be
 primary, as is also some of that in the granite, but some is
 late and crosses the granite feldspar in tiny veinlets. The

red feldspars are dusty with kaolinite and have some perthitic and chess-board structure indicating a history of recrystallization or replacement. The dark minerals are almost wholly changed to carbonate and near the surface these are weathered to rusty spots suggesting that the carbonate was ankerite. The gold was probably related to a deposition of smoky quartz somewhat later than the fluorite pegmatite" (Ref. B, p. 64).

"On Gold Island, within Saganaga Lake, a sheared fluorite-bearing granodiorite and pegmatite (Grout, 1929) probably intrudes the Saganaga Tonalite. Apparently the rock is sheared to the same extent as is the main mass of the tonalite . . . A red, fluorite-bearing granodiorite and pegmatite, on Gold Island, and dikes ranging in composition from lamprophyre to aplite cut the main batholith rocks" (Ref. C, p. 104). [Location uncertain]

An estimate of the fluorite content of the "Gold Island Granite" shows 3.6 (mode, vol. %) in Table III-19 (Ref. C, p. 104). [Location uncertain]

"Quartz vein matter from the northeast side of a small island in Saganaga Lake, SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 14. There is also a very little purple fluorite" (Ref. E, p. 315, #318; see also p. 829, #2046).

"On an island in Saganaga lake (SE $\frac{1}{4}$ -NE $\frac{1}{4}$ sec. 14, T. 66-5 W.) is a large white quartz vein in which a number of years ago some mining for gold and silver was carried on but without success. The main rock of this island is a fluorite granite (Nos. 676G, 677G, 678G, 2046), and this, as far as the writer knows, is the only fluorite granite reported from the state. The fluorspar is not in great amount, but is scattered in small grains throughout the rock." (Ref. F, p. 322)

Testpits: In SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 14 interpreted from Ref. F

Location: Cottonwood County
Township 105N-37W, Sections 6, 29

References: A) DNR Open File Drill Samples List

Other Data: DDH SQ-11 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 6 (Ref. A)
DDH SQ-12 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 29 (Ref. A)
Clay minerals in Sec. 6 and 29, see also summary in Appendix.

Location: Cottonwood County
Township 107N-34W, Sections 5, 7

References: A) DNR Open File Drill Samples List

Other Data: DDH SQ-3A in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 5 (Ref. A)
DDH SQ-6, SQ-6A in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 7 (Ref. A)
Clay minerals in Sec. 5 and 7, see also summary in Appendix.

Location: Cottonwood County
Township 107N-35W, Section 6

References: A) DNR Open File Drill Samples List

Other Data: DDH SQ-3 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 6 (Ref. A)
Clay minerals in Sec. 6, see also summary in Appendix.

Location: Crow Wing County
Township 45N-28W, Sections 25, 26

References: A) Winchell & Grant, Part III, 1895, p. 45, 23rd Annual Report

Occurrences: "In 1872 gold was found on an island in Partridge Lake, a short distance west of Lac des Mille Lacs in a large quartz vein cutting "Huronian" schist. Samples from the vein which showed nuggets of gold were exhibited at Philadelphia in 1876." [Note: from the context, this location may be in Canada or Sec. 25 or 26 here] (Ref. A, p. 45)

Location: Crow Wing County
Township 45N-30W, Sections 11, 32

References: A) DNR General Exploration File

Other Data: DDH 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 3192, 3193, 3253, 3073 in Sec. 32 (Ref. A)
DDH 682, 686 in Sec. 11 (See Appendix)

Location: Crow Wing County
Township 46N-28W, Section 6

Other Data: DDH 1, 1-A, 11, 13, 138, 14, 15, 16, 17, 4, 5, 6, 7, 8 in Sec. 6 (See Appendix)

Location: Crow Wing County
Township 46N-29W, Sections 1, 2, 3, 5, 7, 9, 10, 11, 15, 16, 17

References: A) Krey, 1919, Thesis, p. 23

Occurrences: Referring to manganiferous iron mines in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 10: "Barite was found at the Sultana and Mahnomen Mines. At the Sultana Mine it occurred filling a small cavity in the ore body and as vein material. Where it occurred as a vein it impregnated the rock at either side for a short distance. At the Mahnomen Mine the barite occurred as tabular and prismatic crystals lining a cavity in the ore body. The cavity was nearly a foot across and eight inches high. Black manganese oxide was intergrown with the tabular crystals. The total amount of barite observed was negligible and did not exceed two hundred grams. Quartz is abundant and occurs as vein filling. At the Mahnomen Mine a quartz vein several feet thick was observed. Many quartz veins show brecciation suggesting deformation after being formed." (Ref. A, p. 23)

Referring to a manganiferous iron mine in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 3: "Rhodochrosite and quartz were seen in a small vein at the Hopkins Mine. The vein was about one half inch thick and ten feet long and occurred in a pink chert." (Ref. A, p. 24)

Other Data: DDH T2 in Sec. 1 (See Appendix)
DDH 1, 1-E, 10, 11, 12, 13, 14, 15, 16, 16-C, 17, 18, 19, 2, 653, 2-E, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 3, 3-E, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 4, 4-E, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 5, 5-E, 50, 51, 52, 53, 54, 55,

56, 57, 58, 59, 6, 6-E, 60, 7, 7-E, 70, 71, 72, 73, 8, 80, 81, 82, 84, 9 in Sec. 2 (See Appendix)

DDH 1, 10, 101, 107, 109, 11, 110, 111, 12, 13, 14, 2, 200, 201, 202, 203, 204, 205, 206, 207, 208, 210, 211, 212, 213, 214, 215, 216, 218, 219, 220, 221, 6, 7, 7A in Sec. 9 (See Appendix)

DDH 401, 402, 403 in Sec. 10 (See Appendix)

DDH 23, 24, 25, 30, 31, 38, 39, 40, 41, 61, 62, 63, 84, 85, 86, 87, 88, 89, 91, 92, 93, 94, 95, 96, 97, 98, A-8, C, D, K, L, M, N, T-1, T-2, T-3, T-4, T-5, T-6, U-1, U-2, U-2A, U-3, U-4, U-5, U-6, V-1, V-2, V-3, V-4, V-5, V-6, W-1, W-2, W-3, W-4, W-5, W-6, X-3, X-4, X-5, X-6, Y-5, Y-6, Z-6 in Sec. 11 (See Appendix)

DDH 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 654, 655, 656, 657, 658, 121, 302 in Sec. 2 (See Appendix)

DDH 730 in Sec. 3 (See Appendix)

DDH 1, 10, 11, 12, 13, 14, 2, 3, 4, 6, 7, 8, 9 in Sec. 5 (See Appendix)

DDH 423, 437, 440, 442, 443, 447, 452, 453, 461, 464 in Sec. 6 (See Appendix)

DDH 401, 402, 403, 404, 405, 406, 407, 408 in Sec. 7 (See Appendix)

DDH 304, 306, 307, 308, 309, 310 in Sec. 9 (See Appendix)

DDH 103, 104, 119, 125, 129, 132, 146, 147, 151, 153, 154, 155, 156, 157, 158, 159, 161, 170, 172, 173, 175, 177, 205, 211, 217, 218, 222, 226, 232, 233 in Sec. 10 (See Appendix)

DDH 28A, 29A, 30A, 31A, 32A, 33A, 34A, 1, 10, 11, 13, 138, 16, 17, 2, 24A, 3, 3A, 4, 446, 448, 450, 458, 459, 465, 466, 468, 476, 477, 480, 482, 483, 491, 495, 496, 5, 500, 507, 514, 552, 553, 554, 555, 6, 7, 8, 9, CK2A, 107, 114, 117, 485, 516, 122, 127, 128, 131, 135 in Sec. 11 (See Appendix)

DDH 1, 2, 3 in Sec. 15 (See Appendix)

DDH 133, 112, 115, 120, 123, 100, 101, 102, 105, 106, 108, 109, 124, 126, 130, 155, 156, 159, 164, 136, 137, 139, 140, 141, 143, 111, 113, 116, 118, 121 in Sec. 16 (See Appendix)

DDH H-7, 7M, 22M, 24M, 25M, 26M, 5M in Sec. 17 (See Appendix)

DDH 248, 253, 258, 264, 270, 272, 277, 282, 283, 293, 312, 313, 314, 315, 316, 317, 318, 319, 395, 398, 400, 403, 412, 415, 662, 664, 667, 670, 675, 687, 690, 724, 725, 726, 727, 729, 730 in Sec. 18 (See Appendix)

Location: Crow Wing County
Township 46N-30W, Sections 13, 26, 34

References: A) DNR General Exploration File

Other Data: DDH S-4 in Sec. 34 (Ref. A)

DDH 13, 2, 1, 10, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 12, 14, 4, 8, 9 in Sec. 13 (See Appendix)

DDH 454, 462, 463, 469, 473, 474, 475, 479, 487, 488, 490, 493, 494, 501, 502, 506, 515, 518, 528, 531, 534, 524, 530, 539, 541, 545, 546, 555, 556, 565, 566, 572, 573 in Sec. 26 (See Appendix)

Location: Crow Wing County
Township 47N-28W, Sections 19, 29

Other Data: DDH 152, 162, 167, 171, 181 in Sec. 19 (See Appendix)
DDH 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009,
1010, 1011, 1012, 1013, 1014, 1015, 1016, 1017, 1018, 1019,
1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028, 1029,
1030, 1031, 1032, 1033, 2001, 2002, 2003, 2004, 2005, 2006,
2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016,
2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026,
2027, 2028, 2029, 2030, 3001, 3002, 3003, 3004, 3005, 3006,
3007, 3008, 3009, 3010, 3011, 3012, 3013, 3014, 3015, 3016,
3017, 3018, 3019, 3020, 3021, 3022, 3023, 3024, 3025, 3026,
3027, 3028, 3029, 3030, 3031, 716, 717, 718, 719, 720, 721,
722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733,
734, 735, 736, 737, 738, 740, 741, 742, 743, 744, 745, 746,
747, 748, 749, 750, 751, 752, 753, 800, 801, 802, 804, 805,
806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817,
818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829,
830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841,
842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853,
854, 855, 856, 857, 858, 859, 860, 861 in Sec. 29 (See
Appendix)

Location: Crow Wing County
Township 47N-29W, Sections 2, 20, 22, 25, 26, 27, 28, 29,
30, 32, 34, 35

References: A) Blake, 1958, U of M Ph.D., pp. 73-81

Occurrences: A study pertaining to the Cuyuna District, and
apparently Sec. 30 noted: "Minerals in almost unoxidized
iron-formation, in approximate order of decreasing
abundance, are: carbonate, stilpnomelane, minnesotaite,
magnetite, quartz, a 14 A iron silicate, a 7 A iron
silicate, goethite, hematite, pyrite, amphibole, and
arsenopyrite. Any two, or as many as eight or nine, of
these minerals were observed in a given bed . . . Coarse
anhedral pyrite is often associated with hematite or
magnetite, apparently as a late mineral. Opaque, very
fine-grained, dust-like material may be fine magnetite or
pyrite or carbonaceous matter in beds that have not been
reconstituted or recrystallized. Arsenopyrite in coarse
euhedra (up to 0.35 mm in diameter) are occasionally found
along certain beds associated with magnetite, pyrite, and in
one sample, chalcopyrite. Arsenopyrite also occurs in large
penetration twins in a greenish-yellow altered layer that
contains a montmorillonite mineral (nontronite?) formed by
the breakdown of stilpnomelane. Grout and Broderick (1919,
p. 14) mention the occurrence of arsenopyrite, pyrrhotite,
and chalcopyrite in drill core from the east Mesabi
district. The small amount of sulfides in the iron-
formation, their normally disseminated occurrence, and their
occasional concentration along certain layers suggests a
syngenetic origin for those sulfides which were observed."
(Ref. A)

Other Data: DDH 2, 3, 4 in Sec. 20 (See Appendix)

CROW WING

DDH 7, 8, X-7, X-9, 2201, 2203, 2206, X-1, X-4, X-5 in Sec. 22 (See Appendix)
 DDH 519-A, 543, 552, 556, 557, 558, 559, 564, 568, 570, 574, 576, 584, 585, 592, 593, 596, 101, 102, 103, 104, 105, 106, 107, 108, 109, 108-A, 489-A, 492-A, 520, 520-A, 527, 529, 533, 538, 548, 551, 560, 569 in Sec. 23 (See Appendix)
 DDH 532, 535, 540, 550, 557, 563, 581, 522 in Sec. 25 (See Appendix)
 DDH J1, 1W, 2W, 3W, 4W, 5W in Sec. 26 (See Appendix)
 DDH 15, 29, X-10, X-2, X-3, 16, 17, 18, 19, 23, 25, 26, 27, 28, X-11, X-12, X-13, X-6, X-8, S-1 in Sec. 27 (See Appendix)
 DDH 1A, Z-1, Z-2, Z-10, Z-10A, Z-11, Z-12, Z-13, Z-14, Z-15, Z-16, Z-17, Z-18, Z-19, Z-20, Z-21, Z-22, Z-23, Z-24, Z-25, Z-26, Z-27, Z-28, Z-29, Z-3, Z-4, Z-5, Z-6, Z-7, Z-8, Z-9, 1A in Sec. 28 (See Appendix)
 DDH 5, 6 in Sec. 29 (See Appendix)
 DDH 1 in Sec. 30 (See Appendix)
 DDH V-1, V-2, V-3, V-4, 318, 319, 399, 404, 405 in Sec. 32 (See Appendix)
 DDH U-1, U-2, U-3, U-4, U-5, R-1, R-2 in Sec. 34 (See Appendix)
 DDH 286, 699, 700, 702, 703, 706, 707, 708, 709 in Sec. 35 (See Appendix)

Location: Crow Wing County
 Township 134N-28W, Sections 22, 23, 32
 Other Data: DDH 302, 303, 304, 305, 306, 701 in Sec. 22 (See Appendix)
 DDH 111, 112, 113 in Sec. 23 (See Appendix)
 DDH 114, 115, 307, 308, 309, 310 in Sec. 32 (See Appendix)

Location: Crow Wing County
 Township 136N-25W, Section 28
 Other Data: DDH RL-6, RL-7, RL-8, RL-9 in Sec. 28 (See Appendix)

Location: Crow Wing County
 Township 136N-26W, Sections 4, 7, 19, 26, 30, 35
 Other Data: DDH 101 in Sec. 4 (See Appendix)
 DDH 102 in Sec. 7 (See Appendix)
 DDH 103, 104 in Sec. 19 (See Appendix)
 DDH 107, 108 in Sec. 26 (See Appendix)
 DDH 109, 110 in Sec. 30 (See Appendix)
 DDH 105, MR-5 in Sec. 35 (See Appendix)

Location: Crow Wing County
 Township 136N-27W, Sections 15, 24
 Other Data: DDH 2042 in Sec. 15 (See Appendix)
 DDH 106 in Sec. 24 (See Appendix)

Location: Crow Wing County
 Township 137N-25W, Sections 14, 16, 24, 28, 33, 36
 References: A) DNR General Exploration File

Other Data: DDH 18128, 18130 in Sec. 36 (Ref. A)
 DDH 29 in Sec. 14 (See Appendix)
 DDH 2038 in Sec. 16 (See Appendix)
 DDH 30 in Sec. 24 (See Appendix)

DDH RL-1, RL-2, RL-3, RL-4, RL-5 in Sec. 28 (See Appendix)
 DDH 2039 in Sec. 33 (See Appendix)

Location: Crow Wing County
 Township 138N-25W, Sections 12, 16, 22, 26, 28, 32

References: A) DNR General Exploration File

Other Data: DDH 18126 in Sec. 16 (Ref. A)
 DDH 25 in Sec. 12 (See Appendix)
 DDH 20, 26, 9 in Sec. 22 (See Appendix)
 DDH 18 in Sec. 26 (See Appendix)
 DDH 17 in Sec. 28 (See Appendix)
 DDH 10 in Sec. 32 (See Appendix)

Location: Crow Wing County
 Township 138N-26W, Sections 3, 9, 15, 18, 20, 21, 23, 24,
 25, 26

Other Data: DDH 17 in Sec. 3 (See Appendix)
 DDH 24, 25 in Sec. 9 (See Appendix)
 DDH 19 in Sec. 15 (See Appendix)
 DDH 33 in Sec. 18 (See Appendix)
 DDH 20, 201, 202, 21, 22 in Sec. 20 (See Appendix)
 DDH 16, 23, 31 in Sec. 21 (See Appendix)
 DDH 52, 60, 63, 66, 69, 76, 78 in Sec. 23 (See Appendix)
 DDH 49, 67, 68, 72, 73, 74, 75, 77 in Sec. 24 (See Appendix)
 DDH 54, 58 in Sec. 25 (See Appendix)
 DDH 44, 55 in Sec. 26 (See Appendix)

Location: Crow Wing County
 Township 138N-27W, Sections 13, 29, 35

Other Data: DDH 34 in Sec. 19 (See Appendix)
 DDH 1905 in Sec. 29 (See Appendix)
 DDH GL-1, GL-2, GL-3, GL-4 in Sec. 35 (See Appendix)

Location: Crow Wing County
 Township 138N-28W, Sections 12, 23

Other Data: DDH 1904 in Sec. 12 (See Appendix)
 DDH 45, 46, 47 in Sec. 23 (See Appendix)

Location: Dakota County
 Township 27N-23W, Section 4

Other Data: DDH T-1 in Sec. 4 (See Appendix)

Location: Dakota County
 Township 27N-24W, Section 13

Other Data: DDH T-14 in Sec. 13 (See Appendix)

Location: Dakota County
 Township 28N-22W, Sections 16, 21, 28
 Other Data: DDH T-2 in Sec. 16 (See Appendix)
 DDH T-1, T-2 in Sec. 21 (See Appendix)
 DDH T-1 in Sec. 28 (See Appendix)

Location: Dakota County
 Township 28N-23W, Sections 23, 27, 28, 33, 34, 35
 Other Data: Clay minerals in Sec. 28, see also summary in Appendix.
 DDH T-1, T-2, T-2, T-3, T-4, T-4, T-5, TH-6 in Sec. 23 (See Appendix)
 DDH T-1, T-103, T-105P, T-106P, T-108P, T-2, T-3, T-52, T100P in Sec. 27 (See Appendix)
 DDH T-1, T-109P, T-110P, T-2, T-3 in Sec. 28 (See Appendix)
 DDH T-2 in Sec. 33 (See Appendix)
 DDH T-2, T-50 in Sec. 34 (See Appendix)
 DDH T-1, T-3 in Sec. 35 (See Appendix)

Location: Dakota County
 Township 112N-18W, Section 12
 Other Data: DDH T-1, T-1, T-2, T-2, T-3, T-4, T-5, T-6 in Sec. 12 (See Appendix)

Location: Dakota County
 Township 113N-18W, Sections 4, 8, 9, 16
 References: A) Winchell, 1888, Vol. II, p. 48
 Occurrences: Two pieces of native copper found in glacial drift. [Sec. 8], (Ref. A, p. 48).
 Other Data: Native Copper in Sec. 8, see also summary in Appendix.
 DDH T-6, T-7 in Sec. 9 (See Appendix)
 DDH T-8 in Sec. 16 (See Appendix)
 DDH H65-1 in Sec. 4 (See Appendix)
 DDH H65-3 in Sec. 8 (See Appendix)

Location: Dakota County
 Township 114N-18W, Sections 8, 17, 19, 21
 Other Data: DDH V66-2 in Sec. 8 (See Appendix)
 DDH V66-1 in Sec. 17 (See Appendix)
 DDH V66-3 in Sec. 19 (See Appendix)
 DDH V66-4 in Sec. 21 (See Appendix)

Location: Dakota County
 Township 115N-17W, Sections 18, 23, 26, 34
 Other Data: DDH THA-4 in Sec. 18 (See Appendix)
 DDH THB-1 in Sec. 23 (See Appendix)
 DDH THB-2, THB-4, THB-7 in Sec. 26 (See Appendix)
 DDH T-1, T-2 in Sec. 34 (See Appendix)

Location: Dakota County
 Township 115N-20W, Section 19
 Other Data: DDH T-2 in Sec. 19 (See Appendix)

Location: Dodge County
Township 107N-16W, Section 32
Other Data: DDH T-1, T-2, T-3, T-4 in Sec. 32 (See Appendix)

Location: Dodge County
Township 107N-17W, Section 13
Other Data: DDH T-1, T-2 in Sec. 13 (See Appendix)

Location: Douglas County
Township 129N-36W, Section 22
Other Data: DDH 1913 in Sec. 22 (See Appendix)

Location: Faribault County
Township 102N-24W, Sections 2, 9
Other Data: DDH T-2 in Sec. 2 (See Appendix)
DDH T-1 in Sec. 9 (See Appendix)

Location: Faribault County
Township 102N-25W, Section 10
Other Data: DDH T-3 in Sec. 10 (See Appendix)

Location: Faribault County
Township 102N-26W, Section 12
Other Data: DDH T-2 in Sec. 12 (See Appendix)

Location: Faribault County
Township 102N-27W, Sections 5, 10
Other Data: DDH T-1 in Sec. 5 (See Appendix)
DDH T-2 in Sec. 10 (See Appendix)

Location: Faribault County
Township 102N-28W, Section 3
Other Data: DDH T-1 in Sec. 3 (See Appendix)

Location: Fillmore County
Township 102N-10W, Section 6
Other Data: DDH T-1 in Sec. 6 (See Appendix)

Location: Fillmore County
Township 103N-9W, Sections 3, 7, 16
Other Data: DDH T-1 in Sec. 3 (See Appendix)
DDH T-1, T-2, T-4 in Sec. 7 (See Appendix)
DDH T-1, T-2 in Sec. 16 (See Appendix)

Location: Fillmore County
Township 103N-10W, Section 13

References: A) Heyl & West, 1982, Econ. Geol., Vol. 77, p. 1810,
citation of Winchell, 1884, p. 292.

Occurrence: Galena in Platteville Formation (Middle Ordovician),
called Joseph Taylor's quarry. (Ref. A)

Location: Fillmore County
Township 103N-11W, Section 29

References: A) Heyl & West, 1982, Econ. Geol., Vol. 77, p. 1810,
citation of R.E. Sloan, oral commun. to W.S. West, 1968

Occurrence: "Prospects and galena float in Galena, Decorah, and
Platteville formations called the Watson Creek
Prospects. (Ref. A)."

Location: Fillmore County
Township 103N-13W, Section 26

References: A) Heyl & West, 1982, Econ. Geol., Vol. 77, p. 1810,
citation of Winchell and Leonard, 1876, p. 30.
B) Winchell, 1884, Geol. of Minnesota, Vol. 1, p. 321
C) Upham, 1898, V. 8, p. 291

Occurrences: "at Spring Valley, MN", (see also map p.#1804),
Considerable quantities of galena float in Galena, Decorah,
and Platteville Formations" (Middle Ordovician).(Ref. A, p.
1810)
"In small quantities gold has been washed, by rude methods,
from the drift at several points in the county. It was
found on Hugh Hague's land in gravel, NE $\frac{1}{4}$, Sec. 26, Spring
Valley [Note: probably in T103N-13W, see map p. 268B] and
at Yeariton's sawmill, Sec. 31, Jordan. There are accounts
also of fragments of native copper having been found in the
drift" (Ref. B).

Location: Fillmore County
Township 104N-9W, Section 25

Other Data: DDH B-1 in Sec. 25 (See Appendix)

Location: Fillmore County
Township 104N-12W, Section 31

References: A) Winchell, 1884, Geol. of Minn., Vol. 1, p. 321
B) Upham, 1898, Vol. 8, p. 291

Occurrences: "In small quantities gold has been washed, by rude
methods, from the drift at several points in the county. It
was found on Hugh Hague's land in gravel at Spring Valley
and at Yeariton's sawmill, sec. 31, Jordan [Note: probably
104N-12W, see map pg. 268B]. There are accounts also of
fragments of native copper having been found in the drift"
(Ref. A, p. 321; and B, p. 291).

Location: Freeborn County
 Township 101N-21W, Sections 4, 21, 33
 Other Data: DDH T-1 in Sec. 4 (See Appendix)
 DDH T-11, T-12, T-2 in Sec. 21 (See Appendix)
 DDH T-2 in Sec. 33 (See Appendix)

Location: Freeborn County
 Township 102N-21W, Sections 2, 11, 16, 21, 23
 Other Data: DDH T-1 in Sec. 2 (See Appendix)
 DDH T-1, T-1A in Sec. 11 (See Appendix)
 DDH T-1, T-4 in Sec. 23 (See Appendix)
 DDH CW#4 in Sec. 16 (See Appendix)
 DDH TH in Sec. 21 (See Appendix)

Location: Freeborn County
 Township 103N-19W, Section 7
 Other Data: DDH H-1, H-1A in Sec. 7 (See Appendix)

Location: Goodhue County
 Township 109N-16W
 References: A) Hoeft, 1959, U of M Thesis, p. 178
 Occurrences: In southern Goodhue County and in Olmsted County the
 Pecatonica retains . . . Phosphatic material is very
 abundant" (Ref. A, p. 178).

Location: Goodhue County
 Township 110N-15W
 References: A) Winchell, 1888, Vol. II, p. 48
 Occurrences: 4 to 5 lb. piece of native copper found at Zumbrota in
 glacial drift; occasionally a piece found between Zumbrota
 and Wanamingo [exact location unknown, T110N-15W -
 T110N-17W], (Ref. A, p. 48).
 Other Data: Native Copper, see also summary in Appendix.

Location: Goodhue County
 Township 110N-16W, Sections 21, 29
 References: A) Winchell, 1888, Vol. II, p. 48
 B) Mossler, 1970, MGS personal notes
 Occurrences: 4 to 5 lb. piece of native copper found at Zumbrota in
 glacial drift; occasionally a piece found between Zumbrota
 and Wanamingo [exact location unknown, T110N-R15W -
 T110N-R17W], (Ref. A, p. 48).
 In SE $\frac{1}{4}$, Sec. 29, sphalerite crystals were noted in
 Platteville limestone. (Ref. B)
 Other Data: Clay minerals in Sec. 21, see also summary in Appendix.
 Native Copper, see also summary in Appendix.

Location: Goodhue County
 Township 110N-17W
 References: A) Winchell, 1888, Vol. II, p. 48

Occurrences: 4 to 5 pound piece of native copper found at Zumbrota in glacial drift; occasionally a piece found between Zumbrota and Wanamingo [exact location unknown, T110N-R15W - T110N-R17W], (Ref. A, p. 48).

Other Data: Native Copper, see also summary in Appendix.

Location: Goodhue County
Township 111N-14W

Other Data: Clay minerals, see also summary in Appendix.

Location: Goodhue County
Township 111N-15W, Sections 3, 10, 26

Other Data: Clay minerals in Sec. 3, 10, 26, see also summary in Appendix.

Location: Goodhue County
Township 111N-16W, Sections 28, 29

Other Data: Clay minerals in Sec. 28 and 29, see also summary in Appendix.

Location: Goodhue County
Township 112N-17W, Sections 18, 20

References: A) Winchell, 1888, Vol. II, p. 48

Occurrences: Several small pieces of native copper reported in glacial drift [NW $\frac{1}{4}$, Sec. 20] (Ref. A, p. 48).

Other Data: Native Copper in Sec. 20, see also summary in Appendix.
DDH T-1, T-1A, T-2, T-2A, T-3, T-4 in Sec. 18 (See Appendix)

Location: Goodhue County
Township 112N-18W, Section 21

Other Data: DDH T-1 in Sec. 21 (See Appendix)

Location: Goodhue County
Township 113N-15W, Section 19

Other Data: DDH T-1 in Sec. 19 (See Appendix)

Location: Hennepin County
Township 29N-23W

References: A) Winchell, 1888, Vol. II, p. 372

Occurrences: "A piece of [native copper] weighing about ten pounds was found in the fall of 1874 in grading the streets of Minneapolis; . . . a piece about the size of a pea, covered with green carbonate, was found by the writer in the midst of gravel thrown from his well on State Street, Minneapolis, near the University; Dr. D. D. Owen mentions pieces found in the vicinity of the falls of St. Anthony", [exact location uncertain], (Ref. A, p. 372).

Location: Hennepin County
Township 118N-23W
Other Data: Clay minerals, see also summary in Appendix.

Location: Hennepin County
Township 119N-21W
References: A) Winchell, 1888, Vol. 2, p. 372
Occurrences: "Several small pieces [of native copper] were obtained from the red till overlying the Trenton limestone on the west side of the Mississippi River about three-fourths of a mile below the mouth of Shingle Creek, in April, 1884." [exact location uncertain], (Ref. A, p. 372).

Location: Hennepin County
Township 120N-22W
References: A) Winchell, 1888, Vol. 2, p. 372
Occurrences: "Near Dayton a piece [of native copper] as large as a hickory-nut was found on the river bank by James Rean;" [exact location uncertain, T120N-R22W?], (Ref. A, p. 372).

Location: Itasca County
Township 54N-24W, Section 18
Other Data: DDH 18-L in Sec. 18 (See Appendix)

Location: Itasca County
Township 54N-25W, Sections 4, 13, 24, 25, 26, 27, 34
Other Data: DDH 4-B in Sec. 4 (See Appendix)
DDH 13-Q in Sec. 13 (See Appendix)
DDH 24-G, 24-R in Sec. 24 (See Appendix)
DDH 25-B, 25-E in Sec. 25 (See Appendix)
DDH 26-F in Sec. 26 (See Appendix)
DDH 27-P in Sec. 27 (See Appendix)
DDH 34-A in Sec. 34 (See Appendix)

Location: Itasca County
Township 54N-26W, Sections 4, 23, 25, 26
Other Data: DDH 4-D in Sec. 4 (See Appendix)
DDH 23-Q in Sec. 23 (See Appendix)
DDH 25-C, 25-C-A, 25-D, 25-Q in Sec. 25 (See Appendix)
DDH 26-B in Sec. 26 (See Appendix)

Location: Itasca County
Township 55N-22W, Sections 4, 5, 6
Other Data: DDH 4-D in Sec. 4 (See Appendix)
DDH 5-G in Sec. 5 (See Appendix)
DDH 6-M in Sec. 6 (See Appendix)

Location: Itasca County
Township 55N-23W, Sections 1, 6
Other Data: DDH 1-R in Sec. 1 (See Appendix)
DDH 6-E in Sec. 6 (See Appendix)

Location: Itasca County
Township 55N-24W, Sections 1, 14, 21, 22, 23, 28, 33, 36
Other Data: DDH 8 in Sec. 36 (See Appendix)
DDH 1-A in Sec. 1 (See Appendix)
DDH 14-Q in Sec. 14 (See Appendix)
DDH 21-L in Sec. 21 (See Appendix)
DDH 22-J, 22-L, 22-M in Sec. 22 (See Appendix)
DDH 23-E in Sec. 23 (See Appendix)
DDH 28-J in Sec. 28 (See Appendix)
DDH 33G in Sec. 33 (See Appendix)

Location: Itasca County
Township 55N-25W, Sections 16, 21, 28, 33
Other Data: DDH 16-J, 16-Q in Sec. 16 (See Appendix)
DDH 21-G in Sec. 21 (See Appendix)
DDH 28-A, 28-J in Sec. 28 (See Appendix)
DDH 33-G, 33-J, 33-R in Sec. 33 (See Appendix)

Location: Itasca County
Township 55N-26W, Sections 13, 14, 22, 23, 27, 28, 33
Other Data: DDH 13-K in Sec. 13 (See Appendix)
DDH 14-J, 14-Q in Sec. 14 (See Appendix)
DDH 22-G in Sec. 22 (See Appendix)
DDH 23-F in Sec. 23 (See Appendix)
DDH 27-C in Sec. 27 (See Appendix)
DDH 28-R in Sec. 28 (See Appendix)
DDH 33-B, 33-F in Sec. 33 (See Appendix)

Location: Itasca County
Township 56N-22N, Sections 18, 19, 29
Other Data: DDH 18-M, 18-M-A in Sec. 18 (See Appendix)
DDH 19-J, 19-J-A in Sec. 19 (See Appendix)
DDH 29-C, 29-D, 29-G in Sec. 29 (See Appendix)

Location: Itasca County
Township 56N-23W, Sections 2, 13, 14, 19
Other Data: DDH 1 in Sec. 2 (See Appendix)
DDH 13-J in Sec. 13 (See Appendix)
DDH 14-N, 14-N-A, 14-P in Sec. 14 (See Appendix)
DDH UNK in Sec. 19 (See Appendix)

Location: Itasca County
Township 56N-24W, Section 36
Other Data: DDH 36-H, 36-J, 36-R in Sec. 36 (See Appendix)

Location: Itasca County
Township 57N-22W, Sections 24, 25, 36
Other Data: Clay minerals in Sec. 24, see also summary in Appendix.
DDH T-2 in Sec. 25 (See Appendix)
DDH 7 in Sec. 36 (See Appendix)

Location: Itasca County
Township 58N-22W, Section 16
References: A) 1937 Annual Report, Lands & Minerals (DNR), p. 218
Occurrences: Shaefer Brothers reported rocks containing gold in Sec. 16, but the 1937 DNR inspection saw only golden mica. "The location is interesting, however, and further tests are contemplated." [No assay results are indicated.] (Ref. A, p. 217)

Location: Itasca County
Township 59N-26W, Section 14
References: A) DNR General Exploration File
Other Data: DDH BF-H-1 in Sec. 14 (Ref. A)

Location: Itasca County
Township 60N-22W, Sections 7, 18, 19
References: A) DNR Open File Drill Samples List
Other Data: DDH 40925 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 19 (Ref. A)
DDH CAL-1 in Sec. 7 (See Appendix)
DDH CAL-2, CAL-3, GAN-1 in Sec. 18 (See Appendix)

Location: Itasca County
Township 60N-23W, Sections 16, 25, 34, 35
References: A) DNR Open File Drill Samples List
Other Data: DDH BL-D-1, BL-D-2 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 34 (Ref. A)
DDH KAT-1, KAT-2 in Sec. 16 (See Appendix)
DDH SOC-1 in Sec. 25 (See Appendix)
DDH GUA-1, KAI-1, KAI-2 in Sec. 35 (See Appendix)
Iron Ores - Archean in Sec. 34, see also summary in Appendix.

Location: Itasca County
Township 60N-25W, Section 29
References: A) DNR Terminated Lease Files
Summary: Occurrence in Archean greenstone terrane
Occurrences: DDH CN-16 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 29, Lease Humble CN-7645, has (Ref. A)
- 20 ft. of 500 ppm Cu
Other Data: Iron Ores - Archean in Sec. 29, see also summary in Appendix.

Location: Itasca County
Township 61N-22W, Sections 21, 29, 32
Other Data: DDH SNT-1 in Sec. 21 (See Appendix)

DDH HER-3, HER-1 in Sec. 29 (See Appendix)
 DDH HER-2 in Sec. 32 (See Appendix)

Location: Itasca County
 Township 61N-23W, Sections 4, 17
 References: A) DNR Open File Drill Samples List
 Other Data: DDH C-B-1 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 4 (Ref. A)
 DDH C-K-2 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 17 (Ref. A)
 Graphite in Sec. 4 and 17, see also summary in Appendix.

Location: Itasca County
 Township 61N-24W, Sections 6, 11
 References: A) DNR Terminated Lease Files
 Summary: Occurrence in Archean greenstone terrane
 Occurrences: DDH 26516, in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 6, Lease U.S. Steel CN-7824,
 has: (Ref. A)
 - traces of native copper, cuprite, malachite and
chalcopyrite scattered through the core
 DDH T-13, in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 11, Lease Hanna CN-7763
 has: (Ref. A)
 - gabbro with chalcopyrite (see Himmelberg log)
 Other Data: Graphite in Sec. 6 and 11, see also summary in Appendix.

Location: Itasca County
 Township 61N-25W, Sections 1, 2, 3, 10, 11, 12, 15, 16, 17
 References: A) Ripley, 1973, M.S. Thesis, p. 50
 B) Ripley, 1978, M.G.S. RI 20-B, p. 31
 C) Berkley & Himmelberg, 1978, M.G.S. RI 20-A, p. A11
 D) DNR Open File Drill Samples List
 E) DNR Terminated Lease Files
 F) Nicol, 1980, Thesis
 G) Berkley, 1972, Thesis, p. 18, 19, 23, 29
 H) Ripley, 1979, pp. 345-354
 Summary: Occurrences are in Archean Deer Lake Complex,
 13-km-long by 3-km-wide belt of ultramafic and gabbroic
 rocks. Chalcopyrite, pentlandite, pyrrhotite, pyrite and
chromite are cited.
 Occurrences: "Average metal contents" of the:
 1. Upper Peridotite is 1088 ppm Ni from 4 analyses
 2. Lower Peridotite is 1368 ppm Ni from 7 analyses
 3. Chilled Unit E is 507 ppm Ni from 5 analyses
 4. Pegmatitic Vein is 1728 ppm Cu and 21,750 ppm Zn from
 1 analysis
 The above assays are from Table IV, p. 50, Ref. A.
Chromite is described as occurring in the peridotite and the
 chilled basalt. (Ref. C, p. A11; Ref. B, p. 31 and Ref. G
 pp. 19, 20, 21) [Location uncertain]
 "Peridotite members of the separate sills studied are
olivine and chromite cumulates. Olivine content ranges from
 about 50 to 70% with an average of about 55%. Rocks with
 30% olivine occur at the base of the peridotite units as was
 discussed in the previous section.

Chromite content is found to be variable among sample localities and probably does not surpass more than 1 or 2% in any thin section. It occurs as scattered grains or small, local accumulations.

Chromite is usually observed as small, cubic or irregular grains." [Sec. 1, 2, 10-12, 15, 16] (Ref. G, pp. 23, 29)

"The chilled material comprising the base of any sill within the Deer Lake Complex has been studied from several locations, not all of which display completely exposed sections. Three notable areas, however, present complete or nearly complete exposures of chilled rock extending from the intrusive contact with the amphibolite (see page 13) below, to the overlying peridotite above. These are located in the SW $\frac{1}{4}$, Sec. 1, the NE $\frac{1}{4}$, Sec. 10, and the NW $\frac{1}{4}$, Sec. 15, all of which are in T. 61 N., R. 25 W. Study of field relations and thin sections from these areas and other less exposed sites permit a fairly clear reconstruction of the nature of the contact zones.

Chilled zones may be divided into three parts based on field and petrographic studies; (1) the fine grained material in direct or nearly direct contact with an earlier intrusion, (2) the coarser material away from the contact which is a hornblend dolerite, and (3) the coarse rock in contact with the peridotite which contains appreciable olivine and is, therefore, a peridotite itself.

The fine grained material closely resembles a metabasalt in the field and is also easily mistaken for pyroxenite as it contains no recognizable plagioclase. No chilled material was found that is not excessively altered, with amphiboles being the major alteration product. Veins containing larger actinolitic amphiboles plus feldspar and quartzofeldspathic veins may be observed cutting the finer grained zones. Sulfide minerals may be concentrated in the finer grained portions of the chilled zones, such rocks commonly being highly stained with limonite. (Figure 3)." (Ref. G, pp. 18, 19)

DDH 26512 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 10, Lease U. S. Steel CN-7825 has: (Ref. E)

- 5 veins of $\frac{1}{2}$ " wide between 793'-964' in gabbro that have up to 4% sulfides with minor chalcopyrite.

DDH 26513 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 10, Lease U. S. Steel CN-7825 has: (Ref. E)

- Minor chalcopyrite noted from 380'-452' in pyroxenite and from 686'-920' in serpentinized peridotite,
- Also possibly nickeliferous (Dithizone test) serpentine coatings 769'-785'

DDH 26508 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 12, Lease U. S. Steel CN-7827 has: (Ref. E)

- 10.1 ft. of 0.05% Cu
- 3 ft. of 0.07% Cu

Outcrop 18c of pillowed metabasalt, in Sec. 12, has: (Ref. E, U.S. Steel CN-7827, Map 7)

- Plus 1% of pyrite and nickeliferous pyrrhotite

DDH 26514 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 16, Lease U. S. Steel CN-7828 has: (Ref. E)

- 20 ft. of 0.14-0.16% Ni in serpentinized peridotite

Other Data: DDH 26509, 26510 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 10 (Ref. D)
 DDH 26511 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 10 (Ref. D)
 DDH 26512, 26513 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 10 (Ref. D)
 DDH 26502, 26503 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 12 (Ref. D)
 DDH 26506 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 12 (Ref. D)
 DDH 26507 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 12 (Ref. D)
 DDH 26515 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 16 (Ref. D)
 Olivine, see also summary in Appendix.
 Graphite in Sec. 10, 12, and 16, see also summary in Appendix.

Location: Itasca County
 Township 62N-22W, Section 7, 10, 29

References: A) DNR Terminated Lease Files
 B) DNR Open File Drill Samples List
 C) Sims, 1969, MGS I.C. 7, p. 7.

Summary: Occurrence in Archean greenstone terrane

Occurrences: DDH Cook 8-1 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 7, Lease Humble CN-7476, has (Ref. A)
 - 3 ft. of 550 ppm Zn
 - 4 ft. of 1500 ppm Zn
 - 57 ft. of 2 ppm Ag
 "A few sulfide-bearing quartz veins were observed in the mafic rocks in 62N-22W, west of the Linden pluton." (Ref. C, p. 7) [Location uncertain].

Other Data: DDH MDB-1-1 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 10 (Ref. B)
 DDH CE-6 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 29 (Ref. B)

Location: Itasca County
 Township 62N-24W, Sections 17, 30, 31

References: A) DNR Terminated Lease File
 B) Berkley, 1972, Thesis, p. 29
 C) Ripley, 1973, Thesis [not searched]
 D) DNR Open File Drill Samples List

Summary: Occurrence in Archean greenstone terrane

Occurrences: DDH #40927 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 30, Lease INCO CN-7714, has (Ref. A and D)
 - 2.3 ft. of .06% Cu
 - 2.3 ft. of .09% Ni
 "Chromite content is found to be variable among sample localities and probably does not surpass more than 1 or 2% in any thin section. It occurs as scattered grains or small, local accumulations. Chromite is usually observed as small cubic or irregular grains." [SW $\frac{1}{4}$, Sec. 31] (Ref. B, p. 29)
 DDH T-7 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 17, Lease Hanna CN-7770, has (Ref. A)
 - 5 ft. of sludge sample with 0.1 to 1% Zn from spectrographic analysis
 - Pyrite cubes and alunite suggest hydrothermal alteration of rhyolite tuff (Himmelberg interpretation)

Other Data: DDH 40927 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 30 (Ref. D)
 Graphite in Sec. 17, see also summary in Appendix.
 Clay Minerals in Sec. 30, see also summary in Appendix.

Location: Itasca County
 Township 150N-26W, Sections 9, 15, 17, 20
 Other Data: DDH ML-5, ML-6 in Sec. 9 (See Appendix)
 DDH ML-7 in Sec. 15 (See Appendix)
 DDH ML-3, ML-4, ML-8 in Sec. 17 (See Appendix)
 DDH ML-10 in Sec. 20 (See Appendix)

Location: Itasca County
 Township 150N-27W, Sections 10, 15
 Other Data: DDH ML-2 in Sec. 10 (See Appendix)
 DDH ML-1, ML-9 in Sec. 15 (See Appendix)

Location: Itasca County
 Township 150N-28W
 References: A) DNR General Exploration Files
 Occurrences: "In the explorations made by the Koochiching-Vermilion
 Iron Company on lands two miles to the northeast, typical
 greenstone schists have been encountered. Sometimes these
 contain small segregations of magnetite, also small quantities of
 quartz, the later in one instance having given a high assay for
gold" (Ref. A).

Location: Jackson County
 Township 102N-36W, Sections 11, 31
 References: A) DNR Open File Drill Samples List
 Other Data: DDH SQ-5 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 11 (Ref. A)
 DDH SQ-14 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 31 (Ref. A)
 Clay minerals in Sec. 11 and 31, see also summary in
 Appendix.

Location: Jackson County
 Township 104N-35W, Section 4
 References: A) DNR Open File Drill Samples List
 Other Data: DDH SQ-10 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 4 (Ref. A)
 Clay minerals in Sec. 4, see also summary in Appendix.

Location: Jackson County
 Township 104N-36W, Section 8
 References: A) DNR Open File Drill Samples List
 Other Data: DDH SQ-4 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 8 (Ref. A)
 Clay minerals in Sec. 8, see also summary in Appendix.

Location: Kanabec County
 Township 40N-23W, Sections 21, 22, 26
 References: A) DNR Open File Drill Samples List
 Other Data: DDH MO-3 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 21 (Ref. A)
 DDH MO-2 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 22 (Ref. A)
 DDH MO-1 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 26 (Ref. A)

Location: Kanabec County
Township 42N-22W, Sections 5, 6

References: A) Winchell, 1888, Vol. II, p. 623

Occurrences: "Another piece of drift copper, weighing twenty-seven pounds, was found by lumbermen in 1878 in the channel of Chesley brook about one and a half miles from its mouth, near the north line of Kanabec county," [Sec. 5 or 6], (Ref. A, p. 623).

Other Data: Native Copper in Sec. 5 and 6, see also summary in Appendix.

Location: Kanabec County
Township 42N-23W, Sections 4, 9

References: A) Harder & Johnston, 1918, pp. 44-45

Occurrences: "The schist, which occurs as large masses surrounded by granite, is principally a fine-grained, quartzose biotite schist, but some of it is coarsely crystalline. Locally muscovite occurs with the biotite and along certain streaks and bands much hornblende is developed. Garnet also is commonly disseminated through the rock, while certain hard quartzitic lenses have an interesting development of molybdenite around the borders. The larger of the schist masses, have a fairly uniform strike east and west and dip to the south at angles varying between 50° and 70°. They are cut by dikes of pink granite and also locally by pink pegmatite dikes consisting of quartz and pink feldspar with abundant muscovite. The association shows that the granite is intrusive into the schist, the masses of the latter being fragments caught in the granite" (Ref. A, pp. 44-45) [location probably Sec. 4 or 9, reader must interpret location description of paragraph 2, pg. 44].

Location: Kandiyohi County
Township 122N-34W, Section 2

Other Data: DDH 2020 in Sec. 2 (See Appendix)

Location: Kandiyohi County
Township 122N-36W, Section 5

References: A) Kelley, 1981, Minneapolis Star & Tribune article, September 16, pp. 1A & 2A

Occurrences: Gold is being collected as a by-product from Benson Ready Mix Company's sand pits in glacial drift in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 5 (Ref. A).

Location: Kittson County
Township 159N-45W, Sections 22, 23

Other Data: DDH E-10 in Sec. 22 (See Appendix)
DDH E-7 in Sec. 23 (See Appendix)

Location: Kittson County
Township 159N-46W, Sections 4, 5, 6, 9, 22, 24, 30

Other Data: DDH D-17 in Sec. 4 (See Appendix)

DDH BH-17, D-15, D-19, D-30 in Sec. 5 (See Appendix)
 DDH D-18, UNK in Sec. 6 (See Appendix)
 DDH UNK in Sec. 9 (See Appendix)
 DDH E-11 in Sec. 22 (See Appendix)
 DDH E-9 in Sec. 24 (See Appendix)
 DDH E-8 in Sec. 30 (See Appendix)

Location: Kittson County
 Township 159N-47W, Sections 24, 27
 Other Data: DDH E-13A in Sec. 24 (See Appendix)
 DDH E-2 in Sec. 27 (See Appendix)

Location: Kittson County
 Township 159N-48W, Sections 2, 11, 13, 21, 25
 Other Data: DDH R-1, R-2, R-3, L-3 in Sec. 2 (See Appendix)
 DDH AU-1, AU-2, AU-3 in Sec. 11 (See Appendix)
 DDH CL-1 in Sec. 13 (See Appendix)
 DDH E-1 in Sec. 21 (See Appendix)
 DDH E-13 in Sec. 25 (See Appendix)

Location: Kittson County
 Township 160N-45W, Sections 25, 28
 Other Data: DDH D-8 in Sec. 25 (See Appendix)
 DDH D-3 in Sec. 28 (See Appendix)

Location: Kittson County
 Township 160N-46W, Sections 2, 4, 5, 6, 7, 8, 9, 15, 16, 17,
 20, 21, 25, 30, 32, 33
 Other Data: DDH C-10 in Sec. 2 (See Appendix)
 DDH BH-15, C-31, C-21, C-19 in Sec. 4 (See Appendix)
 DDH C-18, BH-2, C-20, BH-5, C-22, C-24 in Sec. 5 (See
 Appendix)
 DDH BH-23, BH-14 in Sec. 6 (See Appendix)
 DDH BH-29 in Sec. 7 (See Appendix)
 DDH BH-22, C-27 in Sec. 8 (See Appendix)
 DDH BH-21, BH-24, C-28 in Sec. 9 (See Appendix)
 DDH D-23 in Sec. 15 (See Appendix)
 DDH C-26, C-25 in Sec. 16 (See Appendix)
 DDH BH-20, BH-18, BH-6, BH-7, BH-8 in Sec. 17 (See Appendix)
 DDH D-24, BH-28, BH-3, BH-11, BH-12, D-12, D-13 in Sec. 20
 (See Appendix)
 DDH BH-9, D-21, D-14 in Sec. 21 (See Appendix)
 DDH D-4 in Sec. 25 (See Appendix)
 DDH D-20, BH-16 in Sec. 30 (See Appendix)
 DDH D-25, BH-19, D-29, D-26, BH-30 in Sec. 32 (See Appendix)
 DDH D-28, D-27 in Sec. 33 (See Appendix)

Location: Kittson County
 Township 160N-47W, Sections 12, 24, 32, 34
 Other Data: DDH C-32 in Sec. 12 (See Appendix)
 DDH BH-25 in Sec. 24 (See Appendix)
 DDH D-2, D-2A in Sec. 32 (See Appendix)
 DDH D-7, D-7A in Sec. 34 (See Appendix)

Location: Kittson County
 Township 160N-48W, Sections 27, 28, 30, 34
 Other Data: DDH D-11, D-10 in Sec. 27 (See Appendix)
 DDH D-9 in Sec. 28 (See Appendix)
 DDH D-1 in Sec. 30 (See Appendix)
 DDH AN-1, AN-2, C-4 in Sec. 34 (See Appendix)

Location: Kittson County
 Township 161N-45W, Sections 31, 33
 Other Data: DDH C-11 in Sec. 31 (See Appendix)
 DDH C-5 in Sec. 33 (See Appendix)

Location: Kittson County
 Township 161N-46W, Sections 6, 30, 32, 33, 34
 Other Data: DDH 1 in Sec. 6 (See Appendix)
 DDH BR-1 in Sec. 30 (See Appendix)
 DDH C-29, UNK, C-16, C-17 in Sec. 32 (See Appendix)
 DDH C-12, BH-4, C-13, C-14, C-30, C-15 in Sec. 33 (See Appendix)
 DDH BH-1 in Sec. 34 (See Appendix)

Location: Kittson County
 Township 161N-47W, Sections 26, 33, 36
 Other Data: DDH C-1 in Sec. 26 (See Appendix)
 DDH C-2 in Sec. 33 (See Appendix)
 DDH C-3 in Sec. 36 (See Appendix)

Location: Kittson County
 Township 161N-49W, Section 13, 15
 Other Data: DDH 888 in Sec. 13 (See Appendix)
 DDH HA-1 in Sec. 15 (See Appendix)

Location: Kittson County
 Township 162N-45W, Sections 4, 12, 23, 29
 Other Data: DDH A-9 in Sec. 4 (See Appendix)
 DDH A-10 in Sec. 12 (See Appendix)
 DDH B-3 in Sec. 23 (See Appendix)
 DDH B-4 in Sec. 29 (See Appendix)

Location: Kittson County
 Township 162N-47W, Sections 18, 20, 22, 23
 Other Data: DDH B-8 in Sec. 18 (See Appendix)

DDH B-12 in Sec. 20 (See Appendix)
 DDH B-9 in Sec. 22 (See Appendix)
 DDH B-13 in Sec. 23 (See Appendix)

Location: Kittson County
 Township 162N-48W, Sections 13, 14, 16, 18
 Other Data: DDH LA-1 in Sec. 13 (See Appendix)
 DDH B-11 in Sec. 14 (See Appendix)
 DDH B-1 in Sec. 16 (See Appendix)
 DDH B-2 in Sec. 18 (See Appendix)

Location: Kittson County
 Township 162N-49W, Section 15
 Other Data: DDH B-5 in Sec. 15 (See Appendix)

Location: Kittson County
 Township 163N-46W, Sections 20, 26, 30
 Other Data: DDH A-11, A-11A in Sec. 20 (See Appendix)
 DDH A-4 in Sec. 26 (See Appendix)
 DDH A-3 in Sec. 30 (See Appendix)

Location: Kittson County
 Township 163N-47W, Section 28
 Other Data: DDH A-2 in Sec. 28 (See Appendix)

Location: Kittson County
 Township 163N-48W, Sections 15, 17, 18, 24
 Other Data: DDH A-8 in Sec. 15 (See Appendix)
 DDH A-7B in Sec. 17 (See Appendix)
 DDH A-7A in Sec. 18 (See Appendix)
 DDH A-1 in Sec. 24 (See Appendix)

Location: Kittson County
 Township 163N-49W, Section 16
 Other Data: DDH A-6 in Sec. 16 (See Appendix)

Location: Kittson County
 Township 163N-50W, Section 23
 Other Data: DDH A-5 in Sec. 23 (See Appendix)

Location: Koochiching County
 Township 63N-25W, Sections 27, 35
 References: A) DNR Terminated Lease File
 B) DNR Open File Drill Samples List
 Summary: Occurrence in Archean greenstone terrane
 Occurrences: DDH FL-32-1, in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 27, Lease Bear Creek,
 CN-7933, Franklin Lake Anomaly, 1700' S and 3050' W of NE
 corner of Sec. 27, has: (Ref. A)

Other Data: - 4 ft. of 600 ppm Zn in graphite
 - 11 ft. of 2 ppm Ag
 DDH FL-30-1 in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 35 (Ref. B)
 Graphite in Sec. 27 and 35, see also summary in Appendix.
 Clay minerals in Sec. 35, see also summary in Appendix.

Location: Koochiching County
 Township 66N-24W, Section 4
 References: A) DNR General Exploration File #1, pp. 1-2
 Testpits: Two testpits are reported in Sec. 4 (Ref. A)

Location: Koochiching County
 Township 66N-26W, Section 24
 References: A) DNR General Exploration File #1
 Testpits: Two testpits are reported in Sec. 24 (Ref. A)

Location: Koochiching County
 Township 67N-24W, Section 33
 References: A) DNR General Exploration File #1
 Testpits: Two testpits are reported in Sec. 33, (Ref. A)

Location: Koochiching County
 Township 67N-25W, Section 23
 References: A) Vadis, 1984, personal communication (DNR)
 Testpits: A shaft 75 feet deep, a possible gold prospect, is reported
 in the NW $\frac{1}{4}$ of Sec. 23. (Ref. A)

Location: Koochiching County
 Township 67N-26W, Section 3
 References: A) DNR General Exploration File #1
 Testpits: Two testpits are reported in Sec. 3. (Ref. A)

Location: Koochiching County
 Township 68N-22W, Section 3
 Other Data: DDH T-1 in Sec. 3 (See Appendix)

Location: Koochiching County
 Township 68N-23W, Sections 2, 3, 14
 References: A) Grout, 1922, MGS field notebook #21, p. 53
 B) DNR General Exploration File #1
 Occurrences: Exploration on Ray Iron Mining Company property for
magnetite in granite pegmatites in mica schists. "Some
 testpits and drilling" in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 2 and NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec.
 3 and SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 3 (Ref. A, p. 53).
 Testpits: A testpit is reported in Sec. 14 (Ref. B)
 Testpits in Sec. 2 and 3, see above description.

Location: Koochiching County
Township 68N-25W
Other Data: Garnet and Staurolite, see also summary in Appendix.

Location: Koochiching County
Township 68N-26W
Other Data: Garnet and Staurolite, see also summary in Appendix.

Location: Koochiching County
Township 69N-22W
Other Data: Garnet and Staurolite, see also summary in Appendix.

Location: Koochiching County
Township 69N-23W
Other Data: Garnet and Staurolite, see also summary in Appendix.

Location: Koochiching County
Township 69N-24W
Other Data: Garnet and Staurolite, see also summary in Appendix.

Location: Koochiching County
Township 71N-22W, Sections 23, 25, 26, 27, 33
References: A) Winchell & Grant, 1895, pp. 75, 76, 78, 79, 80, 86, 87
B) Winchell, 1899, Vol. 4, pp. 205-206
C) Grout, 1937, pp. 59, 61
D) Ojakangas & Matsch, 1982, pp. 148-149
E) Johnson, 1926, pp. 9-11
F) Sims, 1972, Cent. Vol., p. 176
G) Peterson, 1952, pp. 27-28
H) DNR General Exploration File
I) Ojakangas, 1969, LSI abstract, p. 28
J) Coleman, 1894 in Peterman, 1959, Thesis, p. 2

Summary: Gold occurs in quartz veins along the major regional fault zone, the Rainy Lake Fault. Minerals noted in the ore of the Little American Mine (Ref. C) include pyrite, gold, quartz, ankerite, tourmaline, and a chloritic mineral. "Sulfides are quite commonly disseminated in these rocks and small gossans were noted at several localities. Rocks from the Little America Mine which produced some gold in the 1890's from the shear zone at the south edge of the 'greenstone belt' contain gold and silver, and rocks from a few other localities contain anomalous values of gold, silver, and copper." (Ref. I, p. 28)

Occurrences: "The Little American mine, on Little American Island, near the south shore of Rainy Lake, yielded about \$4,600.00 worth of gold in 1894 and 1895. The gold was extracted from a 4 to 6-foot composite quartz-vein zone in sheared chloritic and biotite schist. In addition to gold, the vein contains ankerite, pyrite, minor chalcopyrite, and tourmaline. Adjacent areas in the Rainy Lake district of Ontario have yielded more than a million dollars worth of gold (Grout,

- 1937, p. 59)." [NE-NW, Sec. 33] (Ref. F, p. 176).
- Testpits:
1. Little American [gold] Mine on small island in NW $\frac{1}{4}$ of Sec. 33 had a shaft or pit 10' x 40' x 44' (Ref. A). The shaft was described later as 60 meters deep (Ref. D). The vein was described as 10 ft. wide, 80°S dip, strike N80°E, and extending a mile or more along strike (Ref. A, pp. 78, 79).
 2. Big American [gold] Mine on the SW $\frac{1}{4}$ of Dryweed Island, SW $\frac{1}{4}$ of Sec. 27, on the homestead of George Davis. A pit five feet square and five feet deep has been dug into siliceous sericitic schist with 3 quartz lenses. (Ref. A, pp. 79, 80)
 3. Unnamed shaft occurs in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 25 on the eastern end of the island and reported to be 28 feet deep, with a short drift to the south. A three foot wide siliceous rock exposed at surface may have been the target here (Ref. A, p. 80).
 4. Old Soldier [gold] Mine is the name of the small island in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 23. [No shaft is specifically described.] The outcrop is of mostly mica schist with considerable disseminated pyrite and some small quartz veins (Ref. A p. 80).
The Lyle [gold] Mine occurs near the center of the SE $\frac{1}{4}$, Sec. 23 and was found by W & E Ward of Duluth. The shaft was 8 feet square and 22 feet deep. It was in fahlband, a siliceous rock with considerable pyrite, and masses of crystalline siderite (Ref. A, p. 86). Grout (Ref. C, p. 59) noted shaft claimed to be 100 feet deep in 1895. He added tourmaline, feldspar, and apatite to the minerals description.
 5. A drift was started along side a vein on the island nearest west of Little American Island [no name for island in NW $\frac{1}{4}$ of Sec. 33] (Ref. A, p. 80).
 6. In Sec. 26 on Bushy Head Islet, there is a quartz vein with later ankerite and muscovite crossing a mineralized and contorted schist, that were "prospected" according to Grout (Ref. C, p. 61). Minerals noted were sericite, chlorite, ankerite, tourmaline, specularite, and pyrite. The blunt point of land in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 26 is crossed by another vein, nearly 6 feet wide, which has been uncovered at several places. (Ref. A, p. 80)
 7. "A shallow shaft was sunk on a quartz vein on Big American Island," [Sec. 27], "and an adit was driven on the south side of Bushyhead Island just above water level. The adit penetrated a 4-foot shear zone, which contains quartz and massive pyrite, as well as several subsidiary subparallel zones" [Sec. 26]. "Also, a shallow pit was sunk on a quartz-pyrite vein in mixed chloritic and biotitic schist on the mainland southeast of Big American Island." [Sec. 34] (Ref. F, p. 176).

Metallurgy: Some dollar values for the Little American Mine by tonnage are published in Ref. A. A. S. Chase, a director of the Bevier Mining and Milling Co., claims the 5 stamp mill ran 52 days, crushing an estimated 500 tons of ore, producing from 8 to 27 ounces of bullion per day for a total of \$5,535.33 [or \$11.07/ton] (Ref. A).

Grout (Ref. C) reported that the ore yielded about \$17/ton, [which may be based on ore mined after the above statement by Mr. A. S. Chase].

Other Data: An historical account is presented in Ref. G (pp. 27-28) and Ref. D (pp. 148-149) and Ref. E (pp. 9-11) and Ref. J. DDH T-1, T-2 in Sec. 33 (Ref. H)

Location: Koochiching County

Township 71N-23W, Sections 26, 30

References: A) Cram, 1924, U of M thesis, p. 10
 B) Grout, 1937, Vol. 32, p. 61
 C) Winchell, 1895, p. 80
 D) DNR General Exploration File

Occurrences: "At the back of the small bay which extends into the northeast portion of Grassy Island, in S30, there is an old prospect hole. The deposit is mainly quartz, tourmaline, and pyrite in a shear zone in the old granite, and may have been tested for gold." (Ref. A, p. 10; Ref. B, p. 61, see Grassy Island)

"The large island in the NW $\frac{1}{4}$ of Sec. 26 known as Kingston Island, has a few small veins running across it. Some work has been done upon these, but at the time of our visit it had not progressed far." (Ref. C., p. 80)

Other Data: DDH T-1, T-2, Sec. 30 (Ref. D)

Location: Koochiching County

Township 151N-28W, Sections 21, 22

References: A) DNR General Exploration File #1
 B) Beckwith, 1984, pers. comm. with Richmond during Waterwell project (#WW-106, 276)
 C) DNR General Exploration File

Summary: Occurrence in Archean greenstone terrane

Occurrences: DDH G-2, SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 21, has: (Ref. A)
 - 15 ft. of trace gold in diabase & diorite and
 - 15 ft. of trace gold and copper in diabase and diorite.
 Some visible copper was present. These samples were submitted by Mr. D. W. George of Northome to DNR, who sent them to South Dakota School of Mines for assay. A summary log of hole is in the files.

Mrs. J. Harmon found a piece of native silver in her garden in Northome in about 1939. She submitted it to the MGS or some other state agency and was later told it was silver. (Ref. B) [location uncertain]

Other Data: DDH GP-132, Sec. 22 (Ref. C)

Location: Koochiching County

Township 152N-27W, Section 22

References: A) DNR Terminated Lease Files
 B) Meineke and Listerud, 1976, DNR Map 87

Summary: Occurrence in Archean greenstone terrane

Occurrences: DDH MIZ A-1 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 22, Lease Humble, CN 7874 has: (Ref. A & B)

- 19 ft. of 826-3600 ppm Cu in dacite porphyry; basalt-dacite-andesite volcanoclastics; gabbro, diabase
 Other Data: Iron Ores - Archean in Sec. 22, see also summary in Appendix.

Location: Koochiching County
 Township 156N-25W
 Other Data: Garnet and Staurolite, see also summary in Appendix.

Location: Koochiching County
 Township 157N-29W, Sections 32, 33
 References: A) DNR Open File Drill Samples List
 Other Data: DDH A-4-1 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 32 (Ref. A)
 DDH A-4-2 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 33 (Ref. A)
 Graphite in Sec. 32 and 33, see also summary in Appendix.

Location: Koochiching County
 Township 158N-27W, Sections 3, 4
 References: A) DNR Project File #1, see cross section
 B) Ojakangas, Meineke and Listerud, 1977, RI 17, Table A-1, p. 74
 C) DNR Terminated Lease File
 D) DNR Open File Drill Samples List
 Summary: Occurrence in Archean greenstone terrane
 Occurrences: DDH R-4-1, in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 4, Lease Exxon CN-7306, has:
 (Ref. A, B, C)
 - A trace of chalcopryrite with 180 ft. of 5% to 100% pyrite + pyrrhotite, and felsic to intermediate tuffs, and basalt.
 -35 - 308 ppm Zn
 Other Data: DDH R-4-2 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 3 (Ref. B and D)
 DDH KC-1 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 3 (Ref. B and D)
 DDH R-4-3 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 4 (Ref. B and D)
 DDH KC-3 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 4 (Ref. B and D)
 Graphite in Sec. 4, see also summary in Appendix.
 Iron Ores-Archean in Sec. 3 and 4, see also summary in Appendix

Location: Koochiching County
 Township 158N-28W, Sections 5, 7, 8, 12
 References: A) DNR Terminated Lease File
 B) DNR Open File Drill Samples List
 Summary: Occurrences in Archean greenstone terrane
 Occurrences: DDH A-9-1 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 5, Lease Amoco CN-7932, has:
 (Ref. A)
 - 39 ft. of 500 to 800 ppm Cu
 - 24 ft. of 0.07 to 0.10 Ag oz/t
 - with chalcopryrite in pyrrhotite-pyrite veins
 DDH A-8-1 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 7, Lease Amoco CN-7933, has:
 (Ref. A)
 - 15 ft. of 600-800 ppm Cu
 Other Data: DDH A-9-2 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 8 (Ref. B)

Location: Koochiching County
 Township 158N-29W, Sections 1, 18, 19, 35

References: A) DNR Open File Drill Samples List

Other Data: DDH A-10-1 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 1 (Ref. A)
 DDH A-6-2 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 18 (Ref. A)
 DDH A-6-1 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 19 (Ref. A)
 DDH A-1-1 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 35 (Ref. A)
 Iron Ores - Archean in Sec. 1 and 19, see also summary in Appendix.

Location: Koochiching County
 Township 159N-25W, Sections 4, 10, 16

References: A) Listerud, 1976, DNR Report 26, pp. 96-97
 B) Gladen, 1978, UMD Thesis, pp. 96-97
 C) Ojakangas, Meineke, Listerud, 1977, MGS RI 17, p. 54 & 76
 D) DNR General Exploration Files
 E) Grout, 1937, p. 65
 F) DNR Project File 40 & 34

Summary: Occurrence in Archean greenstone terrane

Occurrences: "Near Indus, in Sec. 4, T.159N., R.25W., Dr. J. W. Gruner sampled a gold prospect in mineralized diabase and greenstone. The pyritic material is introduced and disseminated in the greenstone but is not accompanied in the diabase by any considerable hydrothermal attack. It may be primary pyrrhotite segregated a little later than the crystallization of the early silicates." (Ref. E, p. 65)
 DDH IH-10 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 16, has: (Ref. D; Ref. C, p. 76)
 - 7 ft. of 1.0 to 1.4 ppm Ag
 - 4 ft. of .001 to .006 Au oz/t
 DDH IH-11 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 16, has: (Ref. D; Ref. C, p. 76)
 - 1 ft. of 1104 ppm Zn and 0.78 ppm Ag
 DDH IH-12 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 16, has: (Ref. D; Ref. C, p. 76)
 - 1 ft. of 510 ppm Ni and 0.77 ppm Ag
 DDH IH-13 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 10, has: (Ref. D; Ref. C, p. 76)
 - 35 ft. of 500 to 1225 ppm Cr
 - 7 ft. of .001 to .003 Au oz/t (See also Ref. F, #40)
 Outcrop samples contained: (Ref. B, pp. 96-97)
 - 1.0 oz/t Ag and 584 ppm Cu in felsic tuff, sa. #3, Sec. 16
 - 1.0 oz/t Ag in metasediments, sa. #24B, SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 16
 - .023 oz/t Au in metasediments, sa. #21, SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 16
 - 1.0 oz/t Ag and .006 oz/t Au in mafic flow, sa. #75, SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 8
 - .012 oz/t Au in intermediate tuff, sa. #59, SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 17
 - .012 oz/t Au in intermediate tuff, sa. #64, NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 17

Testpits: Three testpits and a shaft in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 16 (Ref. A, Page 11 and Map Figure 5) in outcrop of disseminated to massive sulfides. (See also Ref B, Plate 1; Ref. C, Plate 1)
 Indus testpit - Koochiching, 159-25W: (Ref. F, #34) and shaft (see map in 34-1)

Location: Koochiching County
Township 159N-26W, Sections 2, 7, 34

References: A) DNR General Exploration File #3
B) DNR Open File Drill Samples List

Summary: Occurrence in Archean greenstone terrane

Occurrences: DDH RR-80-2 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 7, General Exploration File #3,
has: (Ref. A)
- 2 ft. of 2 ppm Ag
- 1 $\frac{1}{2}$ ft. of 836 ppm Cu

Other Data: DDH M-1 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 2 (Ref. B)
Iron Ores - Archean in Sec. 7, see also summary in Appendix.

Location: Koochiching County
Township 159N-27W, Sections 15, 16, 20, 21, 25, 29, 30,
34, 35

References: A) Ojakangas, Meineke, Listerud, 1977, MGS, RI 17, pp. 74-78
B) DNR General Exploration File
C) Listerud, 1974, thesis
D) Listerud, 1976, DNR Report 26
E) DNR Open File Drill Samples List
F) DNR Terminated Lease File

Summary: Occurrence in Archean greenstone terrane. "The sulfides in the Birchdale anomaly area occur in both massive and disseminated forms. Small amounts of disseminated sulfide are found in almost all rock units." (Ref. C.) Sulfides include chalcopyrite, sphalerite, pentlandite, cubanite, marcasite, pyrite, pyrrhotite, mackinawite. (Ref. A)

Occurrences: DDH S-43-1 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 16, has: (Ref. F; A, p. 75)
- traces of chalcopyrite
DDH S-43-2 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 16, has: (Ref. F; A, p. 75)
- 2 $\frac{1}{2}$ ft. of 5% Po-Py with 4.06% Zn and 0.25 Ag oz/t

DDH R-2-1 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 15, Lease Humble CN-7319, has:
(Ref. F; and Ref. A, p. 75)
- 37 ft. of 540 to 2100 ppm Zn and 2 ft. of 3 ppm Ag and
1900 ppm Cu

DDH R-2-1A in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 16, Lease Humble CN-7320, has:
(Ref. F; and Ref. A, p. 75)
- 42 $\frac{1}{2}$ ft. of 525 to 2000 ppm Zn and
5 ft. of 2 ppm Ag and 630 ppm Cu

DDH R-2-2 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 21, Lease Humble CN-7322, has:
(Ref. F; Ref. A, p. 75)
- 3 ft. of 1100 ppm Zn
- 17 ft. of 500-4300 ppm Cu
- 10.7 ft. of 1700 to 3100 ppm Ni

DDH R.R.6-1 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 20, Lease Texas Gulf Sulfur,
CN-7268, has: (Ref F; Ref. A, p. 75)
- 7 ft. with minor chalcopyrite

DDH R.R.6-2 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 20, Lease Texas Gulf
Sulfur, CN-7268, has: (Ref. F; Ref. A, p. 75)
- 54 ft. with trace chalcopyrite in andesite and dacite

DDH NCB-2 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 16, has: (Ref. B; Ref. A, p. 75)
- 14 ft. of 606-778 ppm Zn

- 15 ft. of 20% py with traces of chalcopyrite
- 9 ft. of .04 Ag oz/t
- DDH R-3-1 in NW₁-NW₁, Sec. 29, Lease Humble CN-7635, has:
(Ref. A, p. 75; Ref. F)
- trace of chalcopyrite in volcaniclastics
- DDH R-3-3 in NW₁-NW₁, Sec. 30, Lease Humble CN-7329, has:
(Ref. F; Ref. A, p. 75)
- trace of chalcopyrite in felsic volcaniclastics with
semi-massive pyrrhotite and pyrite

Other Data: DDH R-1-1 in SE₁-NW₁, Sec. 25 (Ref. E)
 DDH R-3-4 in NW₁-NW₁, Sec. 30 (Ref. E)
 DDH KC-4 in SE₁-SE₁, Sec. 34 (Ref. E)
 DDH KC-2 in SW₁-NW₁, Sec. 35 (Ref. E)
 DDH S-43-3, NCB-1 in SE₁-SE₁, Sec. 16 (Ref. E)
 DDH R-3-2 in SW₁-SW₁, Sec. 21 (Ref. E)
 DDH R-2-3 in NW₁-NE₁, Sec. 21 (Ref. E)
 Graphite in Sec. 15 and 21, see also summary in Appendix.
 Clay minerals in Sec. 16, see also summary in Appendix.
 Iron Ores - Archean in Sec. 34 and 35, see also summary in Appendix.

Location: Koochiching County
 Township 159N-28W, Sections 7, 10, 14, 17, 26

References: A) DNR Project File #62, Clementson SE Prospect
 B) Ojakangas, Meineke, Listerud, 1977, MGS, RI 17, p. 56
 C) DNR Terminated Lease File
 D) DNR Open File Drill Samples List

Occurrences: The sulfides in the Clementson SE prospect occur in an outcrop area in Sec. 17 about 15' wide along a low cliff in a diabase-gabbro dike. The major sulfides are pyrite and pyrrhotite with chalcopyrite, pentlandite and cubanite. Sulfides comprise 2-4% of the rock. (Ref. A)
 Outcrop Sample K-1262 has 1820 ppm Cu, 500 ppm Ni, and 1900 ppm Mn in a mafic dike in SW₁-SE₁, Sec. 17. (Ref. A)
 Outcrop Sample K-1609 has 4.4 ppm Ag, 710 ppm Cu, .004 oz/t Au in a mafic dike in SW₁-SE₁, Sec. 17. (Ref. A)
 Outcrop Sample K-1610 has 640 ppm Cu, 1645 ppm Mn in a mafic dike in SW₁-SE₁, Sec. 17. (Ref. A)
 DDH R-5-2 in NE₁-SW₁, Sec. 26, Lease Humble CN-7360, has: (Ref. C)
 - 9.4 ft. of 1100 ppm Zn
 DDH R-5-1 in NE₁-SW₁, Sec. 26, Lease Humble CN-7360, has: (Ref. C)
 - 29 ft. of 560 to 2300 ppm Zn
 - 3 ft. of 795 ppm Cu
 in felsic to intermediate volcaniclastics, and basalt flows with up to 20% pyrite + pyrrhotite (Table A-1, Ref. B)
 DDH R.R.12-1 in SW₁-NE₁, Sec. 10, Lease Texasgulf Sulfur, CN-7272, has: (Ref. C)
 - 2 ft. of 1.1 ppm Ag
 - 12 ft. of 30-123 ppm As
 There is a gossan in NE₁-SW₁, Sec. 7 (Ref. B, p. 56)
 In Sec. 14, "minor malachite and sulfide minerals were noted in a thin unit of intermediate tuff beds in an outcrop of pillowed volcanic rocks." (Ref. B, p. 56)

Other Data: DDH R.R.12-2 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 10 (Ref. D)
 Graphite in Sec. 10 and 26, see also summary in Appendix.
 Iron Ores - Archean in Sec. 26, see also summary in Appendix.

Location: Koochiching County
 Township 160N-26W, Sections 33, 34, 35, 36

References: A) Meineke, Listerud, Vadis, 1977, DNR Project 41 Maps
 B) Ojakangas, Meineke, Listerud, 1977, MGS RI 17, Plate 1

Summary: Occurrence in Archean greenstone terrane

Occurrences: Outcrop samples from Sec. 36, from sulfide-rich felsic metatuffs, mafic metatuffs, and massive sulfides have pod-like concentrations of sphalerite, along with magnetite and pyrrhotite. Grab samples from Sec. 36 outcrops contain up to: (Ref. A)
 2.50% Zn, .028% Cu, .085% Ni
 0.01 Au oz/t and 0.178 Ag oz/t

Additional outcrop samples contain: (Ref. A)
 Sample K-1600, from SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 35, 4.0 ppm Ag, .002 Au oz/t, 1940 ppm Mn, and 300 ppm Zn in a meta-graywacke or intermediate flow
 Sample K-1601, from SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 35, 6.1 ppm Ag, (Ref. A)
 .003 Au oz/t, 1750 ppm Mn in a Gossan

Testpits: A prospect pit is reported in the center of Sec. 36 (Ref. B, Plate 1)

Location: Koochiching County
 Township 160N-29W, Section 18

Other Data: DDH T-1, T-2 in Sec. 18 (See Appendix)

Location: Lac Qui Parle County
 Township 120N-45W, Section 3

References: A) Lund, 1956, pp. 1475-1490

Occurrences: A garnetiferous quartz diorite gneiss in NW $\frac{1}{4}$ of Sec. 3 (sample #20, in Ref. A), has:
 - 14 vol. % garnet
 - 5 vol. % magnetite

Other Data: Garnet, see also summary in Appendix.

Location: Lac Qui Parle County
 Township 120N-46W, Sections 20, 21

Other Data: DDH 2041 in Sec. 20 (See Appendix)
 DDH 2040 in Sec. 21 (See Appendix)

Location: Lake County
 Township 52N-11W, Sections 2, 12

References: A) Schwartz and Sandburg, 1938 Field Notebook #257, MGS, pp. 2 and 3
 B) Ojakangas and Matsch, 1982, Minnesota's Geology, p. 140
 C) DNR General Exploration File

Occurrences: Native Copper occurs in an outcrop of amygdaloidal basalt with calcite, laumontite, and prehnite. Country rocks are tholeiitic basalt lavas, dominantly olivine tholeiite [SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 2], (Ref. A, p. 3).

Copper occurs in basaltic flow with prehnite and laumontite. Country rocks are tholeiitic basalt lavas, dominantly olivine tholeiite [NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 12], (Ref. A, p. 2).

"The only copper "mine" is located near the Little Knife River; 20 holes were drilled and a 33-m-deep shaft with 60m of drifting (tunnels) was put down by the Mining Corporation of Canada in 1929 and 1930. Three buried flow tops contained copper, but not in great enough quantities to be commercial" [location uncertain], (Ref. B, p. 140).

Testpits: Location uncertain, see above.

Other Data: DDH T-15, T-16, T-17, T-18, T-19 in Sec. 2 (Ref. C)

Zeolites, see also summary in Appendix.

Native Copper in Sec. 2 and 12, see also summary in Appendix.

Location: Lake County

Township 53N-10W, Sections 1, 12, 31

References: A) DNR General Exploration File

Other Data: DDH T-1, T-6A, T-6 Sec. 1 (Ref. A)

DDH T-1A, T-2, T-3 in Sec. 12 (See Appendix)

Clay minerals, see also summary in Appendix.

Zeolites in Sec. 31, see also summary in Appendix.

Location: Lake County

Township 54N-9W, Sections 22, 27

References: A) Winchell, 1881, p. 28, in: Grogan, 1940, p. 106

Occurrences: "Small grains or films of copper in heavy trap have been reported from the high bluff at the mouth of Gooseberry River." [Sec. 22], (Ref. A, p. 106).

Other Data: Clay minerals, see also summary in Appendix.

Zeolites in Sec. 27, see also summary in Appendix.

Location: Lake County

Township 55N-8W, Sections 2, 9, 11, 12, 14, 15, 22

References: A) Grout and Schwartz, 1939, MGS Bulletin 28, p. 74

B) Green, 1979, MGS Guidebook, Series 11, p. 10

C) Gehman, 1957, Thesis, p. 48, 50, 55, 77

D) Winchell, 1900, Vol. 5, p. 188

E) Schwartz, 1929, MGS Field Note Book #191, pp. 35, 37

F) Calton, 1936, U of M Thesis, p. 6

G) Muir, 1954, p. 377

Occurrences: "Winchell notes that a soft, reddish amygdaloidal bed northwest of Beaver Bay in SE $\frac{1}{4}$, Sec. 2, T55N-R8W, was explored for copper by test holes and trenches." [SE $\frac{1}{4}$, Sec. 2], (Ref. A, p. 74 and Ref. D, p. 188).

In the Black Bay gabbro, apatite occurs in large crystals (up to 5mm x 2mm) in the coarse-grained specimens. Minor amounts of chalcopyrite and pyrite are present. (Ref. C, p. 77) [Sec. 11, 15, 22]

"All of the Beaver Bay ferrogabbro is characterized by tabular plagioclase and elongate clinopyroxene and olivine crystals. These minerals form the bulk of the primary precipitate material, together with minor apatite and magnetite...Apatite is an abundant primary precipitate mineral in euhedral prisms in the interstices and enclosed in primary precipitate minerals...Opagues consist of magnetite with ilmenite laths parallel to the octahedral planes, ilmenite in irregular and skeletal intergrowth with silicates, pyrite and chalcopyrite." [Sec. 11, 14, 15, 22] (Ref. C, pp. 48, 50, 55)

In SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 22, in Black Bay of Lake Superior there is an occurrence of titaniferous magnetite in beach sands. A modal analysis reported a total of 62% magnetite plus ilmenite in the sand. (Ref E, sketch map and Ref. F, p. 6)

The following were noted in Table 1: (Ref. G, p. 377)

- 1.70 wt. % P_2O_5 and 4.65% TiO_2 , #2, "Iron-rich diabase on Hiway 61, five-eighths mile SW of settlement Beaver Bay" [probably Sec. 14]
- 1.74 wt % P_2O_5 and 3.44% TiO_2 , #3, "Iron-rich diabase on Hiway 61, about 1 $\frac{1}{2}$ miles SW of the Beaver Bay settlement" [probably SW $\frac{1}{4}$, Sec. 14]

Testpits: There are testpits or shafts at the following four locations. No information is available on the minerals sought. (Ref. A, see maps)

- NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 12, testpit in "weathered basalt"
- NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 12, testpit
- NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 11, testpit in "weathered diabase"
- NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 9, shaft

"A shaft about 400 feet south of E $\frac{1}{4}$ corner, Sec. 9 T.55N., R.8W. was sunk in an ophitic basalt with some amygdaloidal material. The reason for this shaft is not evident from the dump, which shows no special mineralization." (Ref. A, p. 74)

Test holes and trenches (Ref. A, p. 74) [SE $\frac{1}{4}$, Sec. 2]

Location: Lake County
Township 56N-7W, Sections 15, 21

References: A) Gladen, 1984, personal communication and DNR Project 132-3 file

Occurrences: A float boulder of metagraywacke was found in NE $\frac{1}{4}$, Sec. 21 that contained galena and sphalerite. DNR assays indicate: (Ref. A)

- 2880 ppm Pb
- 7980 ppm Zn
- 70 ppm Cu

Other Data: DDH T-7 in Sec. 15 (See Appendix)
DDH T-1, T-2 in Sec. 15 (See Appendix)

Location: Lake County
Township 57N-7W, Sections 17, 36

References: A) DNR Project File #102
B) Green, 1972, pp. 294-332 in MGS Centennial Vol.
C) Rennebaum, 1978, p. 101

Occurrences: "On a small hill just north of Finland (Sec. 17, T.57N., R.7W.), sulfide minerals occur as disseminations in a red, medium- to coarse-grained syenodiorite. Trace element analyses of a mineralized sample by the U.S. Geological Survey show 89 ppm copper, 120 ppm zinc, 5 ppm nickel, and 0.6 ppm silver." [Sec. 17] (Ref. B, p. 331).
"malachite-stained tracybasalt flow top; sample 150 (970 ppm copper)," [Sec. 36] (Ref. C, p. 101).
Disseminated copper sulfides occur in a syenodiorite north of Finland. Exact location unknown. (Ref. A)

Location: Lake County
Township 57N-11W, Section 10

References: A) DNR Open File Drill Samples List

Other Data: DDH S-1 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 10 (Ref. A)
Titaniferous Magnetite in Sec. 10, see also summary in Appendix.

Location: Lake County
Township 58N-7W, Sections 33, 34

References: A) Stevenson, 1974, UMD Thesis, pp. 7-9, 78-86, 86-90

Summary: "A mafic layered intrusion of Keweenawan age near Finland, MN" (Ref. A)

Occurrences: At station 34-11, in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 34, is a hornfelsed intermediate volcanic with 7.7% (modal analysis) sulfides (marcasite). (Ref. A, p. 7-9)
There is an apatite-rich ferrodiorite in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 34, with modal analysis of 8.8% opaques, which are magnetite, ilmenite, pyrrhotite, and chalcopyrite, and 6.15% apatite. The same rock type occurs in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 33 and has modal analysis of 8.8% opaques and 5.0% apatite. See pages 78-86. (Ref. A, pp. 78-86)
A syenodiorite occurs in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 34 and has modal analysis of 8.2% opaques and 4.2% apatite. (Ref. A, pp. 86-90)

Location: Lake County
Township 59N-10W, Section 30

References: A) Weiblen, 1965, Ph.D. Dissertation, pp. 90, 96

Occurrences: "Bornite-chalcopyrite-pyrrhotite intergrowths are found in pyroxene and as interstitial phases in the gabbro in the Greenwood Lake Quadrangle (Plate 14b)." [Location from Plate 14 is SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 30] (Ref. A, pp. 90 & 96)

Location: Lake County
Township 59N-11W, Section 12

References: A) DNR Open File Drill Samples List

Other Data: DDH FL-1 in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 12 (Ref. A)
 DDH FL-2 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 12 (Ref. A)

Location: Lake County
 Township 60N-6W, Sections 20, 29

Other Data: Titaniferous Magnetite in Sec. 20 and 29, see also summary in Appendix.

Location: Lake County
 Township 60N-10W, Sections 3, 5

References: A) Weiblen, 1965, Ph.D. Dissertation. pp. 11, 114, 115

Occurrences: "No detailed analyses of the iron oxides were made. However, in reconnaissance analyses, much of the magnetite was found to contain appreciable chromium. Table 11 lists the samples examined and the ones which contain chromiferous magnetite. Oscilloscope displays of the K alpha 1,2 radiation of Fe, Ti, Al, and Cr show that the chromium occurs in Ti-poor and Al-rich lamellae in the magnetite-ilmenite intergrowths (Pl. 16). Estimates from pure element standards indicate that the chrome rich lamellae contain about 20 mole percent chromite. From Table 11 it appears that this phase is restricted to the outer zone and transition zone of the intrusion and is related to the amount of olivine" (Ref. A, p. 114).

Location: Lake County
 Township 61N-10W, Sections 22, 26, 28

References: A) Weiblen, 1965, Ph.D. Dissertation, pp. 11, 90, 96, 114, 115

Occurrences: "No detailed analyses of the iron oxides were made. However, in reconnaissance analyses, much of the magnetite was found to contain appreciable chromium. Table 11 lists the samples examined and the ones which contain chromiferous magnetite. Oscilloscope displays of the K alpha 1, 2 radiation of Fe, Ti, Al, and Cr show that the chromium occurs in Ti-poor and Al-rich lamellae in the magnetite-ilmenite intergrowths (Pl. 16). Estimates from pure element standards indicate the the chrome rich lamellae contain about 20 mole percent chromite. From Table 11 it appears that this phase is restricted to the outer zone and transition zone of the intrusion and is related to the amount of olivine" (Ref. A, p. 114). [Sec. 22, 28]

"Bornite-chalcopyrite-pyrrhotite intergrowths are found in pyroxene and as interstitial phases in the gabbro in the Greenwood Lake Quadrangle (Pl. 14b)." [SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 26] (Ref. A)

Location: Lake County
 Township 61N-11W, Sections 1, 2, 3, 4, 5, 8, 10, 11, 17, 20, 28, 31

References: A) Phinney, 1972, MGS Centennial Volume, p. 338
 B) DNR Open File Drill Samples List

C) Grout, 1950, Appendix F, p. 116

Occurrences: "Within the more mafic troctolite and picrite in the contact zone there are random lenses as much as several hundred feet long that contain abundant magnetite. The lenses range in thickness from a few inches to several tens of feet and are roughly parallel to the basal contact. The magnetite occurs with olivine, plagioclase, and some pyroxene and typically exists in modal concentrations of 30 to 50 percent; locally magnetite constitutes nearly 90 percent of the rock over a vertical interval of several feet. Magnetic concentrates from these lenses and from inclusions of Biwabik Iron-formation were analyzed for titanium, vanadium, and chromium as compared to magnetite from inclusions of Biwabik Iron-formation. As would be expected, the igneous magnetite shows extensive exsolution of ulvospinel and pleonaste. From one 16-foot-thick magnetite-rich lens analyses at two foot intervals show a gradual increase from 3.0 percent titanium at the base to 7 percent at the top. The numerous inclusion-rich lenses, alternating troctolitic and picritic layers, and large plate-like inclusions of iron-formation -- all parallel to the basal contact -- indicate a significant amount of flowage in a melt laden with crystals and inclusions, probably during several pulses of melt. In a single melt, which was neither flowing nor filled with crystals and inclusions, the magnetite grains would settle quickly and form a basal layer rather than many lenses at various stratigraphic positions in the basal rocks."

Mean V, Cr, and Mn content of magnetite of igneous and iron-formation derivation:

- <u>Vanadium</u> :	Igneous magnetite -----	0.24%
- <u>Chromium</u> :	Igneous magnetite -----	0.53%
	Iron-formation magnetite ---	0.14%
- <u>Manganese</u> :	Igneous magnetite -----	0.20%
	Iron-formation magnetite ---	0.17%

[Sec. 1] (Ref. A, p. 338) (Note: This occurrence description may apply to other townships and sections adjacent to this one, see Ref. A)

Titaniferous magnetite described in: (Ref. C, p. 116)

- "Sec. 28. 500 paces W. of SE. corner. A gabbro outcrop is 'coated' by a thin dike or vein of ore, 5 x 20 paces, 1 inch thick. (D) or (E)"

Other Data: DDH #8 in Sec. 3 (Ref. B)
 DDH #1, #5, #6, #18, #19, #20 in Sec. 4 (Ref. B)
 DDH #2 in SW₄-SE₄, Sec. 5 (Ref. B)
 DDH 34871 in NE₄-NE₄, Sec. 5 (Ref. B)
 DDH #13 in SE₄-NE₄, Sec. 8 (Ref. B)
 DDH #17 in SE₄-NE₄, Sec. 17 (Ref. B)
 DDH #14 in SW₄-NW₄, Sec. 20 (Ref. B)
 DDH #12 in SW₄-NW₄, Sec. 31 (Ref. B)
 DDH #16 in NE₄-NW₄, Sec. 31 (Ref. B)
 DDH NM-3 in Sec. 2 (See Appendix)
 DDH BH-32718, BH-32730, BH-32727, BH-32727A in Sec. 5 (See Appendix)
 DDH NM-6, ELY-4, PD ELY-4 in Sec. 10 (See Appendix)
 DDH NM-5 in Sec. 11 (See Appendix)
 Clay minerals in Sec. 4 and 17, see also summary in Appendix.

Titaniferous Magnetite in Sec. 1 and 5, see also summary in Appendix.

Location: Lake County
Township 62N-6W, Sections 21, 22

References: A) Davidson, 1969, MGS Misc. Map Series M-7
with 10 page discussion
B) Davidson, 1972, p. 360 in MGS Centennial Volume

Occurrences: "The only potential for ore deposits occur in a gossan in Sec. 22 in medium grained gabbroic anorthosite with visible chalcopyrite and pyrrhotite." (Ref. A, p. 8; Ref. B, p. 360)
On map (Kawishiwi Lake Quadrangle and Perent Lake Quadrangle): Mineralized veinlets located in W $\frac{1}{2}$ -SW $\frac{1}{4}$, Sec. 22 and SE $\frac{1}{4}$, Sec. 21. (Ref. A, map)

Location: Lake County
Township 62N-7W, Section 9

References: A) Davidson, 1977, MGS Map M-33

Occurrences: In NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 9 has "a mgr to cgr gabbro, g, . . . that contains layered subunits characterized by relatively high concentrations (80%) of magnetite." (Ref. A, map)

Other Data: Titaniferous Magnetite in Sec. 9, see also summary in Appendix.

Location: Lake County
Township 62N-10W, Sections 19, 24, 30

References: A) Phinney, 1969, MGS-RI-9, p. 15
B) DNR General Exploration File
C) Green, Phinney, Weiblen, 1966, MGS Misc. Map M-2

Occurrences: "The major mass of troctolite in the South Kawishiwi Intrusion consists of three units: the contact zone, augite troctolite, and poikilitic augite troctolite. The contact zone is characterized by very irregular inclusions. Some of the inclusions are fine-grained gabbro and may represent fragments of a chilled margin, whereas others are definitely fragments of the Virginia Formation. Also, many inclusions of anorthositic rock types occur in the contact zone, and patches of gabbroic pegmatite are present sporadically. Plagioclase is the predominant mineral; the mafic minerals are mostly olivine and pyroxenes with a few percent of iron-titanium oxides. All of these appear to be in part primary, whereas in the other troctolite units of the South Kawishiwi Intrusion pyroxenes and oxides appear to be entirely interstitial. The olivine in the contact zone appears to contain slightly more iron (Fa⁵⁰) than that in the other troctolite units of this intrusion (Fa⁴⁰). Gossans are common throughout the contact zone, and contain primarily the sulfides chalcopyrite, pyrrhotite, and pentlandite as well as some cubanite. Mapping of surface outcrops failed to disclose any significant structural trends in the contact zone, for plagioclase is poorly oriented and layering is rare and irregular." (Ref. A, p. 15) [location uncertain]

SVC, Contact zone. Irregularly coarse-to-fine-grained poikilitic augite - and hypersthene-bearing troctolite, contains inclusions of hornfels and sulfide-bearing zones. [Sec. 19] (Ref. C, MGS misc Map M-2)

Other Data: DDH 11518 in Sec. 19 (Ref. B)
 DDH 11516 in Sec. 24 (Ref. B)
 DDH MV2-1W in Sec. 30 (Ref. B)
 DDH NM-1, NM-2 in Sec. 30 (See Appendix)
 Titaniferous Magnetite in Sec. 3, see also summary in Appendix.

Location: Lake County
 Township 62N-11W, Sections 24, 25, 26, 27, 33, 34, 36

References: A) Green, 1970, MGS S.P. 13
 B) DNR Open File Drill Samples List
 C) DNR General Exploration File
 D) Phinney, 1969, MGS-RI 9, p. 15
 E) Grout, 1950, Appendix F, p. 116
 F) Green, Phinney and Weiblen, 1966, MGS Misc. Map M-2

Occurrences: A trace of copper sulfides occurs in granitic rocks in NE $\frac{1}{4}$ of Sec. 24 near Filson Creek (Ref. A)

"The major mass of troctolite in the South Kawishiwi Intrusion consists of three units: the contact zone, augite troctolite, and poikilitic augite troctolite. The contact zone is characterized by very irregular textures and mineral assemblages, and contains numerous fine-grained inclusions. Some of the inclusions are fine-grained gabbro and may represent fragments of a chilled margin, whereas others are definitely fragments of the Virginia Formation. Also, many inclusions of anorthositic rock types occur in the contact zone, and patches of gabbroic pegmatite are present sporadically. Plagioclase is the predominant mineral; the mafic minerals are mostly olivine and pyroxenes with a few percent of iron-titanium oxides. All of these appear to be in part primary, whereas in the other troctolite units of the South Kawishiwi Intrusion pyroxenes and oxides appear to be entirely interstitial. The olivine in the contact zone appears to contain slightly more iron (Fa₅₀) than that in the other troctolite units of this intrusion (Fa₄₀). Gossans are common throughout the contact zone, and contain primarily the sulfides chalcopyrite, pyrrhotite, and pentlandite as well as some cubanite. Mapping of surface outcrops failed to disclose any significant structural trends in the contact zone, for plagioclase is poorly oriented and layering is rare and irregular." (Ref. D, p. 15)

SCV contact zone. Irregularly coarse-to-fine-grained poikilitic augite - and hypersthene-bearing troctolite; contains inclusions of hornfels and sulfide-bearing zones. [Sec. 24-27, 33] (Ref. F, map symbol SCV)

Titaniferous magnetite described in: (Ref. E, p. 116)

- "Sec. 26. Near center. Gabbro is dark and may carry magnetite; 200 paces N. of center, high magnetics, but few outcrops. (D)"

Other Data: DDH 34870, 34870-A in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 25 (Ref. B)
 DDH 34872, NE $\frac{1}{4}$ -NE $\frac{1}{4}$ in Sec. 25 (Ref. B)

DDH #3, #4 in Sec. 34 (Ref. B)
 DDH #7 in Sec. 36 (Ref. B)
 DDH 11519, AD-1, AD-2, AD-3, AD-4, AD-5, AD-6 in Sec. 26
 (Ref. C)
 DDH 11516 in Sec. 24 (See Appendix)
 DDH BH-32740 in Sec. 25 (See Appendix)
 DDH 1, 2, 3 in Sec. 26 (See Appendix)
 Clay minerals in Sec. 36, see also summary in Appendix.

Location: Lake County
 Township 63N-7W, Section 6
 References: A) Grout, 1950, Appendix F, p. 116
 Occurrences: Titaniferous magnetite described in: (Ref. A, p. 116)
 - "Sec. 6. NE. $\frac{1}{4}$. Gabbro or feldspathic lean ore, on
 portage SW. of Thomas Lake for 100 paces; belts 25 paces
 wide. (C)"

Location: Lake County
 Township 63N-8W, Sections 2, 7
 References: A) Grout, 1950, Appendix F, pp. 115, 116
 Occurrences: Titaniferous magnetite described in: (Ref. A, pp. 115-116)
 - "Sec. 2. NW. $\frac{1}{4}$ SW. $\frac{1}{4}$. Lean gabbro? ore, has some large
 ilmenite grains. (D)"
 "100 paces N. and 1900 paces W. of SE. corner, and
 elsewhere in SW. $\frac{1}{4}$ SW. $\frac{1}{4}$. Short belt, lean magnetite
 gabbro, local high magnetics. (D)"
 - "Sec. 7. SW. $\frac{1}{4}$ SE. $\frac{1}{4}$. Olivine magnetite rock. Origin
 uncertain, very lean ore. (D)"
 "Est. 1800 paces N. and 900 paces W. of SE. corner (200
 paces S. of Round Lake at MC.). Gabbro segregation 50 x 20
 paces. (D)"
 Other Data: Titaniferous Magnetite in Sec. 2, see also summary in
 Appendix.

Location: Lake County
 Township 63N-9W, Sections 6, 12, 14, 15, 17, 20, 29, 30
 References: A) DNR General Exploration File #3, Hanna 2, 3
 B) DNR Open File Drill Samples List
 C) Grout, 1937, p. 62
 D) Grout, 1950, Appendix F, p. 115
 E) Winchell, 1900, Vol. 5, pp. 867-868
 Occurrences: Geologic outcrop map shows occurrences of pyrite,
chalcopyrite, and malachite in Archean greenstone (Ref. A,
 File #3)
 Near Fernberg Lookout, east of Ely, a quartz vein is rusty
 as if mineralized, but has no other minerals to suggest its
 origin or value. (Ref. C, p. 62, probably in NE $\frac{1}{4}$, Sec. 17)
Titaniferous magnetite described in: (Ref. D, p. 115)
 - "Sec. 14. East $\frac{1}{4}$ corner. Test pits. Lean ore, belt runs
 NW. Outcrops 20 x 150 paces. Magnetics more. Also a
 small ore area 100 paces S. of $\frac{1}{4}$ corner. Gabbro all around
 it. (D)"
 "North $\frac{1}{4}$ corner. Ore outcrops near. Belt runs NE. (D)"

- "Sec. 14-15. At $\frac{1}{4}$ corner. Magnetics and ore belt 15 paces wide and 600 paces long to the SW. in gabbro; may be Gunflint? (C) or (D)"
- "Sec. 20. Magnetite gabbro, too lean to be ore, except perhaps on Portage, Lake 1 to Kawishiwi River, area 6 x 8 paces. (D)"
- "Sec. 29. 1900 paces N. and 1400 paces W. of SE. corner. Lean ore 5 x 50 paces on Lake 1. (D) Still leaner ore runs N. 60° E. in a belt 100 to 150 paces wide beside a hornfels belt."
- "Sec. 30. 250 paces south of center. Test pit and 4-foot trench in outcrop of 25 x 25 foot segregation. Lean magnetite gabbro, not ore, but with fair magnetics; extends 300+ paces around. (C)"

An altered quartz porphyry is reported 670 paces west of the NE corner of Sec. 8, and 4 rods west of the diabase dike. It reportedly contains quartz, orthoclase, plagioclase, calcite, muscovite, secondary feldspar, epidote, and tourmaline. (Ref. E, p. 867, No. 2237)

Other Data:

DDH S-3 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 12 (Ref. B)
 DDH S-4 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 14 (Ref. B)
 DDH S-2 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 15 (Ref. B)
 DDH S-1 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 14 (Ref. B)
 Titaniferous Magnetite in Sec. 12 and 15, see also summary in Appendix.

Location:

Lake County
 Township 63N-10W, Sections 1, 8, 25, 31, 36

References:

- A) DNR General Exploration File (Note: from U.S. Steel collection obtained January, 1984; "Madden" spelling unknown, but Madden Lake is in the adjacent section.)
- B) Winchell, 1889, 17th Annual Report, p. 81 in Ruotsala & Tufford, 1965, p. 78
- C) Green, 1970, MGS SP-13, p. 34, 60, 85
- D) Grout, 1950, Appendix F, p. 115

Occurrences:

Madden's Mine: Core samples are only a few inches long. They are fine-grained greenstone that do not appear to be mineralized. A request for further information has been submitted. (Ref. A)

#2 Iron ore in Sec. 36, has: (Ref. B, p. 78)

- FeO = 14.42

- TiO₂ = 16.03

"Carbonaceous material. An interesting though problematical occurrence of carbonaceous rock was discovered in fresh cuts along the north side of the Fernberg road just west of Madden Creek, as the road was undergoing improvement in July, 1963. The bedrock in this area is intensely sheared, at the confluence of at least two major faults, and most of the material within the sheared zone appears to belong to the Knife Lake metasediments and felsic volcanics, although Ely Greenstone crops out a short distance to the north and south. Within this phyllitic, rusty-weathering, siderite-impregnated zone is a 3- to 4-foot section, now (1969) largely slumped and covered, of graphitic layers alternating with rusty, clayey material, all sheared, broken,

and deformed. Some parts of the carbonaceous material are soft and dull, whereas other parts, particularly on slickensides, are shiny and coal-like in appearance." (Ref. C, p. 34) [location probably is Sec. 8; see also sulfides, p. 85].

"One pegmatite west of Clear Lake contains tourmaline and magnetite." This is within the Clear Lake facies of the Giants Range Batholith (Ref. C, p. 60). [Location is probably within Sec. 31.]

"Small veinlets and disseminations of sulfides are found locally in all the major rock units of the quadrangle except the Giants Range batholith. They are most abundant in the Ely Greenstone, particularly in the relatively more crushed and sheared zone along the Fernberg road, from the west side of the quadrangle to Moose Lake." (Ref. C, p. 85) [Location uncertain]

Titaniferous magnetite described in: (Ref. D, p. 115)

- "Sec. 25. Scattered ore outcrops. (Offset corners on Range line confuse location.) (D)"
 - "250 paces N. and 140 paces W. of SE. corner. Lean ore, magnetics and a few outcrops in an area 30 x 50 paces. (C)"
- "Sec. 36. 1800 paces N. and 900 paces W. of SE. corner. Scattered magnetite in gabbro. (D)"
 - "1000 paces N. and 600 paces W. of SE. corner. On south shore of lake. Ore segregated in gabbro. Magnetics high for 80 paces. Magnetite gabbro in a larger area around, but too lean to be ore. (D)"
 - "950 paces N. and 650 paces W. of SE. corner on an island, ore for 10 x 30 paces. (D)"
 - "750 paces N. and 800 paces along shore, magnetite troctolite. Small exposures run farther NE. (C)"

Other Data: Iron Ores - Archean in Sec. 1, see also summary in Appendix.

Location: Lake County

Township 63N-11W, Sections 11, 13, 14, 15, 20, 30

References: A) Green, 1970, MGS SP-13, pp. 61-63, 86

B) Peterson, 1952, p. 18

Occurrences: Archean Ely Greenstone near Pea Soup Lake in Sec. 13 has 5% sulfides in small granitic intrusives with sericite and carbonate (and K-spar?) alteration. Fluorite noted (pp. 61-63, and 86, Ref. A).

Archean Knife Lake Group near Fall Lake in Sec. 11 & 15 has fault bounded, sheared granites impregnated with carbonates and containing sericite (p. 63, Ref. A).

"Winchell ran into a Captain Gibbons who was test pitting in Township 63-11, who claimed to have found a nugget. It proved to be worth four dollars." (Ref. B, p. 18, who cites Winchell, 18th Annual Report, pp. 21-22; location uncertain).

Other Data: Iron Ores - Archean in Sec. 14 and 20, see also summary in Appendix.

DDH 5406, 5407 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 30 (See Appendix)

DDH 5408, 5615 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 30 (See Appendix)

DDH 5401, 5402, 5403, 5405 in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 30 (See Appendix)

DDH 5404, 5409, 5410, 5411 in NW $\frac{1}{4}$, Sec. 30 (See Appendix)

Location: Lake County
Township 64N-6W, Sections 6, 14, 15, 19

References: A) Grout, 1950, Appendix F, p. 114

Occurrences: Titaniferous magnetite described in: (Ref. A, p. 114)
- "Sec. 14. On lake shore 1800 paces N. and 1800 paces W. of SE. corner. Gabbro ore 10 x 15 paces and scattered outcrops for $\frac{1}{4}$ mile S. of W. (D)"
- "Sec. 15. 1300 paces N. and 250 paces W. of SE. corner. Small ore outcrops and fair magnetics. (D)"
- "Sec. 19. Gabbro with mag. stringers N. of W. end Boulder Lake; area 5 x 15 paces. (D)"

Other Data: Titaniferous Magnetite in Sec. 6, see also summary in Appendix.

Location: Lake County
Township 64N-7W, Sections 14, 32, 34

References: A) Winchell, 1899, Vol. 4, p. 285
B) Grout, 1950, Appendix F, p. 114

Occurrences: Titaniferous magnetite described in: (Ref. B, p. 114)
- "Sec. 32. 1400 paces N. and 1400 paces W. of SE corner. Magnetite gabbro on shore of Thomas Lake. (D)"
"SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ 'Gabbro ore,' feldspar-magnetite rock, classified by Grant. Doubtful if this is typical feldspathic gneissoid ore like the best segregations. (D)"
- "Sec. 34. 1000 paces N. and 1300 paces W. of SE. corner, magnetite stringers in hornfels. (D)"
"1000 paces N. and 200 paces W. of SE. corner, magnetic attractions, no outcrops. (D)"

Testpits: "The iron which is on the north shore of Fraser Lake, SW $\frac{1}{4}$, Sec. 14 is . . . At the bottom of the shallow pits which have been sunk into the ore is quite rich, though olivinitic." (Ref. A, p. 285)

Other Data: Titaniferous Magnetite in Sec. 14, see also summary in Appendix.
Native Copper in Sec. 32, see also summary in Appendix.

Location: Lake County
Township 64N-8W

Other Data: Titaniferous Magnetite, see also summary in Appendix.

Location: Lake County
Township 64N-9W, Sections 26, 28, 29

References: A) Green, 1970, MGS S.P. 13, p. 86
B) Winchell, Vol. 4, 1899, p. 278
C) Winchell, Vol. 5, 1900, p. 882, No. 2272

Occurrences: The island in Moose Lake has . . . sericitic schist "with much pyrite, evidently cupriferous, since schist is stained by malachite green at a little depth, in scattered small points." [Sec. line between Sec. 28 & 29] (Ref. B, p. 278).
"graywacke (schistose with chalcopyrite)," [m. sec. line between Sec. 28 & 29], (Ref. C, p. 882).
"Traces of sphalerite were seen in several samples, and a small amount was found megascopically in cherty iron-

formation on the island in Moose Lake in SW $\frac{1}{4}$, S29 (Ref. A, p. 86)." [This occurrence is in the Knife Lake Group.]

Other Data: Garnet in Sec. 26, see also summary in Appendix.

Location: Lake County

Township 64N-10W, Sections 26, 30, 34, 36

References: A) Green, 1970, MGS SP-13, p. 52, 63, 64
B) Winchell, 1899, Vol. 4, pp. 274-275.

Occurrences: "Microgranite dikes. Several small dikes and sills of microgranite were found in the map area, outside the zone of aplites and other granitic dikes that are closely associated with the Giants Range batholith. They are fine-grained hypidiomorphic-granular in texture, and a few contain small phenocrysts; three samples show plagioclase, and one also has quartz phenocrysts. One dike has clearly finer-grained (chilled) borders. These dikes cut the Ely Greenstone, the Knife Lake Group, and the Newton Lake Formation. Many are conformable, and are in that sense actually sills. In the area southeast of Moose Lake, and at Jasper Lake, these dikes have been somewhat altered hydrothermally, and contain sericite, pyrite, and carbonate (calcite \pm siderite or ankerite" (Ref. A, p. 52) [location is probably Sec. 36].

"Other, isolated granitoid bodies. Exposed along the northwestern side of the large point in the western end of Ella Hall Lake is a small mass of altered biotite tonalite. It is fine- to medium-grained, has a weak foliation of subhedral to euhedral plagioclase crystals, and has undergone considerable quartz veining, calcite impregnation, and alteration of biotite to chlorite. Apatite, sphene, magnetite, and zircon are accessory minerals. Its relationship to the surrounding volcanic rocks is obscure" (Ref. A, p. 63-64) [location is probably Sec. 30].

"In the SW $\frac{1}{4}$, S34 some drilling and shafting have been done with view to the discovery of merchantable iron ore . . . The rock contains pyrite, calcite, and apparently siderite." (Ref. B, pp. 274-275)

Other Data: Iron Ores - Archean in Sec. 26, see also summary in Appendix.

Location: Lake County

Township 64N-11W, Sections 24, 25, 26, 27, 32, 34

References: A) Grout, 1937, p. 62
B) Green, 1972, MGS Centennial Volume, pp. 76-78
C) Sims, 1969, MGS Information Circular 7, pp. 25-26
D) Schulz, 1974, Thesis, pp. 44, 46

Occurrences: At Pipestone Rapids, T.64N., R.11W., the water falls over a quartz vein which is hypothermal. It was known from the early prospecting that it had tourmaline, pyrite and a copper stain, but the [gold] assays must have been low, because little prospecting was done." (Ref. A, p. 62, probably in Sec. 27).

(Table III-8) Trace element content of serpentinized peridotite (analyses by U. S. Geological Survey, amounts in parts per million) (Sample M-7549, SW $\frac{1}{4}$, Sec. 33, in Newton

Lake Formation. Location of other anomalous samples uncertain. Ref. B, p. 78).

<u>Sample #</u>	<u>Cr</u>	<u>Pd</u>	<u>Ni</u>
E-13	±5000		900
E-44	3000	0.011	
E-46a	5000		840
E-48	±5000		
E-56	5000	0.009	
E-62	±5000	0.008	
M-7549	3000		

Nickel, Paladium, chromium, and gold: (Table I) Analyses, in parts per million of selected samples of metaperidotite bodies from Ely area. [Location uncertain], (Ref. C, p. 26)

<u>Sample #</u>	<u>Au</u>	<u>Ag</u>	<u>Ni</u>	<u>Pd</u>	<u>Cr</u>
AJP-125					G5000
AJP-126				0.011	G3000
AJP-127					G3000
AJP-128			840		G5000
AJP-129				0.009	G5000
AJP-130				0.008	G5000
AJP-131			900		G5000
AJP-984		1.0	770		G5000
AJP-988	0.04	1.0	870		G5000

"Chromite, occurring as euhedral to rounded grains, constitutes no more than 3% of any sample. Grains occur within olivine but are more commonly enclosed in the interstitial minerals. Occasional signs of embayment are present in some samples (Figure 19). Microprobe analyses of chromites from four sills showed the $\frac{Cr}{O_3}$ content to be quite variable, ranging from 15% to 47% (Table 10). Reconnaissance microprobe analyses by Green (1970 a), on chromites from other peridotites within the Newton Lake Formation, indicates that the Cr/Fe ratio tends to decrease outwards towards the margins of the grains. Magnetite has been found to rim many of these grains." [NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 32] (Ref. D, pp. 44,46)

Other Data: Iron Ores - Archean in Sec. 34, see also summary in Appendix.

Location: Lake County
Township 65N-6W, Sections 12, 20
References: A) Winchell, 1900, Vol. 5, p. 905
Occurrences: No. 798G, near section line of Sec. 20-65-6W, from center of dike (greater than 150 yds. wide) in diabase, ilmenite. (Ref. A, p. 905)
Other Data: Iron Ores - Archean in Sec. 12, see also summary in Appendix.

Location: Lake of the Woods County
Township 157N-33W, Sections 8, 34
References: A) DNR Open File Drill Samples List
Other Data: DDH 40918 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 8 (Ref. A)
DDH 40917 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 34 (Ref. A)

LAKE OF THE WOODS

Location: Lake of the Woods County
Township 157N-34W, Sections 5, 14, 21

References: A) DNR Terminated Lease Files
B) Ojakangas, Meineke, and Listerud, 1977, MGS, RI 17, see Table A-2
C) DNR Open File Drill Samples List

Summary: Occurrence in Archean greenstone terrane

Occurrences: DDH B31-1, in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 5, Lease Humble CN-7679, has (Ref. A & B)
- 13.5 ft. of 560-1100 ppm Cu
- 11.8 ft. of 545-1200 ppm Zn
- 12.2 ft. of 2 ppm Ag
- 18 ft. of 140 to 220 ppbillion Au
- 4 ft. of 83 ppm Mo
- 18 ft. of 23 to 63 ppm As
with felsic tuff and volcanoclastics; some intermediate-mafic flows and volcanoclastics with several minor zones of pyrrhotite-pyrite, some as much as 80%

DDH B31-5 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 5, Lease Humble CN-7679, has (Ref. A)
- 60 ft. of 3-5% pyrrhotite-pyrite and 5-8% magnetite with trace chalcopyrite in gabbro, mafic volcanics and intermediate-mafic volcanoclastics (Ref. B).

DDH 40926 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 14, Lease INCO CN-7746, has (Ref. A)
- 2 ft. of .06% Cu
with felsic-intermediate tuff and agglomerate with minor sulfides and graphite (Ref. B).

Other Data: DDH B31-2 in Sec. 5 (Ref. C)
DDH B35-1 in Sec. 21 (Ref. C)
DDH B31-3, B31-4 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 5 (Ref. C)
Graphite in Sec. 14 and 21, see also summary in Appendix.
Clay minerals in Sec. 5, see also summary in Appendix.

Location: Lake of the Woods County
Township 158N-33W, Sections 2, 3, 6, 19, 30, 32, 34

References: A) DNR General Exploration File
B) Ojakangas, Meineke, Listerud, 1977, MGS RI 17, see Table A-2
C) DNR Open File Drill Samples List

Summary: Occurrences in Archean greenstone terrane

Occurrences: DDH B24-1, in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 30, File #1, has: (Ref. A, B)
- 10 ft. of 25-145 ppm As
- 4 ft. of 220 ppm Co
- 167 ft. of 2-90% pyrrhotite-pyrite; 159' of 6-30% pyrrhotite-pyrite

DDH B24-2, in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 30, has: (Ref. A, B)
- .5 ft. of 4.9% Zn and 2.9% Pb, sphalerite
- 20 ft. of 220-255 ppm As
- 30 ft. of 50-95% pyrite; 42' of 40-80% sulfides; 28' of 5-70% pyrrhotite-pyrite; 55' of 1-40% pyrrhotite-pyrite

DDH B24-4, in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 19, has: (Ref. A, B)
- 1 ft. of 503-687 ppm Cu
- 6.5 ft. of 40% pyrrhotite-pyrite with chalcopyrite, much disseminated minor pyrrhotite-pyrite

DDH B21-2, in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 3, has: (Ref. A)
 - 19 ft. of 1133-4500 ppm Zn

DDH B21-3, in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 2, has: (Ref. A, B)
 - 26 ft. of 550-3000 ppm Zn
 - 12 ft. of 630-900 ppm Cu
 - 1 ft. of .01 to .02 Au oz/t
 - 24 ft. of 2-3% pyrrhotite-pyrite-chalcopyrite
 - 12 ft. of 5% pyrrhotite-pyrite-chalcopyrite
 - other disseminated sulfides in tuffaceous metasediment, granitized; granite

DDH MSD-1, in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 6, File #3, has: (Ref. A)
 - 9.3 ft. of 650-2550 ppm Zn
 - 4.9 ft. of 700-1500 ppm Cu

DDH MED-1, in Sec. 32, File #3, has: (Ref. A)
 - 12 ft. of 1400-1925 ppm Cu
 - 64.5 ft. of 1-2.8 ppm Ag

Other Data: DDH B24-3 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 30 (Ref. C)
 DDH B58-1 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 32 (Ref. C)
 Graphite in Sec. 3, see also summary in Appendix.
 Iron Ores - Archean in Sec. 32, see also summary in Appendix.

Location: Lake of the Woods County
 Township 158N-34W, Sections 25, 17, 11, 12

References: A) DNR General Exploration File
 B) DNR Project File #130
 C) DNR Terminated Lease File
 D) DNR Open File Drill Samples List

Summary: Occurrence in Archean greenstone terrane

Occurrences: DDH B5-1, in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 25, File #1, has: (Ref. A)
 - 4 ft. of 2900 ppm Zn & 565 ppm Cu

DDH B54-1, in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 17, File #1, has: (Ref. A)
 - 5 ft. of trace to $\frac{1}{2}$ % chalcopyrite

DDH MQD-2, in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 11, File #2, has: (Ref. A)
 - 8.5 ft. of 510-570 ppm Cu
 - 11.5 ft. of 550-4500 ppm Cu
 - 3 ft. of 2 ppm Ag
 - 11.5 ft. of 0.13-0.19 ppm Au

DDH MDD-1, in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 12, File #2, has: (Ref. A)
 - 0.7 ft. of 1775 ppm Cu
 - 8.9 ft. of 1.3 to 2.8 ppm Ag

DDH MMD-1, in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 25, File #2, has: (Ref. A)
 - 19.8 ft. of 500-1000 ppm Zn
 - 28.3 ft. of 1-2 ppm Ag

DDH B-Q-1, in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 11; Lease Moore-CN-7822 has (Ref. B and C)
 - traces of Cu & Ni in short zones of massive sulfides with gabbro and hornfels
 - 1 ft. of .06% Ni; traces of Cpy

Other Data: DDH MQD-1 in Sec. 11 (Ref. D)

Location: Lake of the Woods County
 Township 159N-32W, Sections 12, 14, 15, 27

References: A) DNR Terminated Lease Files
 B) Ojakangas, Meineke, and Listerud, 1977, MGS RI 17,

see Table A-2

C) DNR Open File Drill Samples List

Summary: Occurrence in Archean greenstone terrane
 Occurrences: -DDH BD-1, in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 12, Lease Ridge CN-7831, has
 (Ref. A, B)
 - 160 ft. of a trace of chalcopyrite; in 85' of 2-6%
sulfide and 5-10% magnetite in felsic and
 intermediate-mafic tuffs; possible iron formation
 - DDH BD-2, in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 15, Lease Ridge CN-7833, has a
 trace of copper; and 100' of 20-25% sulfide, 1-2%
 magnetite in felsic and some intermediate-mafic tuffs,
 lappilli tuff, agglomerate (Ref. A, B)
 -DDH BD-3 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 14, Lease Ridge CN 7832, has:
 (Ref. A)
 - 2 ft. of 1.6 ppm Ag
 - 6 ft. of 200 to 310 ppbillion B
 Other Data: DDH B-B-2 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 27 (Ref. C)
 Graphite in Sec. 14, see also summary in Appendix.

Location: Lake of the Woods County
 Township 159N-33W, Sections 25, 29, 34
 References: A) DNR Terminated Lease Files
 B) Ojakangas, Meineke, and Listerud, 1977, MGS RI 17,
 see Table A-2
 C) DNR General Exploration Files
 D) DNR Project File #130
 Summary: Occurrence in Archean greenstone terrane
 Occurrences: DDH 40919 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 25, Lease INCO 7744, has:
 (Ref. A, B and D)
 - 42.3 ft. of 0.05 to 0.08% Cu
 - with 200' of ave. 25% pyrrhotite and up to 90% in
magnetite-pyrite-pyrrhotite iron formation, gabbro,
 diorite, felsic tuff and agglomerate
 DDH B21-1 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 34, has: (Ref. B)
 - several thin zones of 10-25% pyrrhotite-pyrite and minor
chalcopyrite; 15' graphitic zone; tuffaceous metasediment,
 partially granitized
 - 21 ft. of 2-6 ppm Ag
 - 1 ft. of 267-427 ppm Co
 - 31.5 ft. of 550-2900 ppm Cu
 - 33.5 ft. of 520-6666 ppm Zn
 - 21 ft. of 25-65 ppm As
 DDH 40920 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 29, Lease INCO CN-7745, has:
 (Ref. B, C and D)
 - zones of 3% pyrite, trace of chalcopyrite and native
copper, in intermediate-mafic volcanics (massive, highly
 weathered)
 Other Data: Iron Ores - Archean in Sec. 25, see also summary in Appendix.

Location: Lake of the Woods County
 Township 159N-36W, Section 15
 Other Data: DDH YWQ-1 in Sec. 15 (See Appendix)

Location: Lake of the Woods County
Township 160N-30W, Sections 9, 16, 17, 23, 31

References: A) DNR Terminated Lease File
B) DNR Project File #130
C) DNR General Exploration File
D) DNR Open File Drill Samples List
E) Ojakangas, Meineke, Listerud, 1977, MGS RI-17, p. 76

Occurrences: DDH B-3-3 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 16, Lease Amoco CN-7955, has:
(Ref. A and B)
- 10 ft. of 2600 ppm Zn, 520 ppm Cu, 1.2 ppm Ag
- 10 ft. of 1200 ppm Zn
DDH B-3-2 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 17, Lease Amoco CN-7956, has:
(Ref. A and B)
- 45 ft. of .054% to .14% Cu
- 87 ft. of .06% to .72% Zn
DDH B-7-1 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 23 has: (Ref. C, File #1)
- 16 ft. of 744-1143 ppm Cu
- 4 ft. of massive, black, fine grained tourmaline
DDH B-7-2 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 23 has: (Ref. C, File #1)
- 1 ft. of 613-887 ppm Cu
- .5 ft. of 333 ppm Pb
DDH B-7-3 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 23 has: (Ref. C, File #1)
- 2 ft. of 576-934 ppm Cu
DDH B-57-1 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 9, Lease Humble CN-7835, has:
(Ref. A and Ref. E, p. 76)
- 47 ft. of 505 ppm to 1.25% Zn
- 19 ft. of 500 ppm to .15% Cu
- 14 ft. of 2 ppm Ag
- with 28 ft. of up to 40% sulfide and graphitic
metasediments; minor sphalerite; general lithology is
intermediate volcanics

Other Data: DDH B-3-1 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 17 (Ref. D)
DDH B-57 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 9 (See Appendix)
DDH R.R.16-1 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 31 (Ref. D)
Graphite in Sec. 16, see also summary in Appendix.
Clay minerals in Sec. 9, see also summary in Appendix.

Location: Lake of the Woods County
Township 166N-34W

References: A) Winchell, 1899, Vol. 4, p. 155

Occurrences: "Gold. As we have already hinted, this may be found in the Archean rocks around Lake of the Woods, particularly in the "northwestern angle." Some fine specimens have been found near Rat Portage. Traces of copper have also been found in the Archean rocks on the north side of the Lake of the Woods, but both of these have been found in the "Huronian" slates, while upon the American side of the lake granites are more prevalent" (Ref. A, p. 155). [Note: location uncertain, possibly in Canada.]

Location: Lake of the Woods County
Township 167N-33W, Sections 1, 6

References: A) Grout, 1927, MGS Field Notebook #150, pp. 9, 11, 21
B) Zamzow, 1979, Thesis, pp. 36-37

Occurrences: Details and notes at "Rader's Mine" in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 6 indicate two testpits in a pegmatite. "Diabase is later cutting both greenstone and pegmatite." A "course pink spar" zone is indicated on the detailed sketch map. Minerals described in the notes are mica, spar, columbite or wolframite opaques, garnets. (Ref. A, pp. 9, 11, 21)

"Soapstone occurs as 3 to 10 meter thick bands in the amphibolite . . . Mineralogically the soapstone is composed of 37 to 75% fibrous white talc." Location is in NE $\frac{1}{4}$, Sec. 1, "along north shore of Oak Island, west of Soldiers Point." (Ref. B, pp. 36-37)

Testpits: Two testpits in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 6, see above.
Talc in Sec. 1, see also summary in Appendix.

Location: Lake of the Woods County
Township 168N-34W, Section 32

References: A) Grout, 1927, MGS Field Notebook #150, p. 47

Occurrences: In NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 32 "This [uranium prospect] is a complicated zone of red granite, pegmatite, aplite and more or less granitized siliceous sedimentary rock . . . This (rock with good count of radioactivity) according to Norman Carlson was along a narrow zone which trended roughly N-S across the small pit. Some diamond-shaped crystals seem to be a rare-earth mineral . . . The pegmatite consists mainly of pink feldspar, quartz, and a small amount of biotite. (Ref. A, p. 47, see sketch map)

Testpits: In NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 32 (see above).

Location: Le Sueur County
Township 111N-25W

Other Data: Native Copper, see also summary in Appendix.

Location: Le Sueur County
Township 112N-25W

Other Data: Native Copper, see also summary in Appendix.

Location: Lincoln County
Township 110N-44W, Section 33

Other Data: DDH 2 in Sec. 33 (See Appendix)

Location: Lincoln County
Township 112N-46W, Section 7

Other Data: DDH E-1A in Sec. 7 (See Appendix)

Location: Lyon County
Township 109N-41W, Sections 4, 7, 9

Other Data: DDH K-1 in Sec. 4 (See Appendix)
DDH K-4 in Sec. 7 (See Appendix)
DDH K-3 in Sec. 9 (See Appendix)

Location: Lyon County
 Township 109N-42W, Sections 8, 17, 24
 Other Data: DDH UNK in Sec. 8 (See Appendix)
 DDH UNK, UNK-1 in Sec. 17 (See Appendix)
 DDH K-2 in Sec. 24 (See Appendix)

Location: Lyon County
 Township 109N-43W, Sections 16, 17, 21
 Other Data: DDH F-3 in Sec. 16 (See Appendix)
 DDH F-1 in Sec. 17 (See Appendix)
 DDH F-2 in Sec. 21 (See Appendix)

Location: Lyon County
 Township 110N-39W, Section 16
 Other Data: Clay minerals in Sec. 16, see also summary in Appendix.

Location: Lyon County
 Township 110N-40W, Section 8
 Other Data: DDH UNK in Sec. 8 (See Appendix)

Location: Lyon County
 Township 110N-42W, Section 26
 Other Data: DDH K-6 in Sec. 26 (See Appendix)

Location: Lyon County
 Township 110N-43W, Sections 13, 28, 30
 Other Data: DDH K-5 in Sec. 13 (See Appendix)
 DDH UNK, UNK in Sec. 28 (See Appendix)
 DDH UNK in Sec. 30 (See Appendix)

Location: Lyon County
 Township 111N-40W, Section 6
 Other Data: DDH W-14 in Sec. 6 (See Appendix)

Location: Lyon County
 Township 111N-41W, Sections 2, 3, 6, 7, 8, 9, 10, 12, 16, 17,
 18, 20, 21, 23, 27
 Other Data: DDH W-9, W-10 in Sec. 2 (See Appendix)
 DDH UNK in Sec. 3 (See Appendix)
 DDH R-5 in Sec. 6 (See Appendix)
 DDH OBS-1, OBS-2, OBS-3, UNK in Sec. 7 (See Appendix)
 DDH P-3, P-4, T-1, P-2, UNK, P-1 in Sec. 8 (See Appendix)
 DDH T-3 in Sec. 9 (See Appendix)
 DDH W-7, T-5 in Sec. 10 (See Appendix)
 DDH Z-8 in Sec. 12 (See Appendix)
 DDH W-6, W-5 in Sec. 16 (See Appendix)
 DDH P-6, UNK in Sec. 17 (See Appendix)
 DDH P-5, P-7 in Sec. 18 (See Appendix)
 DDH W-1 in Sec. 20 (See Appendix)

DDH W-4, W-3 in Sec. 21 (See Appendix)
DDH Z-5 in Sec. 23 (See Appendix)
DDH Z-2, Z-1 in Sec. 27 (See Appendix)

Location: Lyon County
Township 111N-42W, Sections 1, 10, 11, 24
Other Data: DDH R-4, R-3 in Sec. 1 (See Appendix)
DDH R-1 in Sec. 10 (See Appendix)
DDH R-2 in Sec. 11 (See Appendix)
DDH UNK, UNK-1 in Sec. 24 (See Appendix)

Location: Lyon County
Township 111N-43W, Section 26
Other Data: DDH UNK, UNK-1 in Sec. 26 (See Appendix)

Location: Lyon County
Township 112N-40W, Sections 15, 30, 31
Other Data: DDH UNK in Sec. 15 (See Appendix)
DDH W-13 in Sec. 30 (See Appendix)
DDH W-12 in Sec. 31 (See Appendix)

Location: Lyon County
Township 112N-41W, Sections 2, 24, 26, 29, 31, 32, 33, 34, 36
Other Data: DDH T-2 in Sec. 32 (See Appendix)
DDH T-1 in Sec. 33 (See Appendix)
DDH G-4, G-2, G-3 in Sec. 2 (See Appendix)
DDH X-6 in Sec. 24 (See Appendix)
DDH UNK, X-4 in Sec. 26 (See Appendix)
DDH R-10 in Sec. 29 (See Appendix)
DDH R-8, R-7 in Sec. 31 (See Appendix)
DDH X-1 in Sec. 34 (See Appendix)
DDH W-11 in Sec. 36 (See Appendix)

Location: Lyon County
Township 112N-42W, Sections 6, 8, 24, 27, 34
Other Data: DDH UNK in Sec. 6 (See Appendix)
DDH UNK in Sec. 8 (See Appendix)
DDH V-6 in Sec. 24 (See Appendix)
DDH V-4 in Sec. 27 (See Appendix)
DDH V-1, V-2 in Sec. 34 (See Appendix)

Location: Lyon County
Township 112N-43W, Section 24
Other Data: DDH UNK in Sec. 24 (See Appendix)

Location: Lyon County
Township 113N-40W, Section 9
Other Data: DDH A-1, CD-3, CD-2 in Sec. 9 (See Appendix)

Location: Lyon County
 Township 113N-41W, Sections 10, 13, 14, 19, 35
 Other Data: DDH UNK in Sec. 10 (See Appendix)
 DDH UNK, UNK-1 in Sec. 13 (See Appendix)
 DDH UNK in Sec. 14 (See Appendix)
 DDH UNK in Sec. 19 (See Appendix)
 DDH G-1 in Sec. 35 (See Appendix)

Location: Lyon County
 Township 113N-42W, Section 7
 Other Data: DDH H-1 in Sec. 7 (See Appendix)

Location: Lyon County
 Township 113N-43W, Sections 25, 26, 35, 36
 Other Data: DDH M-4, M-6 in Sec. 25 (See Appendix)
 DDH M-10, M-5, M-7 in Sec. 26 (See Appendix)
 DDH M-1 in Sec. 35 (See Appendix)
 DDH M-2, M-3 in Sec. 36 (See Appendix)

Location: Marshall County
 Township 154N-45W, Section 4
 Other Data: DDH J-5B in Sec. 4 (See Appendix)

Location: Marshall County
 Township 154N-46W, Section 2
 Other Data: DDH J-3 in Sec. 2 (See Appendix)

Location: Marshall County
 Township 155N-39W, Sections 1, 4
 References: A) DNR Open File Drill Samples List
 Other Data: DDH STAR-3 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 1 (Ref. A)
 DDH STAR-2 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 4 (Ref. A)
 Clay minerals in Sec. 1 and 4, see also summary in Appendix.

Location: Marshall County
 Township 155N-41W, Section 5
 References: A) DNR Open File Drill Samples List
 Other Data: DDH STAR-1 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 5 (Ref. A)

Location: Marshall County
 Township 155N-43W, Section 33
 Other Data: DDH J-2, UNK in Sec. 33 (See Appendix)

Location: Marshall County
 Township 155N-44W, Section 20
 Other Data: DDH J-6A in Sec. 20 (See Appendix)

Location: Marshall County
Township 155N-45W, Sections 2, 33
Other Data: DDH H-4, H-4A in Sec. 2 (See Appendix)
DDH UNK in Sec. 33 (See Appendix)

Location: Marshall County
Township 155N-46W, Sections 2, 31
Other Data: DDH H-6, H-6A in Sec. 2 (See Appendix)
DDH J-4 in Sec. 31 (See Appendix)

Location: Marshall County
Township 155N-47W, Sections 1, 2, 6, 10, 11, 12, 14, 15, 23,
30, 34
Other Data: DDH M-19, M-17, M-18, M-14, M-15, M-16, M-13, M-25, M-22,
M-23 in Sec. 1 (See Appendix)
DDH M-20, M-21, M-1 in Sec. 2 (See Appendix)
DDH H-1 in Sec. 6 (See Appendix)
DDH M-8 in Sec. 10 (See Appendix)
DDH M-40, M-41, M-42, M-39, H-2, M-35, M-50, M-51, M-52,
M-6, M-37, M-36, M-9, M-24, M-5, M-11, M-26, M-7 in Sec. 11
(See Appendix)
DDH M-49, M-53, M-3, M-4, M-12, M-38, M-2, M-10 in Sec. 12
(See Appendix)
DDH M-27, M-28, M-43, M-29, M-30 in Sec. 14 (See Appendix)
DDH M-44, M-45, M-46, M-47, M-48 in Sec. 15 (See Appendix)
DDH M-34, M-32, M-33, M-31 in Sec. 23 (See Appendix)
DDH UNK in Sec. 30 (See Appendix)
DDH J-6 in Sec. 34 (See Appendix)

Location: Marshall County
Township 155N-49W, Section 36
Other Data: DDH J-1 in Sec. 36 (See Appendix)

Location: Marshall County
Township 156N-42W, Section 31
References: A) DNR Open File Drill Samples List
Other Data: DDH GS-1 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 31 (Ref. A)

Location: Marshall County
Township 156N-43W, Sections 4, 11, 28
Other Data: DDH G-5 in Sec. 4 (See Appendix)
DDH G-6 in Sec. 11 (See Appendix)
DDH H-3 in Sec. 28 (See Appendix)

Location: Marshall County
Township 156N-44W, Sections 1, 10, 32
Other Data: DDH G-7 in Sec. 1 (See Appendix)
DDH G-8A in Sec. 10 (See Appendix)
DDH H-5 in Sec. 32 (See Appendix)

Location: Marshall County
 Township 156N-45W, Sections 1, 4, 11
 Other Data: DDH G-4 in Sec. 1 (See Appendix)
 DDH G-3 in Sec. 4 (See Appendix)
 DDH G-9A in Sec. 11 (See Appendix)

Location: Marshall County
 Township 156N-46W, Sections 1, 2, 17
 Other Data: DDH G-11 in Sec. 1 (See Appendix)
 DDH G-8 in Sec. 2 (See Appendix)
 DDH G-10 in Sec. 17 (See Appendix)

Location: Marshall County
 Township 156N-47W, Sections 8, 13, 15
 Other Data: DDH G-1 in Sec. 8 (See Appendix)
 DDH G-9 in Sec. 13 (See Appendix)
 DDH G-12 in Sec. 15 (See Appendix)

Location: Marshall County
 Township 156N-48W, Section 15
 Other Data: DDH G-2 in Sec. 15 (See Appendix)

Location: Marshall County
 Township 157N-39W, Sections 2, 3
 References: A) DNR Open File Drill Samples List
 Other Data: DDH G-1 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 3 (Ref. A)
 DDH MR-2-84, MR-1-84 in Sec. 2 (See Appendix)

Location: Marshall County
 Township 157N-43W, Sections 3, 5
 Other Data: DDH F-3 in Sec. 3 (See Appendix)
 DDH F-10 in Sec. 5 (See Appendix)

Location: Marshall County
 Township 157N-44W, Sections 7, 9, 11
 Other Data: DDH F-4 in Sec. 7 (See Appendix)
 DDH F-9 in Sec. 9 (See Appendix)
 DDH F-7 in Sec. 11 (See Appendix)

Location: Marshall County
 Township 157N-45W, Sections 1, 4, 7
 Other Data: DDH F-12 in Sec. 1 (See Appendix)
 DDH F-11, F-5 in Sec. 4 (See Appendix)
 DDH F-11 in Sec. 7 (See Appendix)

Location: Marshall County
 Township 157N-46W, Section 2
 Other Data: DDH F-6, F-8, F-8-A in Sec. 2 (See Appendix)

Location: Marshall County
Township 157N-48W, Section 4
Other Data: DDH F-1 in Sec. 4 (See Appendix)

Location: Marshall County
Township 158N-40W, Section 15
References: A) Meineke and Listerud, 1978, DNR Minerals Map 153, Sheet 2
of 2
B) DNR General Exploration File
Summary: Occurrence in Archean greenstone terrane
Occurrences: DDH M-1, in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 15, has: (Ref. A, B)
- chalcopyrite, sphalerite, pyrite, pyrrhotite in mafic to
intermediate volcanics with some fragmental, some
brecciated, with massive pyrrhotite

Location: Marshall County
Township 158N-44W, Section 20
References: A) 1940 Annual Report, Div. of Lands & Minerals, (DNR) p. 18
Other Data: A "gold state lease" was "in effect" to Thomas Fick & Lauri
Courte for a prospect in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 20, for 1940 & 1941
(Ref. A).

Location: Marshall County
Township 158N-46W, Section 31
Other Data: DDH F-11A in Sec. 31 (See Appendix)

Location: Marshall County
Township 158N-47W, Sections 23, 32
Other Data: DDH RRVD-30 in Sec. 23 (See Appendix)
DDH F-2 in Sec. 32 (See Appendix)

Location: Marshall County
Township 158N-50W, Section 20
Other Data: DDH 887 in Sec. 20 (See Appendix)

Location: Martin County
Township 104N-32W, Section 1
References: A) DNR Open File Drill Samples List
Other Data: DDH SQ-9 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 1 (Ref. A)
Clay minerals in Sec. 1, see also summary in Appendix.

Location: Meeker County
Township 118N-31W, Section 10
References: A) DNR Open File Drill Samples List
Other Data: DDH BKV-81-1 in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 10 (Ref. A)

Location: Meeker County
Township 119N-29W, Section 29
References: A) DNR Open File Drill Samples List
Other Data: DDH NB-81-1 in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 29 (Ref. A)

Location: Meeker County
Township 119N-32W, Section 15
References: A) DNR Open File Drill Samples List
Other Data: LL-81-1 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 15 (Ref. A)

Location: Meeker County
Township 121N-30W, Section 6
Other Data: DDH W-8 in Sec. 6 (See Appendix)

Location: Meeker County
Township 121N-31W, Sections 1, 12
Other Data: DDH W-10, W-11, W-7 in Sec. 1 (See Appendix)
DDH W-9 in Sec. 12 (See Appendix)

Location: Mille Lacs County
Township 37N-27W, Section 26
Other Data: DDH T-1 in Sec. 26 (See Appendix)

Location: Mille Lacs County
Township 38N-27W
References: A) Winchell, 1888, Vol. II, p. 623
Occurrences: "A mass of drift copper, weighing about five pounds, was found by Mr. Benjamin R. Soule in the excavation at the north end of Stony Brook dam on the west branch of Rum river" [exact location unknown], (Ref. A, p. 623).
Other Data: Native Copper, see also summary in Appendix.

Location: Morrison County
Township 39N-32W, Section 20
Other Data: Staurolite, see also summary in Appendix.
Clay minerals in Sec. 20, see also summary in Appendix.

Location: Morrison County
Township 40N-28N, Section 36
Other Data: DDH R-1 in Sec. 36 (See Appendix)

Location: Morrison County
Township 40N-29W, Section 8
References: A) Skillman, 1946, Unpublished Ph.D. Thesis, p. 198
Occurrences: "In NE $\frac{1}{4}$ Sec. 8, T40N-R29W, a test pit for gold was once opened in a pegmatite dike 2 feet wide which contains 0.5 centimeter crystals of pyrite", (Ref. A, p. 198)

Testpits: In NE $\frac{1}{4}$, Sec. 8, see above

Location: Morrison County
Township 40N-32W, Sections 7, 17, 20, 27

References: A) Winchell, 1900, Vol. 5, p. 758

Occurrences: "A fine grained, slightly pinkish marble" is reported on "west bank of the Mississippi, just below the mouth of Swan River, Morrison County," (Ref. A, p. 758, sample number 1681) [Location uncertain]

Other Data: DDH T-2 in Sec. 17 (See Appendix)
DDH T-1 in Sec. 20 (See Appendix)
DDH T-1 in Sec. 27 (See Appendix)
Staurolite and Garnet in Sec. 7, see also summary in Appendix.

Location: Morrison County
Township 41N-32W, Sections 26, 27

Other Data: DDH T-1, T-3 in Sec. 26 (See Appendix)
DDH T-2, T-3, T-4 in Sec. 27 (See Appendix)

Location: Morrison County
Township 42N-29W, Sections 2, 3

Other Data: DDH 2004 in Sec. 2 (See Appendix)
DDH 2003 in Sec. 3 (See Appendix)

Location: Morrison County
Township 42N-30W, Sections 1, 21

Other Data: DDH 1, 2 in Sec. 21 (See Appendix)
DDH 2002 in Sec. 1 (See Appendix)

Location: Morrison County
Township 127N-29W, Section 5

References: A) DNR Open File Drill Samples List
B) Annual Field Report, 1961, Div. of Lands & Minerals, (DNR), p. 264
C) DNR General Exploration File #1

Occurrences: "In search for radioactive minerals . . . two drill holes were put down in NW $\frac{1}{4}$ of S5 by the I.R.R.R.C. and beryl was discovered. The material encountered consisted of decomposed gneiss and schist containing staurolites, and pegmatites containing quartz, feldspar, mica, garnets, and some beryl crystals." (Ref. B, p. 264; and C)

Testpits: A shaft is in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 5 on a map of above beryl prospect (Ref. C, File #1, Map 9)

Other Data: DDH 1, 2, 3, 4 in NW $\frac{1}{4}$, Sec. 5 (Ref. A)

Location: Morrison County
Township 127N-30W, Section 8

Other Data: DDH 2007 in Sec. 8 (See Appendix)

Location: Morrison County
Township 127N-31W, Section 29
Other Data: DDH 2008 in Sec. 29 (See Appendix)

Location: Morrison County
Township 128N-29W, Section 32
References: A) Skillman, 1946, Unpublished Ph.D. Dissertation,
p. 198
Occurrences: "A farmer reports that the staurolite schist in SE $\frac{1}{4}$, Sec. 32,
T128N-R29W, contains a quartz vein which assays \$9 per ton in
gold. The vein is reported to lie beneath an oxbow slough of
the Mississippi River." [SE $\frac{1}{4}$, Sec. 32], (Ref. A, p. 198)

Location: Morrison County
Township 128N-30W, Section 15
Other Data: DDH 2005 in Sec. 15 (See Appendix)

Location: Morrison County
Township 129N-29W, Sections 7, 8
Other Data: DDH T-1, T-2 in Sec. 7 (See Appendix)
DDH T-1 in Sec. 8 (See Appendix)

Location: Morrison County
Township 129N-30W
Other Data: Garnet and Staurolite, see also summary in Appendix.

Location: Morrison County
Township 129N-32W, Section 32
Other Data: Garnet and Staurolite in Sec. 32, see also summary in
Appendix.

Location: Morrison County
Township 130N-30W, Section 6
Other Data: DDH 104, 105, 107, 108, 109, 110, 111, 112, 113, 117, 118 in
Section 6 (See Appendix)

Location: Morrison County
Township 130N-31W, Section 21
Other Data: DDH 2001 in Sec. 21 (See Appendix)

Location: Morrison County
Township 131N-30W, Sections 9, 16, 31
References: A) DNR General Exploration File
Other Data: DDH 731, 732 in Sec. 9 (Ref. A)
DDH 704, 706, 707, 709, 721, 723, 731, 732 in Sec. 16 (See
Appendix)

DDH 101, 102, 103, 114, 115, 116, 201, 202, 203, 204, 205,
206, 207, 208, 209, 210, 211, 212 in Sec. 31 (See Appendix)

Location: Morrison County
Township 131N-31W, Sections 17, 23, 26
References: A) DNR General Exploration File
Other Data: DDH 721, 722 in Sec. 17 (Ref. A; see also Appendix)
DDH 401, 402, 403, 404, 407 in Sec. 23 (Ref. A; see also
Appendix.)
DDH 405, 406 in Sec. 26 (Ref. A; see also Appendix)

Location: Morrison County
Township 132N-30W, Sections 7, 11, 14, 16, 18, 36
References: A) DNR General Exploration File
Other Data: DDH 701, 702, 703 in Sec. 36 (Ref. A)
DDH 705, 708, 710 in Sec. 16 (Ref. A)
DDH 711, 713, 714 in Sec. 18 (Ref. A)
DDH 716, 717 in Sec. 7 (Ref. A)
DDH 715 in Sec. 14 (Ref. A)
DDH 712 in Sec. 11 (Ref. A; see also Appendix)

Location: Morrison County
Township 132N-31W, Sections 6, 21
Other Data: DDH 1911 in Sec. 6 (See Appendix)
DDH 1998 in Sec. 21 (See Appendix)

Location: Morrison County
Township 133N-30W, Section 9
Other Data: DDH 1997 in Sec. 29 (See Appendix)

Location: Mower County
Township 101N-18W, Section 33
Other Data: Clay minerals in Sec. 33, see also summary in Appendix.

Location: Mower County
Township 102N-18W, Sections 25, 27
Other Data: DDH T-1, T-2, T-3, T-4 in Sec. 27 (See Appendix)
Clay minerals in Sec. 25, see also summary in Appendix.

Location: Mower County
Township 103N-14W, Sections 11, 23
Other Data: DDH T-1, T-2 in Sec. 11 (See Appendix)
DDH T-1, T-2 in Sec. 23 (See Appendix)

Location: Mower County
Township 103N-17W, Sections 29, 32, 35
Other Data: DDH T-1, T-3 in Sec. 29 (See Appendix)

Clay minerals in Sec. 32 and 35, see also summary in Appendix.

Location: Mower County
Township 103N-18W, Sections 23, 33
Other Data: DDH T-1, T-3 in Sec. 33 (See Appendix)
Clay minerals in Sec. 23, see also summary in Appendix.

Location: Murray County
Township 105N-43W, Section 34
References: A) DNR Open File Drill Samples List
Other Data: DDH SQ-7 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 34 (Ref. A)
Clay minerals in Sec. 34, see also summary in Appendix.

Location: Nicollet County
Township 110N-30W, Sections 21, 35
Other Data: DDH T-20, T-23 in Sec. 21 (See Appendix)
Clay minerals in Sec. 35, see also summary in Appendix.

Location: Nicollet County
Township 111N-32W, Section 6
Other Data: Clay minerals in Sec. 6, see also summary in Appendix.

Location: Nicollet County
Township 111N-33W
Other Data: Clay minerals, see also summary in Appendix.

Location: Nobles County
Township 101N-39W, Sections 11, 20
References: A) DNR Open File Drill Samples List
Other Data: DDH RL-1 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 11 (Ref. A)
DDH RL-2 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 20 (Ref. A)
Clay minerals in Sec. 20, see also summary in Appendix.

Location: Nobles County
Township 101N-40W, Sections 2, 10, 27, 31, 33
Other Data: DDH W-13 in Sec. 2 (See Appendix)
DDH W-11 in Sec. 10 (See Appendix)
DDH W-22A, W-22B, W-23, W-25, W-24 in Sec. 27 (See Appendix)
DDH B-1, B-3 in Sec. 31 (See Appendix)
DDH W-12 in Sec. 33 (See Appendix)

Location: Nobles County
Township 101N-41W, Section 9
Other Data: DDH W-5 in Sec. 9 (See Appendix)

Location: Nobles County
Township 102N-39W, Sections 14, 27, 28, 32

Other Data: DDH W-21 in Sec. 14 (See Appendix)
DDH W-16 in Sec. 27 (See Appendix)
DDH W-15, W-14 in Sec. 28 (See Appendix)
DDH W-26 in Sec. 32 (See Appendix)

Location: Nobles County
Township 102N-40W, Sections 7, 15, 16, 22, 23, 24, 25, 26, 27, 34

Other Data: DDH W56-7, W56-4, W56-8, W56-5 in Sec. 7 (See Appendix)
DDH W56-10, W56-9, E-1, E-2 in Sec. 15 (See Appendix)
DDH W56-11 in Sec. 16 (See Appendix)
DDH W-9 in Sec. 22 (See Appendix)
DDH W-10 in Sec. 23 (See Appendix)
DDH W-27, W-7 in Sec. 24 (See Appendix)
DDH W57-4, W57-5 in Sec. 25 (See Appendix)
DDH W57-3, W57-6, W56-1, W57-2 in Sec. 26 (See Appendix)
DDH P-1, W56-2, W56-3, W56-6 in Sec. 27 (See Appendix)
DDH W57-7, W57-9, W57-8 in Sec. 34 (See Appendix)

Location: Nobles County
Township 102N-41W, Sections 10, 17, 22, 34

Other Data: DDH W-2 in Sec. 10 (See Appendix)
DDH WF-21, WF-22, WF-24, WF-4 in Sec. 17 (See Appendix)
DDH W-1 in Sec. 22 (See Appendix)
DDH W-8 in Sec. 34 (See Appendix)

Location: Nobles County
Township 103N-41W, Section 4

Other Data: DDH W-19, W-17 in Sec. 4 (See Appendix)

Location: Nobles County
Township 104N-40W, Section 35

Other Data: DDH W-20 in Sec. 35 (See Appendix)

Location: Norman County
Township 143N-44W, Section 34

References: A) DNR General Exploration File #1

Summary: Occurrence in Archean greenstone terrane (Ref. A)

Occurrences: DDH HL-1, in Sec. 34 (Ref. A)
- 36 ft. of 582-766 ppm Zn
- 10 ft. of 2 ppm Ag

Location: Norman County
Township 143N-45W, Sections 5, 20

References: A) DNR General Exploration File #1

Summary: Occurrence in Archean greenstone terrane (Ref. A)

Occurrences: DDH RK-1, in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 20, has: (Ref. A)
- 4 ft. of 592 ppm Zn

Other Data: Clay minerals in Sec. 5, see also summary in Appendix.
DDH W-1 in Sec. 5 (See Appendix)

Location: Norman County
Township 143N-46W, Section 12
Other Data: Iron Ores - Archean in Sec. 12, see also summary in Appendix.
Clay minerals in Sec. 12, see also summary in Appendix.
DDH W-1 in Sec. 12 (See Appendix)

Location: Norman County
Township 144N-44W, Section 9
Other Data: DDH E-1, E-2 in Sec. 9 (See Appendix)

Location: Norman County
Township 144N-46W, Section 1
References: A) DNR Open File Drill Samples List
Other Data: DDH K-1 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 1 (Ref. A)
Clay minerals in Sec. 1, see also summary in Appendix.

Location: Norman County
Township 145N-43W, Section 7
References: A) DNR Open File Drill Samples List
Other Data: DDH GD-1 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 7 (Ref. A)

Location: Norman County
Township 145N-44W, Sections 15, 20
References: A) DNR General Exploration File #1
B) DNR Open File Drill Samples List
Occurrences: DDH ST-1 in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 15 has: (Ref. A)
- 8 ft. of 2 to 3 ppm Ag
- 3 ft. of 71 ppm As
- trace of chalcopryrite noted
DDH ST-2 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 15 has: (Ref. A)
- 10 ft. of 0.10 ppm Au and 22 ppm As
- 44 other ft. of 21-44 ppm As
- 20 ft. of 0.08 ppm Au
- trace of chalcopryrite noted
Other Data: DDH ST-3 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 15 (Ref. B)
Clay minerals in Sec. 15 and 20, see also summary in Appendix.

Location: Norman County
Township 145N-45W, Sections 8, 14
References: A) DNR Open File Drill Samples List
Other Data: DDH GM-1 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 8 (Ref. A)
DDH FL-1 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 14 (Ref. A)
Clay minerals in Sec. 14, see also summary in Appendix.

Location: Norman County
Township 145N-47W, Section 15
Other Data: DDH RRVD-26 in Sec. 15 (See Appendix)

Location: Norman County
Township 146N-44W, Section 36
References: A) DNR Open File Drill Samples List
B) DNR General Exploration File #1
Occurrences: DDH GA-1 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 36 (Ref. A and B)
- 100 ft. of 620 ppm to .24% Cr
- 40 ft. 654-795 ppm Ni
- 20 ft. of 0.21 ppm Au

Location: Olmsted County
Township 105N-13W, Sections 3, 5, 7
Other Data: DDH T-1, T-3 in Sec. 3 (See Appendix)
DDH T-1, T-2 in Sec. 5 (See Appendix)
DDH T-2, T-3 in Sec. 7 (See Appendix)

Location: Olmsted County
Township 105N-14W, Sections 12, 22, 31, 32
Other Data: DDH T-1 in Sec. 12 (See Appendix)
DDH T-1, T-2 in Sec. 22 (See Appendix)
DDH T-1 in Sec. 31 (See Appendix)
DDH T-2 in Sec. 32 (See Appendix)

Location: Olmsted County
Township 106N-11W, Sections 28, 29, 30
Other Data: DDH T-1, T-2 in Sec. 28 (See Appendix)
DDH T-1 in Sec. 29 (See Appendix)
DDH T-2 in Sec. 30 (See Appendix)

Location: Olmsted County
Township 106N-12W, Sections 27, 29, 30
Other Data: DDH T-1, T-2, T-3, T-1A, T-2A, T-3A in Sec. 27 (See Appendix)
DDH T-1, T-1A, T-2 in Sec. 29 (See Appendix)
DDH T-2 in Sec. 30 (See Appendix)

Location: Olmsted County
Township 106N-13W, Sections 19, 20, 26, 27, 28, 34
Other Data: DDH T-3, T-3A in Sec. 19 (See Appendix)
DDH T-1 in Sec. 20 (See Appendix)
DDH T-2, T-3, T-4, T-6 in Sec. 26 (See Appendix)
DDH T-1, T-1A in Sec. 27 (See Appendix)
DDH T-2, T-3 in Sec. 28 (See Appendix)
DDH T-2 in Sec. 34 (See Appendix)

Location: Olmsted County
 Township 106N-14W, Sections 2, 3, 10, 11, 14, 15, 19, 24

Other Data: DDH T-7 in Sec. 2 (See Appendix)
 DDH T-1 in Sec. 3 (See Appendix)
 DDH T-1D, T-1C, T-3B, T-1B, T-3A, T-1A, T-1, T-2, T-3, T-4
 in Sec. 10 (See Appendix)
 DDH T-1, T-2, T-2A in Sec. 11 (See Appendix)
 DDH T-1, T-1A, T-4, T-5, T-6 in Sec. 14 (See Appendix)
 DDH T-1 in Sec. 15 (See Appendix)
 DDH T-5 in Sec. 19 (See Appendix)
 DDH T-2 in Sec. 24 (See Appendix)

Location: Olmsted County
 Township 107N-11W, Sections 33, 34

Other Data: DDH T-2 in Sec. 33 (See Appendix)
 DDH T-1 in Sec. 34 (See Appendix)

Location: Olmsted County
 Township 107N-13W, Section 32

Other Data: Clay minerals in Sec. 32, see also summary in Appendix.

Location: Olmsted County
 Township 107N-14W, Sections 1, 11, 12, 14, 16, 23, 25, 26, 35

References: A) Winchell, 1884, Geol. of Minn., Vol. 1, p. 346
 B) Upham, 1898, Vol. 8, p. 291
 C) Heyl & West, 1982, Econ. Geol., Vol. 77, p. 1810;
 citation of A.E. Flint written communication to
 A. F. Agnew, early 1950's; see map p. 1804.

Occurrences: "Lead prospects along Zumbro River; nineteenth century
 lead mines in river bank; ore occurs in gash veins." (Ref. C,
 p. 1810) [Location "in the west edge of Sec. 25, along the
 east band of the Zumbro River (approx. 44°N-93°15' W)"]
 "Gold has been found in the drift along the Zumbro from
 Rochester and Oronoco down to the Wabasha border and beyond.
 It is found only on the Cambrian limestones. Murchison calls
 attention to this fact as generally true. It is found in the
 drift about the stream, but mostly in the bed of the stream
 or in material worked over by it at a comparatively recent
 date . . . The gold is in minute, angular fragments. The
 quantity is so small that it does not pay to work it by the
 ordinary method of hand washing" (Ref. A, p. 346). [Location
 probably Sec. 1, 11, 12, 14, 23, 26, 35]

Testpits: Mines in Sec. 25, see above

Other Data: DDH T-1, T-4, T-7, T-8, T-11, T-12, T-14, T-16, T-17 in Sec.
 16 (See Appendix)

Location: Olmsted County
 Township 108N-13W

References: A) Hoeft, 1959, U of M Thesis, p. 178

Occurrences: "In southern Goodhue County and in Olmsted County the
 Pecatonica retains . . . Phosphatic material is very
 abundant" (Ref. A, p. 178).

Location: Olmsted County
 Township 108N-14W, Sections 2, 11, 14, 23, 26, 35, 36

References: A) Winchell, 1884, Geol. of Minn., Vol. 1, p. 346
 B) Upham, 1898, V. 8, p. 291

Occurrences: "Gold has been found in the drift along the Zumbro from Rochester and Oronoco down to the Wabasha border and beyond. It is found only on the Cambrian limestones. Murchison calls attention to this fact as generally true. It is found in the drift about the stream, but mostly in the bed of the stream, or in material worked over by it at a comparatively recent date . . . The gold is in minute, angular fragments. The quantity is so small that it does not pay to work it by the ordinary method of hand washing" (Ref. A, p. 346 and B, p. 291).

Other Data: DDH T-1, T-2 in Sec. 11 (See Appendix)

Location: Otter Tail County
 Township 132N-37W, Section 34

Other Data: DDH 1646, 1647 in Sec. 34 (See Appendix)

Location: Otter Tail County
 Township 133N-36W, Section 1

Other Data: DDH 1642 in Sec. 1 (See Appendix)

Location: Otter Tail County
 Township 133N-43W

Other Data: Clay minerals, see also summary in Appendix.

Location: Otter Tail County
 Township 134N-44W, Section 21

Other Data: DDH RRVD-24 in Sec. 21 (See Appendix)

Location: Otter Tail County
 Township 135N-37W, Section 1

References: A) Anderson, 1957, p. 46

Other Data: DDH 7-1 in Sec. 1, (Ref. A)

Location: Otter Tail County
 Township 136N-40W, Section 7

References: A) Anderson, 1957, p. 40

Other Data: DDH 2-1 in Sec. 7 (Ref. A)

Location: Otter Tail County
 Township 136N-41W, Section 34

Other Data: DDH MC-1 in Sec. 34 (See Appendix)

Location: Otter Tail County
Township 137N-39W, Section 22

References: A) Anderson, 1957, pp. 41-43

Occurrences: Native Copper:
DDH 3-1: 400'N and 50'W of SE corner Sec. 22 (SE $\frac{1}{4}$ -SE $\frac{1}{4}$):
440'-485': "highly weathered amphibolite gneiss (?)
becoming finer grained and less weathered downward. Weak
foliation, some later shearing. Large phenocrysts or
metacrysts at intervals. Bearing sulphides at 459.
Disseminated native copper around 459." [SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec.
22], (Ref. A, p. 41).

Other Data: DDH 3-2, 3-3, 3-4 in Sec. 22 (Ref. A, pp. 41-43)
Native Copper in Sec. 22, see also summary in Appendix.

Location: Pine County
Township 38N-20W

References: A) Winchell, 1888, Vol. II, p. 643

Occurrences: "A mass of drift copper weighing eighty pounds is said to
have been found by Scott La Prairie in the bed of the Snake
River a short distance below Chengwatana" [exact location
unknown], (Ref. A, p. 643).

Location: Pine County
Township 38N-21W

References: A) Ojakangas and Matsch, 1982, Minnesota's Geology, p. 141.

Occurrences: Native Copper: "and there are several test sites just east
of Pine City." [exact location uncertain], (Ref. A, p. 141)

Location: Pine County
Township 39N-20W

Other Data: Native Copper, see also summary in Appendix.

Location: Pine County
Township 39N-21W, Sections 25, 26, 34

References: A) Winchell, 1888, Vol. II, pp. 636-637
B) Ojakangas and Matsch, 1982, Minnesota's Geology, p. 141

Occurrences: Native Copper: 1. Mr. Adolf Munch: several shafts of
little depth, about 3/4 mile below Chengwatana, upon each
side of the river and in its channel. Trap rock. [Location
probably in Sec. 25, 26] (Ref. A, p. 25, 26)
2. Chengwatana Mining Company, Mr. J. Bennett Smith, during
1880-1881, shafts at 3 points on north side of river 3/4 mile
east, 1.0 mile east, 1 $\frac{1}{2}$ miles east from Chengwatana. First
is in red conglomerate, 30 ft. thick, strike N15°E dip 70°S
75°E. At 1.0 mile east, shaft in amygdaloidal bed, 50 ft.
wide, dip 70°S 75°. The shaft had been excavated to a depth
of 45 feet, below which farther exploration was done with a
diamond drill. [Probably Sec. 25, 26], (Ref. A, pp. 636-637)
". . . and there are several test sites just east of Pine
City." [Location probably in Sec. 34] (Ref. B, p. 141).

Testpits: Sec. 25, 26, 34, see above.

Location: Pine County
Township 40N-19W, Sections 19, 33

References: A) Ileichen and Grimes, 1908, pp. 18-20, 23
B) Winchell, Vol. II, 1888, p. 634

Occurrences: "There is a peculiar feature about the Big Eddy, previously mentioned as in Section 19, Township 40, Range 19. This eddy is formed by an enlargement of the area of the river which at the same time goes over a trap and deepens from a few feet to 20 or 30 feet in a perpendicular drop. On the south shore of the river about a hundred yards along the bank from his ledge is a calcite vein in the quarter cracking of the trap. This is perhaps four inches wide and is peculiar only because iron and copper-iron-pyrites were found in place in the calcite", [Sec. 19], (Ref. A, pp. 19, 20).

Native(?) Copper: trap rock with calcite veins nearby, Mr. N.C.D. Taylor sunk prospecting shafts in 1865, [SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 33], (Ref. B, p. 634).

Testpits: In SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 33, see above

Other Data: Native Copper in Sec. 19 and 33, see also summary in Appendix.

Location: Pine County
Township 40N-20W, Sections 12, 34

References: A) Ileichen and Grimes, 1908, pp. 18-20, 23

Occurrences: Native Copper: "An outcrop is reported by residents of Hinckley on the creek a quarter of a mile west of the government road", [Sec. 12], (Ref. A, p. 18).

Other Data: Native Copper in Sec. 34, see also summary in Appendix.

Location: Pine County
Township 41N-16W

References: A) Winchell, 1888, Vol. II, p. 643

Occurrences: Native Copper: "Another piece weighing twenty-two pounds was found on the St. Croix river about 3 miles east of the mouth of Tamarack creek", [exact location unknown], (Ref. A, p. 643).

Location: Pine County
Township 41N-19W, Sections 19, 26, 29, 35

References: A) Ileichen and Grimes, 1908, pp. 18-20, 23.

Occurrences: "In Sections 29 and 19, Township 41, Range 19, there is a soft blue claylike substance which becomes very hard when dry. This we have not assayed personally, but it is claimed by fairly reliable people that this stuff ran 1.1% copper, and .4 oz. of silver. This blue rock can be found at varying depths for a half mile along the river. A group of business men of Chisholm, Minnesota, are prospecting here, and on the SE $\frac{1}{4}$ of the SE $\frac{1}{4}$, Section 26 and the NE $\frac{1}{4}$ of the NE $\frac{1}{4}$ of Section 35, by means of diamond drill borings," [Sec. 19, 26, 29, 35], (Ref. A, p. 19).

Other Data: Native Copper in Sec. 19 and 29, see also summary in Appendix.

Location: Pine County
Township 41N-20W, Sections 26, 34

References: A) Eng, DNR Minerals, pers. comm. 11/1984
B) Ilichen and Grimes, 1908, pp. 18-20 & 23
C) Ojakangas and Matsch, 1982, pp. 140, 141

Occurrences: An old copper mine shaft in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 26 was backfilled by the MNDOT Sandstone maintenance garage in 1957 in the roadbed in trunk highway 48 near Hinckley (east of the bridge over the Kettle River). It required periodic backfilling with bituminous patching (Ref. A).
"Assay of quartz filling found on Section 34, Township 41, Range 20 ran 0.25% copper and .02 oz silver." (Ref. B, p. 19).
"Just east of Hinckley on the east bank of the Kettle River, the Great Northern Copper Company reportedly mined native copper from 1897 to 1902." [Location uncertain] (Ref. C. pp. 140-141).
"Other operations not previously mentioned are a prospect just a few feet north of the bridge on the Turpville road. This is apparently on a fissure filled with quartzose material which follows the general strike of the trap to the south . . . Assays made by us of samples taken at random from the prospect holes ran 0.17% copper and 0.02 oz. silver per ton. The Great Northern Copper Company is operating here." [Location uncertain, possibly Sec. 26, see above] (Ref. B, p. 18)

Other Data: Native Copper in Sec. 26, see also summary in Appendix.

Location: Pine County
Township 43N-16W, Section 22

References: A) Eng, DNR Minerals, pers. comm. 11/1984

Occurrences: On the John Fuery farm in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 22, a native copper boulder probably 3 feet (or more) in diameter was found at 10 feet depth in 1956 while digging a shallow water well. The well had to be abandoned because the copper inhibited the digging. Mr. Fuery sawed off a sample, showed it to M. Eng, and reported it to the University of Minnesota. M. Eng described the sample as sharp and spiny, so interpreted it to not have been transported very far by the glacier (Ref. A)

Other Data: Native Copper in Sec. 22, see also summary in Appendix.

Location: Pine County
Township 43N-20W, Section 11

Other Data: DDH T-1, T-2, T-3, T-4 in Sec. 11 (See Appendix)

Location: Pine County
Township 44N-21W, Sections 1, 10, 19, 20

References: A) DNR Open File Drill Samples List

B) Keighin, Morey, & Goldich, 1972, MGS Cent. Vol., pp. 243-244

Occurrences: "The gneiss along Bremen Creek (table IV-7) resembles typical McGrath Gneiss (phase 1) in hand specimen. In thin section, however, it is seen to be granular and recrystallized rock, and much fresher appearing than phase 1; the plagioclase is less highly sericitized and there is an appreciable amount of flourite, which is found only in trace amounts in other samples of the gneiss. Flourite is abundant in a fine-grained aplite dike (table IV-7) that is concordant to the structure of the gneiss in the bed of Bremen Creek. The relation of this rock to gneiss elsewhere in the area is unknown." (Ref. B, p. 243)

The gneiss has 0.5 (mode, vol %) fluorite and the aplite has 0.9 (mode vol %) fluorite. (Ref. B, see Table IV-7, p. 244) [Location not cited, probably Sec. 19 & 20]

Other Data: DDH PR-1 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 1, (Ref. A)
DDH RS-1 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 10 (Ref. A)
DDH RS-2 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 10 (Ref. A)
Clay minerals in Sec. 10, see also summary in Appendix.

Location: Pine County
Township 45N-17W, Section 20
Other Data: DDH T-5, T-6 in Sec. 20 (See Appendix)

Location: Pine County
Township 45N-19W, Section 11
References: A) DNR Open File Drill Samples List
Other Data: DDH MLCH-13 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 11 (Ref. A)

Location: Pine County
Township 45N-20W, Sections 3, 4, 7, 8, 10, 19, 20, 28, 29
References: A) DNR General Exploration File #4
B) Winchell, 1899, Vol. 4, p. 23
C) DNR Open File Drill Samples List
D) Keighin, Morey, Goldich, 1972, Cent. Vol., p. 249
E) Weiblen, 1964, Thesis, pp. 26, 43, 45, 106
F) Rapp and Wallace, 1966, p. 38
Occurrences: DDH ML-43C, in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 29, has: (Ref. A)
- 24 feet with chalcopryrite in schist
- 1 ft. with chalcopryrite in graphite
- 1 ft. with chalcopryrite in dolomite
- 3 ft. of 599 ppm Cu
- 1 ft. of 1420 ppm V, 110 ppm Mo, 48.5 ppm U, 7.84% S
DDH ML-45C, in NE $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 29, has: (Ref. A)
- 2.5 ft. of 2.91% P₂O₅, 24 ppm Th, 1090 ppm V, 6020 ppm F,
and 320 ppm U total, in a graphitic unit with apatite in
dolomite
- 2 ft. of 0.73% P₂O₅
- 1 ft. of 1150 ppm Cu, 838 ppm V, 110 ppm Mo, 40 ppm As, and
60 ppm U total
- see Mr. Honea's mineralogy report identifying uranoan
apatite, silver-bearing selenian galena, and miargyrite

indicating the nature of the probable hydrothermal events.

- "Gamma anomaly, 4 ft. of 0.01% eU" at 382.5 to 386.5 footage
- "Gamma anomaly, 2 ft. of 0.003% eU" at 411.5 to 413.7 footage

DDH MLCH-6 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 29, has: (Ref. A)

- 4 ft. of 1270 ppm F

DDH ML-23 in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 29, File 4, Sheets 4 & 24, has (Ref. A)

- 10 ft. of 710 to 1650 ppm Zn
- 5 ft. of 840 ppm Co, 500 ppm Ni

DDH ML-53C in NE $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 29, File 4, Sheets 4 & 24, has (Ref. A)

- 3 ft. of 550 to 3320 ppm Cu
- 1 ft. of 2.6 ppm Ag, 70 ppm Mo
- 2 ft. of 650 ppm Zn

DDH ML-56C in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 29, File 4, Sheets 4 & 24, has (Ref. A)

- 1 ft. of 620 ppm Cu
- 2 ft. of 73 ppm Mo, 0.25% P $\frac{2}{5}$ O $\frac{5}{5}$
- Graphite schist, 3 ft. thick, with about 100 ppm eU $\frac{3}{8}$ O $\frac{3}{8}$
- Graphite-chlorite phyllite, one ft. thick, with about 100 ppm eU $\frac{3}{8}$ O $\frac{3}{8}$
- Graphitic phyllite, one ft. thick, with about 120 ppm eU $\frac{3}{8}$ O $\frac{3}{8}$

DDH ML-49C in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 29, File 4, Sheets 4 & 24, has (Ref. A)

- 1 ft. of 2.6 ppm Ag, 620 ppm Cu, 89 ppm Mo

Garnet occurs within the Thomson formation northeast of Denham, in NE $\frac{1}{4}$ of Sec. 19. The modes in volume percent range from 4.6 to 8.4. (Ref. D, Tables IV-10, IV-11, p. 249) [See also Ref. E, pp. 26, 43, 45, 106 for garnet and staurolite.]

"An impure marble is at the surface only in the area southeast of the village of Denham" [Location uncertain] (Ref. F, p. 38]

Testpits: A testpit is reported in Sec. 4, east bank of the river, in a list of old gold prospects (Ref. B, p. 23).

Other Data: DDH ML-22 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 20 (Ref. C)
 DDH ML-42C in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 20 (Ref. C)
 DDH ML-55CA in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 28 (Ref. C)
 DDH ML-44C, ML-50C, ML-51C, ML-52C, ML-54C, MLCH-10 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 29 (Ref. C)
 DDH ML-20 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 29 (Ref. C)
 DDH ML-21 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 29 (Ref. C)
 DDH ML-19 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 29 (Ref. C)
 DDH KR-2 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 3 (Ref. C)
 DDH KRCH-8 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 4 (Ref. C)
 DDH MLCH-8 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 7 (Ref. C)
 DDH ML-27 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 8 (Ref. C)
 DDH JW-1 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 10 (Ref. C)
 DDH DRP-1, DRP-2 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 19 (Ref. C)

Garnet and Staurolite, see also summary in Appendix.

Clay minerals in Sec. 19, 20, 28, and 29, see also summary in Appendix.

Location: Pine County
Township 45N-21W, Sections 1, 9, 11, 25, 36

References: A) DNR Project Files
B) DNR General Exploration File
C) DNR Open File Drill Samples List

Occurrences: The Paul Rybak prospect in a biotite schist in W $\frac{1}{2}$ -SE $\frac{1}{4}$, Sec. 25, has: (Ref. A, Project 64a)
- one sample with 20 ppm Ag, .002 oz/T Au, 1790 ppm Cu
- another sample with 0.02 oz/T Au, 0.26 oz/T Ag, 0.8% Pb, .05% Zn, note that fire assay method was used
- another sample with 0.01 oz/T Au, 0.36 oz/T Ag, 0.75% Pb, 0.43% Zn, [note that fire assay method was used]
In NW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec. 33 from a testpit 50 ft. long, 12 feet deep, 15 feet wide, Mr. Filipick brought 3 samples described as augen gneiss containing magnetite crystals, some granitic materials, and schists for scintillator readings. One sample had "copper pyrites, magnetite, and schists" and another had a reading of 0.12 mR/Hr. (Ref. B)
DDH D-2 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 9, (Ref. B) has:
- 3 ft. of 0.40 to 0.44% $\frac{P_2O_5}{2-5}$

Testpits: In NW $\frac{1}{4}$ -NE $\frac{1}{4}$ of Sec. 33 (see above description Ref. B).
In W $\frac{1}{2}$ -SE $\frac{1}{4}$, Sec. 25 (see above description Ref. B)

Other Data: DDH KRCH-1 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 1 (Ref. C)
DDH D-1 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 9 (Ref. C)
DDH ML-26 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 11 (Ref. C)
Clay minerals in Sec. 9 and 11, see also summary in Appendix.

Location: Polk County
Township 147N-44W, Section 20

Other Data: Clay minerals in Sec. 20, see also summary in Appendix.

Location: Polk County
Township 148N-45W, Section 19

References: A) DNR Open File Drill Samples List
B) DNR General Exploration File #1
C) DNR Project File #158

Occurrences: DDH P4-B in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 19 has: (Ref. A, B, C)
- 38 ft. of oxide-rich rock with up to
49% $\frac{Fe_2O_3}{2-3}$
0.95% $\frac{V_2O_5}{2-5}$
3.42% $\frac{TiO_2}{2}$

Other Data: Titaniferous Magnetite in Sec. 19, see also summary in Appendix.

Location: Polk County
Township 149N-43W, Section 26

References: A) DNR General Exploration File

Other Data: DDH L-2, L-3, L-4 in Sec. 26 (Ref. A)
DDH L2, L3, L4 in Sec. 26 (See Appendix)

Location: Polk County
Township 150N-46W
Other Data: Clay minerals, see also summary in Appendix.

Location: Polk County
Township 152N-49W, Section 11
Other Data: DDH RRVD-27 in Sec. 11 (See Appendix)

Location: Pope County
Township 123N-40W, Section 32
References: A) DNR Open File Drill Samples List
Other Data: DDH 27008 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 32 (Ref. A)
Clay minerals in Sec. 32, see also summary in Appendix.

Location: Pope County
Township 124N-39W, Section 21
References: A) DNR Open File Drill Samples List
Other Data: DDH 27009 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 21, (Ref. A)
Clay minerals in Sec. 21, see also summary in Appendix.

Location: Ramsey County
Township 28N-23W, Section 5
References: A) Mossler, 1970, MGS personal notes
Occurrences: In E $\frac{1}{2}$ -NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 5, sphalerite crystals were noted in Platteville limestone (Ref. A).
Other Data: Clay minerals, see also summary in Appendix.

Location: Ramsey County
Township 29N-22W
References: A) Pettijohn, 1925, Thesis, p. 1
Occurrences: "The problem consisted of a study of certain small polished black pebbles occurring at several horizons in the Ordovician of the Twin City Region. The pebbles are hard black shiny phosphate granules and consist in a large part of diminutive internal molds of gastropod shells. They are associated with "corrosion pebbles", "corrosion surfaces", and quartz grains in a siliceous dolomite. Their chemical composition is such as would lead one to believe that they consist of lime phosphate with inclusion of calcium carbonate and iron sulfide." (Ref. A, p. 1)

Location: Ramsey County
Township 29N-23W
Other Data: Native Copper, see also summary in Appendix.

Location: Ramsey County
Township 30N-22W, Section 24
References: A) Winchell, 1888, Vol. II, p. 372
Occurrences: "Two copper nuggets were found on the south side of White

Bear lake near the Washington county line;" [probably Sec. 24], (Ref. A, p. 372).

Location: Red Lake County
Township 150N-44W, Section 10
Other Data: DDH RRVD-28 in Sec. 10 (See Appendix)

Location: Redwood County
Township 109N-38W, Section 35
Other Data: DDH UNK in NW-NE, Sec. 35 (See Appendix)

Location: Redwood County
Township 109N-39W, Section 17
Other Data: DDH UNK-1 in SW-SE, Sec. 17 (See Appendix)

Location: Redwood County
Township 112N-34W, Sections 8, 23
Other Data: Clay minerals in Sec. 8 and 23, see also summary in Appendix.

Location: Redwood County
Township 112N-35W, Sections 1, 2, 6, 8, 19, 30
Other Data: Clay minerals in Sec. 1, 2, 8, and 30, see also summary in Appendix.
DDH RF-25 in Sec. 6 (See Appendix)
DDH RF-33 in Sec. 19 (See Appendix)

Location: Redwood County
Township 112N-36W, Sections 1, 2, 11, 12, 13, 14, 18, 22, 23, 24, 25, 36
Other Data: DDH RF-14, BUCKLEY, RF-11, RF-12 in Sec. 1 (See Appendix)
DDH RF-10, RF-13 in Sec. 2 (See Appendix)
DDH RF-15, RF-20, RF-5 in Sec. 11 (See Appendix)
DDH 1, 2, RF-24, RF-16, RF-18, RF-23, RF-19, RF-21, RF-22, RF-17 in Sec. 12 (See Appendix)
DDH RF-2, RF-36 in Sec. 13 (See Appendix)
DDH RF-38, RF-40, RF-41, RF-1 in Sec. 14 (See Appendix)
DDH RF-34, RF-3 in Sec. 18 (See Appendix)
DDH RF-32 in Sec. 22 (See Appendix)
DDH RF-29 in Sec. 23 (See Appendix)
DDH RF-27, RF-30 in Sec. 24 (See Appendix)
DDH RF-26, RF-35 in Sec. 25 (See Appendix)
DDH RF-31 in Sec. 36 (See Appendix)

Location: Redwood County
Township 113N-35W, Sections 29, 31, 32, 33, 34, 35
Other Data: Clay minerals in Sec. 29, 31, 32, 33, 34, 35, see also summary in Appendix.

Location: Redwood County
Township 113N-36W, Sections 4, 24
Other Data: Clay minerals in Sec. 4 and 24, see also summary in Appendix.

Location: Renville County
Township 110N-30W, Section 35
Other Data: Clay minerals in Sec. 35, see also summary in Appendix.

Location: Renville County
Township 112N-32W, Section 31
Other Data: Clay minerals in Sec. 31, see also summary in Appendix.

Location: Renville County
Township 112N-33W, Sections 18, 21, 27
References: A) DNR Project File 206; MGS Samples

Occurrences: Sample MFG-961 in Sec. 18, is a weathered mafic rock with:
(Ref. A, # 206) This is from part of the Cretaceous
weathering profile on Archean gneiss terrane.

- 2.6 ppm Ag
Other Data: Clay minerals in Sec. 21 and 27, see also summary in
Appendix.

Location: Renville County
Township 112N-34W, Sections 3, 11
Other Data: Clay minerals in Sec. 3 and 11, see also summary in Appendix.

Location: Renville County
Township 113N-34W, Sections 7, 31, 33
References: A) DNR Project File 206; MGS Samples
B) Goldich and Wooden, 1980, II, pp. 269, 273, 274, 292-295
C) Nielsen & Weiblen, 1980, pp. 95-103

Occurrences: Sample MFG-970 in Sec. 33 is a weathered gneiss with: (Ref. A)

This is from part of the Cretaceous weathering profile on
Archean gneiss terrane.

- 4.8 ppm Ag

"In the Morton area the tonalitic gneisses contain numerous enclaves or fragments of amphibolite . . . Many, although not all, of the smaller clasts are plagioclase-poor amphibolites, and these were derived from precursors of basaltic komatiite composition. Chemical analyses of the two types of amphibolites are given in Table 3 (664 and 665). Both varieties are iron-rich but analysis 665 is characterized by low Al_2O_3 and high contents of MgO, Cr, and Ni. Chemically, the samples are similar to the basaltic komatiite of South Africa (Viljoen and Viljoen, 1969). These samples, together with two samples of similar composition from Granite Falls, are plotted in Fig. 5."

Sample 665 is a low-Al amphibolite with 800 ppm chromium.

[Probably Sec. 7] (Ref. B, pp. 292, 293)

The Archean Morton Gneiss in Sec. 31 has: (Ref. C, see Table 1)

- 7.8 (% modal) sulfides in pyroxene amphibolite

Other Data: Clay minerals in Sec. 33, see also summary in Appendix.

Location: Renville County

Township 113N-35W, Sections 22, 30, 32

References: A) DNR Project File 206; MGS Samples

Occurrences: Sample MFG-979 in Sec. 22, is a weathered mafic inclusion in gneiss with: (Ref. A) (This is from part of the Cretaceous weathering profile on Archean gneiss terrane.)

- 2.2 ppm Ag

- 7200 ppm Zn

Sample MFG-991, in Sec. 32 is a pisolitic brown clay (Parham's unit 2) with: (Ref. A) (This is from part of the cretaceous weathering profile on Archean gneiss terrane.)

- 106 ppm As

Other Data: Clay minerals in Sec. 30, see also summary in Appendix.

Location: Renville County

Township 113N-36W, Section 4

References: A) Grout, 1937, p. 65

Occurrences: A vein was prospected for gold. "A similar vein was explored two and a half miles north of Delhi, in the northwest quarter of Sec. 4, T. 113 N., R. 36 W., and from there northwest a mile or more.²¹ The quartz of the vein is shattered and full of strain shadows, and has associated some albite (Ab₉₅An₅). It crosses a basic rock that has the petrographic character of a hornfels, but is not exposed well enough to show its origin. These (two) veins are probably pegmatitic but may have later hypothermal quartz added and they are old enough to have suffered considerable deformation." (Ref. A, p. 65)

Other Data: Clay minerals, see also summary in Appendix.

Location: Rice County

Township 109N-21W, Section 1

Other Data: DDH T-1, T-2 in Sec. 1 (See Appendix)

Location: Rice County

Township 110N-20W, Section 33

References: A) Johnson, 1933, Masters Thesis, p. 38

Occurrences: "Gold and native copper occurs in very small amounts have been found in the drift at Lieb's quarry." It is red glacial drift with yellow, white, & red sand, many granite boulders and limonite concretions. It overlies the Decorah shale, ranges from 10' to 50' thick and was interpreted as Illinoian age drift (Ref. A, p. 38). [Note: Lieb's quarry was located in a plat book at SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 33, but location was not in original citation.]

Other Data: Native Copper in Sec. 33, see also summary in Appendix.

Location: Rice County
Township 110N-21W, Sections 24, 26, 35
Other Data: DDH T-1, T-2, T-3 in Sec. 24 (See Appendix)
DDH T-1, T-2 in Sec. 26 (See Appendix)
DDH T-1, T-1A, T-2, T-2A, T-3, T-3A in Sec. 35 (See Appendix)

Location: Rice County
Township 111N-20W, Section 1
Other Data: DDH T-1, T-2 in Sec. 1 (See Appendix)

Location: Rice County
Township 112N-20W, Section 36
Other Data: DDH T-1, T-2, T-3 in Sec. 36 (See Appendix)

Location: Rice County
Township 112N-21W, Section 14
Other Data: DDH L65-2, L65-1 in Sec. 14 (See Appendix)

Location: Roseau County
Township 159N-41W, Section 36
Other Data: DDH W1-84 in Sec. 36 (See Appendix)

Location: Roseau County
Township 159N-43W, Sections 25, 29
Other Data: DDH E-3 in Sec. 25 (See Appendix)
DDH E-5 in Sec. 29 (See Appendix)

Location: Roseau County
Township 159N-44W, Sections 20, 23
Other Data: DDH E-6 in Sec. 20 (See Appendix)
DDH E-4, E-4A in Sec. 23 (See Appendix)

Location: Roseau County
Township 160N-42W, Section 32
Other Data: DDH RRVD-29 in Sec. 32 (See Appendix)

Location: Roseau County
Township 160N-43W, Sections 1, 33
Other Data: DDH C-9 in Sec. 1 (See Appendix)
DDH D-5 in Sec. 33 (See Appendix)

Location: Roseau County
Township 160N-44W, Section 34
Other Data: DDH D-6 in Sec. 34 (See Appendix)

Location: Roseau County
Township 161N-36W, Section 6

References: A) Meineke & Listerud, 1978, DNR Map 143, Sheet 2

Summary: Archean greenstone terrane

Occurrences: DDH W3-1, in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 6, has: (Ref. A)
- mafic tuff, intermediate volcanics, mafic volcanoclastics, intermediate tuff, basalt; with chalcopryrite noted.

Location: Roseau County
Township 161N-37W, Sections 9, 12

References: A) Meineke & Listerud, 1978, DNR Map 143, Sheet 2
B) DNR Open File Drill Samples List

Summary: Archean greenstone terrane

Occurrences: DDH W1-1 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 12, has: (Ref. A)
- mafic to intermediate volcanoclastics, basalt, felsic volcanics, diabase; with chalcopryrite noted.

Other Data: DDH HC-1 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 9 (Ref. B)

Location: Roseau County
Township 161N-43W, Section 33

Other Data: DDH C-8 in Sec. 33 (See Appendix)

Location: Roseau County
Township 161N-44W, Sections 30, 34

Other Data: DDH G-6 in Sec. 30 (See Appendix)
DDH C-7 in Sec. 34 (See Appendix)

Location: Roseau County
Township 162N-36W, Sections 10, 18, 27, 31, 35, 36

References: A) Meineke & Listerud, 1978, DNR Map 143, Sheet 2
B) DNR General Exploration File, #2
C) DNR Project File, #76

Summary: Occurrences in Archean greenstone terrane.

Occurrences: DDH W9-1 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 10, has: (Ref. A)
- felsic and intermediate volcanoclastics, and intermediate tuff; with chalcopryrite noted.

DDH W8-1 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 35, has: (Ref. A)
- felsic and intermediate tuff; 15 ft. of magnetite-rich rock; mafic tuff; intermediate volcanoclastics; fragmental felsic and intermediate tuff, with felsic intrusive; with chalcopryrite noted.

DDH W13-1 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 18, has: (Ref. A)
- ultramafics with some serpentinized and fragmental; with malachite noted.

- Sa #R3384: $\frac{1}{2}$ (?) ft. of 0.36% Cr_2O_3 , 800 ppm Ni
- Sa #R3385: $\frac{1}{2}$ (?) ft. of 0.32% Cr_2O_3 , 570 ppm Ni
- Sa #R3386: $\frac{1}{2}$ (?) ft. of 0.33% Cr_2O_3 , 560 ppm Ni
[Sec 18], (Ref A, B and C, #76)

Other Data: Clay minerals in Sec. 31, see also summary in Appendix.
DDH YGWA-1, YGWA-2, YWA-3, YWA-4 in Sec. 27 (See Appendix)
DDH BD-1, BD-2 in Sec. 31 (See Appendix)
DDH W13-1 in Sec. 36 (See Appendix)
DDH W8-1 in Sec. 35 (See Appendix)

Location: Roseau County
 Township 162N-37W, Sections 14, 27, 36
 Other Data: DDH WB-1 in Sec. 27 (See Appendix)
 DDH SP-2, SP-1A in Sec. 36 (See Appendix)
 DDH D-1 in SEC. 14 (See Appendix)

Location: Roseau County
 Township 162N-43W, Sections 28, 36
 Other Data: DDH B-6 in Sec. 28 (See Appendix)
 DDH B-7 in Sec. 36 (See Appendix)

Location: Roseau County
 Township 162N-44W, Sections 15, 33, 35
 Other Data: DDH B-10 in Sec. 15 (See Appendix)
 DDH YGH-1 in Sec. 33 (See Appendix)
 DDH YGH-2 in Sec. 35 (See Appendix)

Location: Roseau County
 Township 163N-40W, Section 36
 Other Data: DDH J-1 in Sec. 36 (See Appendix)

Location: Scott County
 Township 115N-22W, Section 5
 Other Data: DDH T-1009, T-1010 in Sec. 5 (See Appendix)

Location: Scott County
 Township 115N-23W, Sections 1, 2, 10
 Other Data: Clay minerals, see also summary in Appendix.
 DDH T-30, T-32 in Sec. 1 (See Appendix)
 DDH T-44, T-8, T-9 in Sec. 2 (See Appendix)
 DDH T-4 in Sec. 10 (See Appendix)

Location: Sherburne County
 Township 32N-26W, Section 3
 Other Data: DDH T-4 in Sec. 3 (See Appendix)

Location: Sherburne County
 Township 34N-29W, Section 13
 Other Data: DDH T-1, T-2 in Sec. 13 (See Appendix)

Location: St. Louis County
 Township 49N-14W, Sections 4, 6
 Other Data: DDH T-360, T-357, T-356, T-354, T-400, T-366, T-479C, T-3,
 T-395, T-124, T-123, T-121, T-396, T-479A, T-394, T-347,
 T-346, T-397, T-399, T-398 in Sec. 4 (See Appendix).
 Olivine in Sec. 6, see also summary in Appendix.

- Location: St. Louis County
Township 49N-15W, Sections 12, 14, 15, 16, 20, 23, 30, 32, 33, 34
- References: A) Green, 1972, pp. 294-332
B) Kilburg, 1972, Thesis, p. 24
C) Taylor, 1964, MGS Bulletin #44, p. 29
- Occurrences: "A few occurrences of copper sulfides are known from the north shore area. At the trap-rock quarry at Ely's Peak, west of Duluth, small calcite veins in fractures carry rare, small crystals and stringers of pyrite, chalcopyrite, chalcocite, and bornite. Native copper is present elsewhere in the same quarry, in amygdules and veinlets." [Sec. 32, 33] (Ref. A, p. 331).
- "Peridotite is the major rock type exposed on the Duluth, Winnipeg and Pacific Railroad tracks near the top of the Bardon Peak mass. The layer is somewhat more than 50 feet thick; other mafic layers alternate with feldspar-rich layers in the cuts to the west. None of the peridotite is fresh; serpentine, chlorite, and talc make up almost half of the rock. Primary plagioclase (An_{68}) has been partly replaced by light-green serpentine, as shown by relict albite twinning. Olivine (Fa_{42}) is the most common primary mineral, and magnetite-ilmenite and augite are present in considerable amounts. A chemical analysis of this rock is given in Table 8, No. 12. No. 12 is described as: Intrusion at Bardon Peak: Peridotite, Short Line Park, Sec. 34, T.49N., R.15W. F. F. Grout, analyst (Grout, 1918b, p. 646, No. 2): Chemical analyses of Gabbroic Rocks from the Duluth area: Cu_2O - .15%. [Sec. 34] (Ref. C, p. 29)
- "Trace amounts of pyrite and chalcopyrite are disseminated in the flows, but they are most abundant in the Arrowhead Blacktop Quarry ($NE\frac{1}{4}$, Sec. 32 and $NW\frac{1}{4}$, Sec. 33, T 49 N, R 15 W); where the sulfides occur mainly in veins associated with calcaite. William Listerud (personal communication) has identified bornite, chalcocite, and chalcopyrite in one such vein." (Ref. B, p. 24)
- Other Data: DDH T-2, T-3, T-1A, T-2A in Sec. 12 (See Appendix)
DDH T1-F, T1-H, T-2, T-1, T-2A, T-3, T-6, T-8, T-9 in Sec. 14 (See Appendix)
DDH T-1, T-1A, T-2 in Sec. 15 (See Appendix)
DDH T-2A, T-4, T-5 in Sec. 16 (See Appendix)
DDH T-2A, T-4 in Sec. 20 (See Appendix)
DDH T-2A in Sec. 30 (See Appendix)
Olivine in Sec. 14, 23, 34, see also summary in Appendix.
Titaniferous Magnetite, see also summary in Appendix.

- Location: St. Louis County
Township 50N-13W, Section 4
- Other Data: DDH T-1, T-2, T-3, T-4, T-5, T-6, T-10, T-13, T-18, T-21, T-24 in Sec. 4 (See Appendix)
Olivine, see also summary in Appendix.
Titaniferous Magnetite, see also summary in Appendix.

- Location: St. Louis County
Township 50N-14W, Sections 1, 4, 7, 8, 20, 23, 26, 27, 30, 33, 34
- References: A) Winchell, 1900, Vol. 5, pp. 119-120, 153
B) Schwartz, 1949, MGS Bull. 33, p. 130
C) Duluth Herald, February 28, 1928 (in Aguar, 1971, p.9)
D) Taylor, 1964, p. 11
E) Duluth Herald, December 3, 1930 (in Aguar, 1971, p. 9)
F) Taylor, 1955, pp. 22-30 & 62
G) Grout, 1917, Ph.D., p. 17
- Occurrences: A sample from (uncertain location) "Duluth, east of Brewery Creek and east of Minnesota Point at the Lakeshore" (possibly in Sec. 23), "from a vein in diabase. It contained gold identified with microscope and nitric acid [but not by assay]." (Ref. A, Nos. 18 & 18a, pp. 119-120).
- A sample of vein material containing calcite, fluorite, and bornite in "a heavy bed 3 feet thick" (Ref. A, p. 153, sa. #64a). [Note: location uncertain]
- "An exposure of a somewhat greater concentration of magnetite and ilmenite was opened at an early date by a pit between converging roads in the NW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec. 7, T.50N., R.14W. (Plate 11). The pit is now filled with rubbish, but the dump indicates that almost solid magnetite-ilmenite veins up to 2 inches in diameter cut the coarse-grained gabbro." (Ref. B, p. 130).
- "Silver Mine. In 1930 an old mining shaft at the base of the Point of Rocks was discovered behind the retaining wall at 10th Avenue West and Michigan Street. At the same time as the Vermilion Range ore strikes (1880), a shaft had been sunk into the base to a distance of 375' from the Michigan Street level. When the funds were exhausted, the miners had 60 bags of silver and copper ore, which could not be shipped to the eastern market because there was no money to pay the hauling costs. There was about \$30,000 worth of silver stored in the Culver warehouse on Lake Avenue waiting for transportation funds. The bags lay there for over two years; finally they rotted, and the sulphides oxidized and turned to dust. Eventually the lot was dumped into the bay. Interest in the silver mine was revived about 1923 when the city cut away the part of the point that jutted out above Michigan Street. A very rich silver vein was disclosed and a shaft was sunk from the top, but work was never completed and the shaft was later boarded up" (Ref. C and Ref. E) [location uncertain].
- "Pits in the NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 7, T.50N., R.14W., discussed by Schwartz (1949, p. 130), are now covered with rubbish, but the dump from the pits indicates that magnetite-ilmenite veins up to two inches wide cut coarse-grained gabbro. There is no reason to believe that these deposits have appreciable potential value, for the much larger and higher grade deposits in the northern part of the gabbro complex (Grout, 1949-1950) are not being exploited at the present time." [NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 7] (Ref. D, p. 11).
- There is magnetite-rich syenogabbro in NE $\frac{1}{4}$ of Sec. 30 with a high apatite content (3 mode %). (Ref. F, pp. 22-30)

There is a granodiorite in Sec. 20 that has: (Ref. F, p. 62)

-Fe₂O₃ 2.30 wt%
 -FeO 11.99 wt%
 -TiO₂ 2.93 wt%
 -P₂O₅ 1.53 wt%

"Metallic copper is reported from seams in bedrock near the old courthouse downtown, and chalcopyrite is not rare in joints and possibly as a primary mineral in the gabbro." (Ref. G, p. 17) [location uncertain]

Testpits: NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 7, see above.

See shaft described above.

Other Data: DDH T-1, T-2 in Sec. 1 (See Appendix)

DDH T-478, T-479 in Sec. 4 (See Appendix)

DDH T-3 in Sec. 8 (See Appendix)

DDH T-1, T-1A, T-2, T-4 in Sec. 13 (See Appendix)

DDH T-3 in Sec. 18 (See Appendix)

DDH T-660, T-662, T-663, T-678 in Sec. 23 (See Appendix)

DDH T-642, T-646 in Sec. 26 (See Appendix)

DDH T-556, T-1A, T-4A, T-6A, T-8, T-9, T-10, T-590, T-591,

T-534, T-535, T-537, T-538, T-614, T-615, T-612, T-613,

T-545, T-547, T-548, T-549, T-554, T-557, T-559, T-620,

T-629, T-635, T-636, T-638, T-639, T-641, T-556A, T-563,

T-564, T-565, T-566, T-567, T-568, T-569, T-527, T-546,

T-571, T-570, T-598, T-577, T-578, T-602, T-603, T-605,

T-606, T-607, T-2A, T-2, T-1, T-3, T-572, T-610, T-610A,

T-610B, LT-103, LT-104, T-626, T-637, T-640, T-125, T-127,

T-128, T-576, T-1A in Sec. 27 (See Appendix)

DDH T-3, T-16, T-18, T-21, T-25, T-27, T-28, T-1, T-12,

T-330, T-331, T-804, T-805, T-323, T-332, T-325, T-328,

T-329, T-300, T-300A, T-302, T-324, T-327, T-518, T-520C,

T-512A, T-512C, T-592, T-593, TP-2A, TP-8B, TP-13A, TP-16A,

TP-16B, TP-27B, TP-29A, TP-32B, TP-33A, TP-40A, TP-40B,

T-122, T-304A, T-594 in Sec. 33 (See Appendix)

DDH T-521, T-524, T-531, T-530, T-516, T-517, T-523, T-540,

LT-101, T-542 in Sec. 34 (See Appendix)

Olivine, see also summary in Appendix.

Native Copper, see also summary in Appendix.

Location: St. Louis County

Township 50N-15W, Sections 12, 25, 26, 27

References: A) Schwartz, 1949, MGS Bull. 33, p. 130

Occurrences: One of the locations of the testpits was in Sec. 25, T.50N., R.15W. (Plate 12). Some of the old pits may be seen just west of the church at the corner of Hermantown and Haines roads. The rock is a dark gabbro, but little magnetite may now be seen. It is probable that the original patches which led to the exploration were small and of no importance. (Ref. A, p. 130)

Testpits: In Sec. 25, see above.

Other Data: DDH T-1 in Sec. 12 (See Appendix)

Olivine in Sec. 25, 26, and 27, see also summary in Appendix.

Titaniferous Magnetite in Sec. 25, see also summary in Appendix.

Location: St. Louis County
Township 50N-16W, Section 25
Other Data: Titaniferous Magnetite in Sec. 25, see also summary in Appendix.

Location: St. Louis County
Township 51N-12W, Sections 4, 17, 25
References: A) Green, 1972, pp. 294-332 in MGS Centennial Vol.
B) Schwartz, 1949, p. 132, in Rennebaum, 1978, p. 61
C) Winchell, 1899, Vol. 4, p. 216
D) Winchell, 1900, Vol. 5, p. 163, No. 80
E) Schwartz, 1949, MGS Bull. #33, pp. 130-133
F) Ojakangas and Matsch, 1982, Minnesota's Geology, p. 140
G) Wieland, North Shore Minerals and Mining Operations (St. Louis County Historical Society, "Copper" file): in Aguar, 1971, p. 10
Occurrences: "In two prospects northeast of Duluth (Sec. 17, T51N-R12W; Sec. 25, T52N-R12W), masses of copper weighing as much as 15 pounds had been recovered by 1866 (Hall, 1889), but more recent (1929) intensive exploration in the area by the Mining Corporation of Canada (see Schwartz, 1949, p. 130-133) proved unsuccessful", [Sec. 17], (Ref. A, p. 331).
"Native copper along Sucker River", [Sec. 4], (Ref. B, p. 61)
"Lavas contain prehnite and native copper at French River; once explored with a shaft" [probably Sec. 17], (Ref. C, p. 216).
"From an old copper shaft," host rock, prehnite, and native copper, about a mile up the French River [exact location unknown], (Ref. D, p. 163).
"Up Sucker River from the bridge over the old highway [Plate 13], 1,000 paces along the stream, is a falls where the water drops about 15 feet in about 20 feet. Below the falls there is, all across the stream, an outcrop, partly under water, of red sediments about 4 inches thick between amygdaloids. Some pipe amygdules run up about 1 foot above the sediment. It seems to be sandy shale. Sheets of metallic copper follow the joints and bedding. The strike was estimated as N40°E and dip 15°±SE" [NE¼, Sec. 4], (Ref. E, p. 132).
"Along the French River, the French River Mining Company mined about a ton of copper over a period of several years, starting in 1863" [location uncertain], (Ref. F, p. 140).
"French River Copper Mine. In 1863, the French River Mining Company took charge of the SW¼ and lots 3 and 4 of Sec. 17, 51-12. The total amount of copper removed during several years of operation did not exceed one ton." (Ref. G, p. 10)
Testpits: Location uncertain, see above.
Other Data: Native Copper in Sec. 4 and 17, see also summary in Appendix.

Location: St. Louis County
Township 51N-13W, Sections 25, 33
Other Data: DDH T-1 in Sec. 25 (See Appendix)
DDH T-2 in Sec. 33 (See Appendix)

Location: St. Louis County
Township 51N-14W, Section 33
Other Data: DDH T-1 in Sec. 33 (See Appendix)

Location: St. Louis County
Township 51N-17W, Sections 16, 28
References: A) DNR Open File Drill Samples List
Other Data: DDH GL-1 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 28 (Ref. A)
DDH 2028 in Sec. 16 (See Appendix)

Location: St. Louis County
Township 52N-12W, Sections 25, 26, 34, 36
References: A) Schwartz, 1949, MGS, Bull. #33, pp. 130-133
B) Green, 1972, pp. 294-332 in MGS Centennial Vol.
C) Schwartz, 1949, pp. 130-132, in: Rennebaum, 1978, p. 61
D) Wieland, North Shore Minerals and Mining Operations (St. Louis Co. Historical Society, "Copper" File): in Aguar, 1971, p. 11
Occurrences: Native Copper: "The shaft is located on the east bank of the Little Knife River not far from the northeast corner of the SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Section 26. The station of the single level is 106 feet below the collar of the shaft, and drifts extend along the strike of the flows about 80 feet northeast and 100 feet southwest. The strike of the slightly mineralized amygdaloidal zone is N32°, 45°E and the dip 12°SE.

Many assays along the drift show a trace of copper or no copper, but a few others show fractions of one percent of copper with .32 percent the maximum. The writer first visited the site in 1931. At that time the dump of the shaft showed considerable amygdaloidal basalt with chlorite, laumontite, calcite, and prehnite as introduced minerals. Ore specimen of highly altered rock contained a considerable number of fine specks of native copper. The drill core shack had been wrecked and cores scattered around showed much fine-grained ophite with amygdaloidal zones and the minerals noted above in some cores" (See #339 for DDH information), [SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 26], (Ref. A, p. 132).

The following is a partial log of Diamond Drill Hole No. 3: Medium to fine ophite, becoming finer with increasing amygdules of chlorite, quartz, and feldspar. Color of last 6 inches of core is reddish brown and grain is fine. . . .65-70 feet depth.

Copper 14 percent. First 2 feet of core probably represent Sec. 65-70. Open fracture at 72, about 4 inches across and water nearly all lost . . . 70-75 feet depth.

Gray-brown ophite with varying numbers of augite and chlorite amygdules, some of which have connecting stringers. Grain increases to medium at center of section and declines to fine again at end. Very few amygdules in last 2 feet, copper 12 percent . . . 99-105 feet depth [SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 26], (Ref. C, p. 61). (See reference for other copper occurrences within DDH #3 log.) (Note: "14% and 12%?" discrepancy within reference itself, p. 132.)

"On the main Knife River the course of the stream near the mouth is from the west [Plates 17 and 18]. The auto road goes a very short way. Then one must go up about a quarter of a mile, following the "old" channel (now almost abandoned, since a flood cut a better channel a little way northeast of the old one, for nearly a mile). Some float of red amygdaloidal conglomerate carries metallic copper, but most has now been picked up. At the upper end of this stretch where float is scattered, a small outcrop of similar rock occurs in the southwest bank at water level. The best exposure I saw was about 4 inches thick and ran only about 4 feet along the bank. Nearby exposures indicate that the rock above and below is amygdaloid without much color or mineralization.

A few places farther upstream there are green copper stained veinlets up to an inch wide, and Mr. Farrell reports one was 6 inches, but ended abruptly", [Probably Sec. 36], (Ref. A, p. 132-133).

"In two prospects northeast of Duluth (Sec. 17, T51N, R12W; Sec. 25, T52N, R12W) masses of copper weighing as much as 15 pounds had been recovered by 1866 (Hall, 1889), but more recent (1929) intensive exploration in the area by the Mining Corporation of Canada (see Schwartz, 1949, pp. 130-133) proved unsuccessful." [Sec. 25], (Ref. B, p. 331).

"20 diamond drill holes; 1 shaft; native copper associated with chlorite, laumontite, calcite, and prehnite in amygdaloid basalt." [Sec. 25, 26, 34], (Ref. C, p. 61).

"Native Copper in "float" of red amygdaloid conglomerate along Knife River." [Sec. 36], (Ref. C, p. 61).

"Knife River Copper Mines. There is an old shaft in the southeast corner of the NE $\frac{1}{4}$ Sec. 26, 52-12. Additional work was done in this area by John Parry in 1854-1856. Thomas Sexton simultaneously with the French River operations and the North Shore Mining Company (SE $\frac{1}{4}$ of Sec. 25, 52-12) in 1863 to the late 1860's. In 1928, the Mining Corporation of Canada secured title to lands including this area. A shaft was sunk in the northeast corner of the SW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Sec. 26, 52-12; and about fifteen diamond drill holes were made. Work was suspended because of the 1929 stock market crash, but prospects seemed very favorable." (Ref. D, p. 11)

Testpits: In NE $\frac{1}{4}$, Sec. 26 (see above) is an old shaft.
In SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 26 is a shaft (see above).
Native Copper in Sec. 25, 26, 36, see also summary in Appendix.

Location: St. Louis County
Township 52N-15W, Section 22

References: A) DNR Project File 72-3

Occurrences: MPL-1, NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 22, MP&L Project 72-3 has: (Ref. A)
- 2 ft. of 0.05% Ni
- 2 ft. of 0.06% Ni

Other Data: Titaniferous Magnetite in Sec. 22, see also summary in Appendix.

Location: St. Louis County
Township 53N-14W, Sections 7, 8

References: A) DNR-Terminated Lease File

Occurrences: DDH IV-6, SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 7, Lease Phelps Dodge CN-7007
has: (Ref. A)
- 300 ft. of .05% to .52% Cu
- 90 ft. of .05% to 0.10% Ni
- Cpy throughout hole 0.2% to 0.5%

DDH IV-7, SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 7, Lease Phelps Dodge CN-7007
has: (Ref. A)
- 30 ft. of 0.056% to .08% Cu
- 37 ft. of 0.055% to 0.076% Ni
- Cubanite and Cpy throughout the hole

DDH IV-8, SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 7, Lease Phelps Dodge CN-7007
has: (Ref. A)
- 196 ft. of .54% to 0.21% Cu
- 20 ft. of 0.058% to 0.078% Ni

DDH IV-9, NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 7, Lease Phelps Dodge CN-7007
has: (Ref. A)
- 50 ft. of 0.05% to 0.07% Cu

DDH IV-1, SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 8, Lease Phelps Dodge CN-7008
has: (Ref. A)
- 460 ft. of 0.05% to 0.318% Cu

Other Data: Titaniferous Magnetite in Sec. 7 and 8, see also summary in Appendix.

Location: St. Louis County
Township 53N-15W, Sections 24, 25, 36

References: A) DNR Terminated Lease Files
B) DNR Open File Drill Samples List
C) Bonnicksen, 1972, Cent. Vol., pp. 372-376
D) Bonnicksen, Delano, Forbes, 1972, EOS abstract, p. 535

Summary: "The late-stage ultramafic bodies are considered part of the troctolitic series inasmuch as they are gradational into and interlayered with troctolite and ferrogabbro. Most of the known late-stage ultramafics are associated with hornfelses of probable volcanic origin. The significance of this association is not known.

Drilling and geophysical data suggest that there are two geographic groups of late-stage ultramafic bodies, as well as a few scattered occurrences. One group occurs near the footwall in Ts.57 and 58 N., R. 14W., and the other forms a zone a few miles wide that trends north-northeast, away from the base of the complex, in the Boulder Lake area (T.53 N., R.15 W.)." (Ref.C)

Occurrences: DDH VII-3A, NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 24, Lease Phelps Dodge CN-7085
has: (Ref. A)
- 90 ft. of 0.05% to 0.18% Cu
- 10 ft. of 0.09% Ni

DDH V-2, Sec. 25, Lease Phelps Dodge CN-7086 has: (Ref. A)
- Cu mineralization, footage intervals not given

DDH V-3, SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 36, Lease Phelps Dodge CN-7087
has: (Ref. A)
- Many (hundreds) feet of greater than 0.05% Cu

DDH V-I, NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 36, Lease Phelps Dodge CN-7087
has: (Ref. A)

- 230 ft. of 0.06% to 0.19% Cu

"A steeply-dipping, tabular or lens-shaped body of peridotite overlain by olivine gabbro in sec. 36 T.53 N., R.15W, near Boulder Lake reservoir, is being investigated by J. W. Delano, Warren C. Forbes, and myself (fig. V-52). The body is approximately a quarter of a mile long and is elongated in a north-south direction; almost its entire thickness was penetrated by a drill hole. The upper part of the core is gabbro; it grades downward through a zone of interlayered gabbro and peridotite to peridotite and local dunite at the base of the intrusion. The mafic minerals are altered (deuteric?) in the upper part of the hole, but are fresh in the lower part. The footwall rock is a volcanic hornfels (see analysis 3, table V-30, and later discussion). The footwall contact dips approximately 60° E., as indicated by its position in another hole 700 feet to the west.

Ilmenite is abundant and locally accounts for as much as 40% of the rock. Apatite is moderately abundant in the lower part of the core and minor quantities of sulfides and graphite are present." A sample of peridotite at 880 ft. assayed 16.03% TiO₂, and 13.7% MgO. (Ref. C, pp. 372-376)

Other Data: Titaniferous Magnetite in Sec. 36, see also summary in Appendix.

DDH UNK in Sec. 36 (See Appendix)

Location: St. Louis County
Township 53N-19W, Sections 10, 32, 33
References: A) DNR Open File Drill Samples List
Other Data: DDH 27003 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 10 (Ref. A)
DDH 27002 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 32 (Ref. A)
DDH 27001 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 33 (Ref. A)
DDH 2034 in Sec. 32 (See Appendix)

Location: St. Louis County
Township 54N-14W, Sections 9, 10, 14, 16, 23
References: A) DNR Terminated Lease File
B) DNR Open File Drill Samples List
Occurrences: DDH I-6, SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 9, Lease Phelps Dodge CN-7025
has: (Ref. A)
- Many feet of 0.05% to 0.08% Cu
DDH I-1A, SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 10, Lease Phelps Dodge CN-7026
has: (Ref. A)
- 20 ft. of 0.06% - 0.07% Cu
DDH I-5A, SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 10, Lease Phelps Dodge CN-7026
has: (Ref. A)
- 120 ft. of 0.05% to 0.08% Cu
DDH I-2, NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 16, Lease Phelps Dodge CN-7030
has: (Ref. A)
- Many feet of low grade Cu

DDH I-3, SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 16, Lease Phelps Dodge CN-7030
has: (Ref. A)

- Many feet of low grade Cu

DDH I-4, NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 16, Lease Phelps Dodge CN-7030
has: (Ref. A)

- Many feet of low grade Cu

DDH I-7, NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 16, Lease Phelps Dodge CN-7030
has: (Ref. A)

- Many feet of low grade Cu

DDH I-8, SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 16, Lease Phelps Dodge CN-7030
has: (Ref. A)

- Many feet of low grade Cu

DDH I-9, SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 16, Lease Phelps Dodge CN-7030
has: (Ref. A)

- Many feet of low grade Cu

DDH I-10, NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 16, Lease Phelps Dodge CN-7030
has: (Ref. A)

- Many feet of low grade Cu

DDH I-12, SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 16, Lease Phelps Dodge CN-7030
has: (Ref. A)

- Many feet of low grade Cu

DDH I-13, NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 16, Lease Phelps Dodge CN-7030
has: (Ref. A)

- Many feet of low grade Cu

DDH VIII-2, NE $\frac{1}{2}$ -NW $\frac{1}{4}$, Sec. 23, Lease Phelps Dodge CN-7037
has: (Ref. A)

- Trace of cubanite and Cpy mentioned

Other Data: DDH VIII-4A in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 14 (Ref. B)

Clay minerals in Sec. 14 and 16, see also summary in
Appendix.

Titaniferous Magnetite in Sec. 10, 14, 16, and 23, see also
summary in Appendix.

Location: St. Louis County
Township 54N-18W, Section 18

Other Data: DDH 2029 in Sec. 18 (See Appendix)

Location: St. Louis County
Township 55N-12W, Section 20

References: A) Bonnicksen, 1969, Mining Symposium, 36th Annual Meeting
pp. 89-93

Occurrences: Hoyt Lakes Gabbro Lake area, Troctolitic series: "masses of
anorthosite and anorthositic rocks that contain poikilitic
crystals of olivine, pyroxene, and oxides...inclusions of
iron formation...magnetite and minor to locally abundant
amounts of olivine, orthopyroxene, plagioclase, ilmenite and
sulfides." [Sec. 20] (Ref. A, pp. 89-93)

Other Data: Olivine in Sec. 20, see also summary in Appendix.
Titaniferous Magnetite in Sec. 20, see also summary in
Appendix.

Location: St. Louis County
 Township 55N-14W, Sections 9, 29
 References: A) DNR Terminated Lease File
 Occurrences: DDH CV-2, NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 9, Lease Exxon CN-7989 has: (Ref. A)
 - 9.5 ft. of 600 ppm Cu
 DDH CV-1, NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 29, Lease Exxon CN-8001 has: (Ref. A)
 - 18.5 ft. of 0.05% to 0.09% Cu
 Other Data: Titaniferous Magnetite in Sec. 29, see also summary in Appendix.

Location: St. Louis County
 Township 55N-18W, Section 6
 Other Data: DDH 2032 in Sec. 6 (See Appendix)

Location: St. Louis County
 Township 55N-20W, Section 14
 Other Data: DDH 2030 in Sec. 14 (See Appendix)

Location: St. Louis County
 Township 56N-13W, Section 31
 References: A) DNR Open File Drill Samples List
 Other Data: DDH HL-1A in N $\frac{1}{2}$ -NW $\frac{1}{4}$, Sec. 31 (Ref. A)
 DDH HL-2 in W $\frac{1}{2}$ -NE $\frac{1}{4}$, Sec. 31 (Ref. A)
 Clay minerals in Sec. 31, see also summary in Appendix.
 Titaniferous Magnetite in Sec. 31, see also summary in Appendix.

Location: St. Louis County
 Township 56N-14W, Section 28
 Other Data: DDH CN-7 in Sec. 28 (See Appendix)

Location: St. Louis County
 Township 56N-18W, Sections 14, 15, 31
 Other Data: DDH 14-G in Sec. 14 (See Appendix)
 DDH A4, A4-A in Sec. 15 (See Appendix)
 DDH 2031 in Sec. 31 (See Appendix)

Location: St. Louis County
 Township 56N-20W, Sections 5, 6
 Other Data: DDH 5-B, 5-B-A, 5-R in Sec. 5 (See Appendix)
 DDH 6-B, 6-D, 6-F, 6-F-A in Sec. 6 (See Appendix)

Location: St. Louis County
 Township 56N-21W, Sections 1, 3, 12
 Other Data: DDH 1-A, 1-D, 1-D-1 in Sec. 1 (See Appendix)
 DDH 3-A, 3-A-A, 3-B, 3-B-A in Sec. 3 (See Appendix)
 DDH 12-Q in Sec. 12 (See Appendix)

- Location: St. Louis County
Township 57N-14W Sections 16, 28, 34
- References: A) DNR General Exploration File
B) Mainwaring, Naldrett, 1974, Inst. on Lake Superior
Geology, 20th Annual Meeting, p. 21
C) DNR Open File Drill Samples List
D) Bonnicksen, 1972, MGS Cent. Vol., p. 372
E) DNR Terminated Lease File
- Summary: "The late-stage ultramafic bodies are considered part of the troctolitic series inasmuch as they are gradational into and interlayered with troctolite and ferrogabbro. Most of the known late-stage ultramafics are associated with hornfels of probable volcanic origin. The significance of this association is not known.
- Drilling and geophysical data suggest that there are two geographic groups of late-stage ultramafic bodies, as well as a few scattered occurrences. One group occurs near the footwall in T.57 and 58 N., R.14W., and the other forms a zone a few miles wide that trends north-northeast, away from the base of the complex, in the Boulder Lake area (T.53 N., R. 15 W.)." (Ref. D, p. 372)
- Occurrences: DDH BC-80-1 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 34, Lease Exxon CN-8024, has:
(Ref. A)
- 7 ft. of 1 to 2 ppm Ag
- "One of the larger of these bodies, the Water-Hen Creek layered complex in sec. 28 T. 57 N., R. 14 W., has been penetrated by several drill holes (fig. V-51). P. R. Mainwaring, who is studying the body, suggested (1971, written comm.) that it has the overall shape of a moderately steeply-dipping, somewhat flattened cylinder with a very thin lip forming the westernmost extremity. The lower part of the intrusion, which lies at some depth in the northeastern part of the area shown in Figure V-51, consists of a few feet of a plagioclase-ilmenite rock. Immediately above this is a few hundred feet of dunite, which gives way upward to a layered sequence of troctolite and peridotite. The layered zones are discontinuous and of limited extent. The body intrudes an older troctolite. Marginal facies are complicated and evidently rich in inclusions. The lack of chilling or recrystallization along the margins indicates that the host troctolite had undergone little cooling when the Water-Hen Creek magma was emplaced." (Ref. D, p. 372)
- DDH II-1, II-4, SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 16 (Ref. C and E)
- Many feet of low grade Cu
- DDH II-2, SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 16 (Ref. C and E)
- Many feet of low grade Cu
- DDH II-3, NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 16 (Ref. C and E)
- Many feet of low grade Cu
- DDH II-5, NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 16 (Ref. C and E)
- Many feet of low grade Cu
- DDH II-6, NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Lease Phelps Dodge CN-7070, Sec. 16 (Ref. C and E)
- Many feet of low grade Cu
- "The Water Hen Creek Intrusion is a relatively small body

which has been emplaced along the Middle Precambrian footwall-Troctolitic Series contact and consists of layered cumulates. Dunite, peridotite, ilmenite peridotite and troctolite with minor anorthosite comprise the greater part of the intrusion . . .

Abundant intercumulus sulfide occurs in most dunites whereas it is virtually absent in the more feldspathic rocks. This contrasts strongly with the known mineralization in the feldspathic rocks near Ely, Minnesota in the north part of the Duluth Complex. Sulfide mineralization in the Water Hen Intrusion also occurs in rocks that show evidence of contamination by Thomson or Virginia slates. Partial assimilation is evidenced by the formation of cordierite-hypersthene rich inclusions and advanced assimilation by cordierite-graphite inclusions usually with small amounts of sulfide development. Sulfur isotope data suggest that at least some of the sulfides have been derived from isotopically related sulfur sources such as those found in metasediments in the footwall of the Complex." [Sec. 28] (Ref. B, p. 21)

Other Data: DDH CN-1, CN-7 in Sec. 28 (Ref. A)
 DDH CN-2, CN-3, CN-4, CN-5, CN-6, CN-8, CN-9 in Sec. 28 (See Appendix)
 Titaniferous Magnetite, see also summary in Appendix.
 Native Copper in Sec. 16, see also summary in Appendix.
 Clay minerals in Sec. 16 and 34, see also summary in Appendix.

Location: St. Louis County
 Township 57N-15W, Sections 1, 6, 17
 Other Data: DDH 1-C in Sec. 1 (See Appendix)
 DDH 6-E in Sec. 6 (See Appendix)
 DDH 17-A, 17-C, 17-D in Sec. 17 (See Appendix)

Location: St. Louis County
 Township 57N-16W, Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 21
 Other Data: DDH 1-C, 1-D, 1-M in Sec. 1 (See Appendix)
 DDH 2-A, 2-A-A, 2-C, 2-N, 2-N-A, 2P in Sec. 2 (See Appendix)
 DDH 3-C, 3-Q, 3-R in Sec. 3 (See Appendix)
 DDH 4-E, 4-L, 4-Q in Sec. 4 (See Appendix)
 DDH 5-A in Sec. 5 (See Appendix)
 DDH 6-B, 6-C, 6-D in Sec. 6 (See Appendix)
 DDH 7-D in Sec. 7 (See Appendix)
 DDH 8-A in Sec. 8 (See Appendix)
 DDH 9-N, 9-Q, 9-R in Sec. 9 (See Appendix)
 DDH 10-D in Sec. 10 (See Appendix)
 DDH 11-E, 11-H in Sec. 11 (See Appendix)
 DDH 12-N in Sec. 12 (See Appendix)
 DDH 13-C, 13-G in Sec. 13 (See Appendix)
 DDH 15-B, 15-D in Sec. 15 (See Appendix)
 DDH 16-B, 16-B-A, 16-N in Sec. 16 (See Appendix)
 DDH 17-C, 17-H, 17-J in Sec. 17 (See Appendix)
 DDH 18-D, 18-M in Sec. 18 (See Appendix)

DDH 19-E in Sec. 19 (See Appendix)
 DDH 21-E, 21-M in Sec. 21 (See Appendix)

Location: St. Louis County
 Township 57N-17W, Sections 1, 3, 4, 8, 9, 11, 15, 16, 17, 19, 20, 21, 22, 23, 27, 29, 30, 31

References: A) Dolence, 1961, Thesis, p. 65

Occurrences: (D.H. #3, 596.5 ft., 0.5 ft. above basement contact),
 "glaucinitic, silty, pebbly sandstone . . . The arenaceous and silty areas are sericitic, sandy argillite with 5 to 7% very finely disseminated sulfides in the more mineralized bands. These sulfides are probably primary and colloiddally precipitated." [Location uncertain] (Ref. A, p. 65)

Other Data: DDH 1-C in Sec. 1 (See Appendix)
 DDH 3-E, 3-Q in Sec. 3 (See Appendix)
 DDH 4-J, 4-R in Sec. 4 (See Appendix)
 DDH 8-D, 8-R, 8-R-A in Sec. 8 (See Appendix)
 DDH 9-H, 9-K in Sec. 9 (See Appendix)
 DDH 11-D, 11-M in Sec. 11 (See Appendix)
 DDH 15-A in Sec. 15 (See Appendix)
 DDH 16-A, 16-B, 16-E, 16-F, 16-N, 16-P in Sec. 16 (See Appendix)
 DDH 17-C in Sec. 17 (See Appendix)
 DDH 19-N in Sec. 19 (See Appendix)
 DDH 20-A, 20-K in Sec. 20 (See Appendix)
 DDH 21-P in Sec. 21 (See Appendix)
 DDH 22-Q, 22-N in Sec. 22 (See Appendix)
 DDH 23-Q, 23-N in Sec. 23 (See Appendix)
 DDH 27-B in Sec. 27 (See Appendix)
 DDH 29-F, 29-H in Sec. 29 (See Appendix)
 DDH 30-D, 30-F, 30-H in Sec. 30 (See Appendix)
 DDH 31-D in Sec. 31 (See Appendix)

Location: St. Louis County
 Township 57N-18W, Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 30, 34, 35

Other Data: DDH 2-C, 2-M in Sec. 2 (See Appendix)
 DDH 3-D, 3-F, 3-B, 3-A, 3-G, 3-K, 3-P in Sec. 3 (See Appendix)
 DDH 4-H, 4-P in Sec. 4 (See Appendix)
 DDH 5-E, 5-B, 5-B-A, 5-Q, 5-L in Sec. 5 (See Appendix)
 DDH 6-D, 6-B, 6-A, 6-H, 6-J, 6-N in Sec. 6 (See Appendix)
 DDH 7-B, 7-M, 7-L in Sec. 7 (See Appendix)
 DDH 8-D, 8-B, 8-A, 8-K in Sec. 8 (See Appendix)
 DDH 9-D, 9-G, 9-L, 9-N in Sec. 9 (See Appendix)
 DDH 10-B, 10-A, 10-Q in Sec. 10 (See Appendix)
 DDH A-1 in Sec. 11 (See Appendix)
 DDH 13-F, 13-H, 13-R in Sec. 13 (See Appendix)
 DDH 15-J in Sec. 15 (See Appendix)
 DDH 16-C, 16-F in Sec. 16 (See Appendix)
 DDH 17-D, 17-Q in Sec. 17 (See Appendix)
 DDH 18-B in Sec. 18 (See Appendix)
 DDH 19-C in Sec. 19 (See Appendix)

DDH 20-D, 20-J, 20-R in Sec. 20 (See Appendix)
 DDH 21-C, 21-A, 21-N in Sec. 21 (See Appendix)
 DDH 22-P, 22-N in Sec. 22 (See Appendix)
 DDH 23-G, 23-M, 23-N in Sec. 23 (See Appendix)
 DDH 24-A, 24-J, 24-J-A in Sec. 24 (See Appendix)
 DDH 25-G, 25-J, 25-J-A in Sec. 25 (See Appendix)
 DDH 26-B, 26-F, 26-J, 26-L, 26-P, A-3 in Sec. 26 (See Appendix)
 DDH 27-A, 27-A-A, D1, D2, D3, J1, J2, 27-Q in Sec. 27 (See Appendix)
 DDH 29-D in Sec. 29 (See Appendix)
 DDH 30-C in Sec. 30 (See Appendix)
 DDH 34-D, 34-C, A1, J1, J1-A in Sec. 34 (See Appendix)
 DDH N1, N2 in Sec. 35 (See Appendix)

Location: St. Louis County
 Township 57N-19W, Sections 1, 7, 9, 10, 12, 13, 14, 16, 21, 22, 23, 24, 25, 28, 29, 36

Other Data: DDH 1-G in Sec. 1 (See Appendix)
 DDH 7-B in Sec. 7 (See Appendix)
 DDH 9-R1 in Sec. 9 (See Appendix)
 DDH 10-Q in Sec. 10 (See Appendix)
 DDH 12-Q, 12-M in Sec. 12 (See Appendix)
 DDH 13-A in Sec. 13 (See Appendix)
 DDH 14-C, 14-N in Sec. 14 (See Appendix)
 DDH 16-6A in Sec. 16 (See Appendix)
 DDH 21-Q in Sec. 21 (See Appendix)
 DDH 22-Q in Sec. 22 (See Appendix)
 DDH 23-B in Sec. 23 (See Appendix)
 DDH 24-C, 24-A, 24-N in Sec. 24 (See Appendix)
 DDH 25-A in Sec. 25 (See Appendix)
 DDH 28-D in Sec. 28 (See Appendix)
 DDH 29-D in Sec. 29 (See Appendix)
 DDH 2033 in Sec. 36 (See Appendix)

Location: St. Louis County
 Township 57N-20W, Sections 1, 2, 4, 7, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 25, 26, 27, 28, 29, 30, 31, 32

Other Data: DDH 1-R in Sec. 1 (See Appendix)
 DDH 2-N, 2-R in Sec. 2 (See Appendix)
 DDH 15, 8, 4-F in Sec. 4 (See Appendix)
 DDH 7-J, 2 in Sec. 7 (See Appendix)
 DDH 10-A, 10-B in Sec. 10 (See Appendix)
 DDH 11-C in Sec. 11 (See Appendix)
 DDH 12-C in Sec. 12 (See Appendix)
 DDH 14-E, 14-L in Sec. 14 (See Appendix)
 DDH 15-F, 15-K, 15-L, 15-R3 in Sec. 15 (See Appendix)
 DDH 16-E, 16-F, 16-K in Sec. 16 (See Appendix)
 DDH 17-F, 17-K in Sec. 17 (See Appendix)
 DDH 6, 6-A, 18-L, 18-P, 4 in Sec. 18 (See Appendix)
 DDH 13, 5, 19-C, 19-E1, 19-H1, 19-P1, 19-QZ, 19-R1, 12 in Sec. 19 (See Appendix)
 DDH 20-P1, 20-R1, 10 in Sec. 20 (See Appendix)
 DDH 21-L1 in Sec. 21 (See Appendix)

DDH 25-D1 in Sec. 25 (See Appendix)
 DDH 26-D2 in Sec. 26 (See Appendix)
 DDH 27-A1, 27-B1, 27-C1 in Sec. 27 (See Appendix)
 DDH 28-A1 in Sec. 28 (See Appendix)
 DDH 14, 29-E1, 29-H1, 29-H2 in Sec. 29 (See Appendix)
 DDH 30-D1, 30-R1 in Sec. 30 (See Appendix)
 DDH 31-D1, 31-D2, 31-K1, 31-R1 in Sec. 31 (See Appendix)
 DDH 32-D3, 32-N1 in Sec. 32 (See Appendix)

Location: St. Louis County
 Township 57N-21W, Sections 7, 13, 14, 15, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 33, 34, 36

Other Data: DDH 7-7A in Sec. 7 (See Appendix)
 DDH 13-7A, MESABI in Sec. 13 (See Appendix)
 DDH 14-E1, 14-K1, 14-K2 in Sec. 14 (See Appendix)
 DDH 15-R1, 15-R2 in Sec. 15 (See Appendix)
 DDH 20-J1 in Sec. 20 (See Appendix)
 DDH 21-J1, 21-K1, 21-L1 in Sec. 21 (See Appendix)
 DDH 22-B1, 22-B2, 22-L1 in Sec. 22 (See Appendix)
 DDH 23-A1, 23-G1 in Sec. 23 (See Appendix)
 DDH 16, 24-A1, 24-B1, 24-B2, 24-D1, 24-G1, 24-G2, 24-M1, 24-P1, in Sec. 24 (See Appendix)
 DDH 25-F1, 25-J1, 25-J2, 25-L1, 25-Q1, 25-R1 in Sec. 25 (See Appendix)
 DDH 26-B1, 26-H1, 26-H2, 26-Q1, 26-Q2, 26-R1 in Sec. 26 (See Appendix)
 DDH 27-A1, 27-E1, 27-G1 in Sec. 27 (See Appendix)
 DDH 28-E1, 28-F1, 28-G1, 28-P1, 28-P2, 28-R1, 28-R2 in Sec. 28 (See Appendix)
 DDH 29-F1 in Sec. 29 (See Appendix)
 DDH 30-F1, 30-F2, 30-G1, 30-H1, 30-M1, 30-R1 in Sec. 30 (See Appendix)
 DDH 33-Q1, 33-Q2 in Sec. 33 (See Appendix)
 DDH 34-A1, 34-Q1 in Sec. 34 (See Appendix)
 DDH 36-C1, 36-C2, 36-Q1 in Sec. 36 (See Appendix)

Location: St. Louis County
 Township 57N-22W, Section 19

Other Data: Iron Ores - Archean in Sec. 19, see also summary in Appendix.

Location: St. Louis County
 Township 58N-14W, Sections 3, 4, 7, 8, 9, 17, 18, 22, 34

References: A) DNR Open File Drill Samples List
 B) DNR General Exploration File

Other Data: DDH W-5 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 3 (Ref. A)
 DDH W-15 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 3 (Ref. A)
 DDH W-4 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 4 (Ref. A)
 DDH 3 in Sec. 34 (Ref. B)
 DDH A-1, A-2, A-3, A-4, A-5 in Sec. 22 (See Appendix)
 DDH A2-1, A2-2, A2-3, A2-4, A2-5 in Sec. 9 (See Appendix)
 DDH A2-6, A2-7, A3-1, A3-2 in Sec. 4 (See Appendix)
 DDH 7-P1 in Sec. 7 (See Appendix)

DDH 8-P1, 8-R1 in Sec. 8 (See Appendix)
 DDH 17-D1 in Sec. 17 (See Appendix)
 DDH 18-A in Sec. 18 (See Appendix)
 Iron Ores - Proterozoic in Sec. 3, see also summary in Appendix.
 Titaniferous Magnetite in Sec. 34, see also summary in Appendix.

Location: St. Louis County
 Township 58N-15W, Sections 3, 4, 8, 9, 10, 13, 14, 15, 16, 19, 20, 21, 22, 24

Other Data: Clay minerals in Sec. 3, see also summary in Appendix.
 DDH 3-C1 in Sec. 3 (See Appendix)
 DDH 4-C2 in Sec. 4 (See Appendix)
 DDH 8-J1 in Sec. 8 (See Appendix)
 DDH 9-B, 9-B1, 9-G1, 9-M1, 9-Q1 in Sec. 9 (See Appendix)
 DDH 10-C, 3, 1, 2, 10-H2, 10-J1, 10-R, 10-Q, 4, 10-P in Sec. 10 (See Appendix)
 DDH 13-B in Sec. 13 (See Appendix)
 DDH 5 in Sec. 14 (See Appendix)
 DDH 15-D, 15-E, 15-A1, 15-A2, 15-B1, 15-P1, 15-M, 15-P in Sec. 15 (See Appendix)
 DDH 16-D, 16-A, 16-J1, 16-Q, 16-N in Sec. 16 (See Appendix)
 DDH 19-E1 in Sec. 19 (See Appendix)
 DDH 20-K, 20-M in Sec. 20 (See Appendix)
 DDH 21-G, 21-G-A, 21-K, 21-M in Sec. 21 (See Appendix)
 DDH 22-Q in Sec. 22 (See Appendix)
 DDH 24-L in Sec. 24 (See Appendix)

Location: St. Louis County
 Township 58N-16W, Sections 11, 15, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36

Other Data: DDH 2 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 22 (See Appendix)
 DDH 11-H in Sec. 11 (See Appendix)
 DDH 15-H in Sec. 15 (See Appendix)
 DDH 19-Q in Sec. 19 (See Appendix)
 DDH 20-D, 20-K, 20-Q1, 20-P, 20-J, 20-N in Sec. 20 (See Appendix)
 DDH 21-E in Sec. 21 (See Appendix)
 DDH 22-M1 in Sec. 22 (See Appendix)
 DDH 23-G1 in Sec. 23 (See Appendix)
 DDH 24-E1 in Sec. 24 (See Appendix)
 DDH 26-L1, 26-M, 26-P1, 26-L in Sec. 26 (See Appendix)
 DDH 27-K, 27-P in Sec. 27 (See Appendix)
 DDH 28-D, 28-H, 28-G in Sec. 28 (See Appendix)
 DDH 29-L, 29-J1, 29B in Sec. 29 (See Appendix)
 DDH 30-D1, 30-J1, 30-K1, 30-Q1 in Sec. 30 (See Appendix)
 DDH 31-L1 in Sec. 31 (See Appendix)
 DDH 32-B1, 32-D1 in Sec. 32 (See Appendix)
 DDH 33-P1 in Sec. 33 (See Appendix)
 DDH 34-R1 in Sec. 34 (See Appendix)
 DDH 35-K1, UNK in Sec. 35 (See Appendix)
 DDH 36-F1, 36-G2, 36-G3, 36-N1, 36-R1 in Sec. 36 (See Appendix)

- Location: St. Louis County
Township 58N-17W, Sections 6, 7, 17, 18, 19, 22, 23, 24, 25, 29, 35, 36
- References: A) Sutton, 1963, UM thesis, pp. 72-74 and map
B) Grout, 1937, Econ. Geol., v. 32, p. 63
- Occurrences: "Showings of gold, copper and zinc, have been noted in association with some of the quartz-albite porphyries. Gruner (personal comm.) said that gold has been found in quartz veins in a porphyry outcrop on the D.M. & I.R. Railroad tracks in the NW $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 22:58-17. The outcrop is the first one west of the railroad cut through the conglomerate on the south side of the tracks. Apparently the gold is contained in pyrite in the quartz veins. Oxidation of the pyrite to ochreous limonite releases the gold. Gruner collected samples from the next outcrop west, a ridge of porphyry, for assay. They all assayed some gold but only one showed enough to be considered economic. A good showing of chalcopyrite with some sphalerite, was discovered by the writer and his field assistant, Bruce Wachter, in a fresh highway cut in the center of Sec. 29:58-17. An irregular-shaped intrusive porphyry contains an unusually high amount of pyrite. The pyrite is white in color, and has a radiating crystal habit. Chalcopyrite and sphalerite were not found in the porphyry but in the adjacent slates and graywackes. Pyrite is abundant in the slates and graywackes also, but instead of being white with a radiating crystal habit, it is yellow with a cubic habit; some of the cubes being as large as a half-inch. Quartz veinlets seem to have controlled the deposition of the sulfides. Large chunks of chalcopyrite are present but it is very irregularly distributed in the road cut. Microscopic examination of several polished sections reveals, also, that the chalcopyrite is not disseminated throughout the rock. Although the copper and zinc sulfides are not found in the porphyry, it apparently served as a channel for solutions which carried them. The time of deposition is not known but a thin section of this porphyry body indicates there has only been one period of sericitization which probably occurred near the end of the magmatic period. It is quite possible that these late-magmatic solutions also brought up the copper and zinc sulfides. Gruner (personal comm.) also reports finding traces of chalcopyrite at the old quarry in a large porphyry body in NW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 21:58-17. Sulfide mineralization at this location is generally weak." (Ref. A)

"Dr. J. W. Gruner collected some rocks near a prospect in the Virginia 'Horn', showing rhyolite porphyry, and metamorphic rocks probably older than the porphyry, partly greenstone and partly fragmental rocks. The porphyry and other rocks are mineralized and crossed by small veins of quartz, carbonate and albite. The carbonate and feldspar are more abundant at the walls and within the walls, and quartz is more abundant in the centers of veins. Pyrite and probably gold may be related to this introduction but more have been noted in the wall rock thin sections than in the veins. Much of the carbonate is oxidized as if highly

ferruginous originally. Grains of gold are visible but no large body is exposed and not much work has been done." (Ref. B p. 63)

Other Data: DDH 5702 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 4 (See Appendix)
 DDH 5703 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 4 (See Appendix)
 DDH 5701 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 5 (See Appendix)
 DDH 6-M in Sec. 6 (See Appendix)
 DDH 7-D, 7-P in Sec. 7 (See Appendix)
 DDH T-2, T-3, T-4, T-5, T-6, T-7, 17-M in Sec. 17 (See Appendix)
 DDH 18-F, 18-M3, 18-E, 18-G, 18-M1, 18-D5, T-5, 18-Q, 18-Q-A, 18-M, 18-L, 18-M10, 18-M11, 18-N, 18-N-A, 18-N-B in Sec. 18 (See Appendix)
 DDH 19-D, 19-C in Sec. 19 (See Appendix)
 DDH T-1, T-2 in Sec. 23 (See Appendix)
 DDH T-1 in Sec. 24 (See Appendix)
 DDH T-3, 25-J in Sec. 25 (See Appendix)
 DDH 35-E, 35-K, 35-N1, 35-N2, 35-J in Sec. 35 (See Appendix)
 DDH 36-N in Sec. 36 (See Appendix)

Location: St. Louis County
 Township 58N-18W, Sections 1, 2, 10, 11, 12, 13, 14, 15, 16, 17, 18, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30

References: A) 1938 Annual Report, Division of Lands and Minerals, (DNR) State of Minnesota, p. 216.

Occurrences: "A research engineer, Mr. Aho, was attracted by the presence of mineral particles in some of the boulders at the Wheeling [Mine] surface stockpile. Samples from these boulders were brought back to Hibbing and tests made by various methods. The quantity of sphalerite was such that . . . a ground sample was found to contain 5.24% Zn and 3.50% Fe. A flotation test was made on the same material and a concentrate obtained contained 37% Zn and 11% Fe." (Ref. A, p. 216) [Location probably SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 1, or SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 2]

Other Data: DDH 10-L, OIM, OIM1, OIM2, OIM3, 10-P, 10-N in Sec. 10 (See Appendix)
 DDH 11-R in Sec. 11 (See Appendix)
 DDH 12-D, 12-G, T-4, T-4A, 12-C13B, 12-M, 12-P, 12-A13, 12-C13, 12-N in Sec. 12 (See Appendix)
 DDH 13-F, 13-A, 13-G, 13-Q, 13-C62 in Sec. 13 (See Appendix)
 DDH 14-C13A, 14-K, 14-R, 14-C13C, 14-J, UNK-3, UNK, UNK-1, UNK-2, 14-C47 in Sec. 14 (See Appendix)
 DDH 15-B, 15-K, T-3, T-3A, 15-M, 15-L in Sec. 15 (See Appendix)
 DDH 16-J in Sec. 16 (See Appendix)
 DDH 17-F in Sec. 17 (See Appendix)
 DDH 18-H in Sec. 18 (See Appendix)
 DDH 21-H, OIL A5, 21-R, 21-N in Sec. 21 (See Appendix)
 DDH 22-F, 22-C59 in Sec. 22 (See Appendix)
 DDH 23-C15, 23-Q, 23-C58, 23-M in Sec. 23 (See Appendix)
 DDH 24-C in Sec. 24 (See Appendix)
 DDH 25-C64, 25-M in Sec. 25 (See Appendix)
 DDH 26-D, 26-F, 26-C, 26-E, 26-P1, 26-P2, 26-M, 26-N in Sec.

26 (See Appendix)
 DDH 27-C, 27-B in Sec. 27 (See Appendix)
 DDH 28-A, 28-H, 28-J in Sec. 28 (See Appendix)
 DDH 29-A, 29-H, 29-A2, 29-M, 29-N in Sec. 29 (See Appendix)
 DDH 30-A, 30-K, 30-L in Sec. 30 (See Appendix)
 DDH 31-D in Sec. 31 (See Appendix)
 DDH 32-H, 32-G, 32-J in Sec. 32 (See Appendix)
 DDH 33-D, 33-F, 33-E, 33-G in Sec. 33 (See Appendix)
 DDH 34-C, 34-J, 34-Q, 34-M, 34-P in Sec. 34 (See Appendix)
 DDH 35-E, 35-K, 35-K1, 35-K2, 35-Q in Sec. 35 (See Appendix)
 DDH 36-N in Sec. 36 (See Appendix)

Location: St. Louis County
 Township 58N-19W, Sections 25, 28, 36
 Other Data: DDH 25-G in Sec. 25 (See Appendix)
 DDH 28-F, 28-G1 in Sec. 28 (See Appendix)
 DDH 36-A16 in Sec. 36 (See Appendix)

Location: St. Louis County
 Township 58N-20W, Sections 8, 9, 15, 16, 17, 21, 28, 29, 32, 36
 Other Data: DDH 5 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 36 (See Appendix)
 DDH 8-R in Sec. 8 (See Appendix)
 DDH 9-P in Sec. 9 (See Appendix)
 DDH 15-M1 in Sec. 15 (See Appendix)
 DDH 16-F, 16-K2, 16-M, 16-L, 1, 16-N in Sec. 16 (See Appendix)
 DDH 17-J, 17-R in Sec. 17 (See Appendix)
 DDH 21-D, 21-F, 2, 21-G in Sec. 21 (See Appendix)
 DDH T-1, T-2 in Sec. 28 (See Appendix)
 DDH T-6, T-7, T-8, T-9 in Sec. 29 (See Appendix)
 DDH 1, 23, 4, 6, 1005, 1006, 1007, 1008, 1009, 1011, 1015, 117, 119, 120, 121, 2, 22, 24, 25, 26, 27, 28, 29, 3, 30, 5, 100, 1000, 1001, 1002, 1003, 1010, 1012, 1013, 1014, 1016, 1017, 1018, 1019, 102, 1020, 105, 106, 107, 111, 112, 113, 114, 115, 116, 17, 21, 93, 95 in Sec. 32 (See Appendix)

Location: St. Louis County
 Township 58N-21W, Section 35
 References: A) Winchell, 1900, Vol. 5, p. 933
 Occurrences: No. 2275, Ilmenite in hornblende schist. [NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 35]
 (Ref. A, p. 933)

Location: St. Louis County
 Township 59N-12W, Sections 4, 5, 7
 References: A) DNR Open File Drill Samples List
 Other Data: DDH BA-1 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 4 (Ref. A)
 DDH 34873 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 5 (Ref. A)
 DDH BA-5 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 7 (Ref. A)
 Iron Ores - Proterozoic in Sec. 4, see also summary in Appendix.
 Clay minerals in Sec. 4, see also summary in Appendix.

Location: St. Louis County
Township 59N-13W, Sections 1, 2, 9, 10, 11, 14, 16, 17, 18, 19, 20, 30

References: A) Gladen, 1984, pers. comm. (DNR)
B) Linscheid, UMD Master's Thesis, in progress
C) DNR Open File Drill Samples List

Occurrences: The Longnose peridotite bulk sample testpit was created with a bulldozer to get a 25-ton bulk sample for testing. The ilmenite-magnetite ore occurs within an ultramafic lens in the Duluth Complex. (Ref. A and B)

Testpits: Longnose Bulk Sample Testpit in Sec. 30, described above, was dug through 6 to 7 ft. of overburden on Erie Mining Co. property and was "reclaimed" (smoothed and seeded).

Other Data: DDH BA-4 in SE₁-SE₁, Sec. 1 (Ref. C)
DDH BA-3 in NE₁-NE₁, Sec. 14 (Ref. C)
DDH A4-11 in NE₁-NW₁, Sec. 16 (Ref. C)
DDH W-1, W-14 in SE₁-SW₁, Sec. 17 (Ref. C)
DDH W-6, W-8B in NE₁-SW₁, Sec. 17 (Ref. C)
DDH W-7, W-9, A4-5, A4-8, in NW₁-SW₁, Sec. 17 (Ref. C)
DDH W-10 in SE₁-NW₁, Sec. 17 (Ref. C)
DDH W-11 in SW₁-SW₁, Sec. 17 (Ref. C)
DDH A4-9 in SW₁-NW₁, Sec. 17 (See Appendix)
DDH W-13 in SE₁-SE₁, Sec. 18 (Ref. C)
DDH W-12 in NW₁-NE₁, Sec. 19 (Ref. C)
DDH A4-14 in SW₁-NE₁, Sec. 20 (Ref. C)
DDH W-2 in NW₁-NW₁, Sec. 20 (Ref. C)
DDH A1-1 in SE₁-NE₁, Sec. 30 (See Appendix)
DDH BA-6 in SE₁-NW₁, Sec. 30 (Ref. C)
DDH A4-1, A4-2, A4-3, A4-4, A4-6, A4-7 in Sec. 18 (See Appendix)
Titaniferous Magnetite in Sec. 30, see also summary in Appendix.
Iron Ores - Proterozoic in Sec. 16, 17, 18, 19, 20, and 30, see also summary in Appendix.
Clay minerals in Sec. 14, see also summary in Appendix.
DDH 26096, 26103, 26118, 26120, 26127 in Sec. 2 (See Appendix)
DDH 26080 in Sec. 9 (See Appendix)
DDH 26073, 26074, 26078, 26081, 26115, 26121, 26123, 26124 in Sec. 10 (See Appendix)
DDH 26075, 26116, 26122 in Sec. 11 (See Appendix)

Location: St. Louis County
Township 59N-14W, Sections 25, 33, 34, 36

References: A) DNR Open File Drill Samples List

Other Data: DDH A4-12 in SE₁-NE₁, Sec. 25 (Ref. A)
DDH W-3 in NE₁-SW₁, Sec. 25 (Ref. A)
DDH B-3 in NW₁-NW₁, Sec. 36 (Ref. A)
DDH A3-3 in NE₁-SE₁, Sec. 33 (See Appendix)
DDH A3-4 in NW₁-SW₁, Sec. 34 (See Appendix)
DDH A3-5 in SW₁-SW₁, Sec. 34 (See Appendix)
Iron Ores - Proterozoic in Sec. 25, see also summary in Appendix.

Location: St. Louis County
Township 59N-15W, Sections 25, 29

Other Data: DDH 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 in Sec. 25 (See Appendix)
DDH 1, 2, 3, 4, 5 in Sec. 29 (See Appendix)

Location: St. Louis County
Township 59N-17W, Sections 3, 4, 14

Other Data: DDH UNK in Sec. 3 (See Appendix)
DDH 4-A7 in Sec. 4 (See Appendix)
DDH 14-C7 in Sec. 14 (See Appendix)

Location: St. Louis County
Township 59N-18W, Sections 5, 10, 11, 13, 15, 24

Other Data: DDH UNK in Sec. 5 (See Appendix)
DDH 10-Q1 in Sec. 10 (See Appendix)
DDH 11-A6 in Sec. 11 (See Appendix)
DDH 13-A2 in Sec. 13 (See Appendix)
DDH 15-B1, 15-B2, 15-G1 in Sec. 15 (See Appendix)
DDH UNK in Sec. 24 (See Appendix)

Location: St. Louis County
Township 59N-21W

Other Data: Garnet, see also summary in Appendix.

Location: St. Louis County
Township 60N-12W, Sections 2, 3, 10, 11, 34

References: A) DNR Open File Drill Samples List
B) Grout, 1950, Appendix F, p. 116

Occurrences: Titaniferous magnetite described in: (Ref. B, p. 116)
- "Secs. 2 and 3. North side of sections, half a mile east of the iron-formation of East Mesabi, the gabbro has stringers of magnetite, not more than 1 inch thick. Some fair magnetic attractions. (D)"

Other Data: DDH D-1 in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 2 (Ref. A)
DDH D-2, D-3 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 2 (Ref. A)
DDH D-9, D-10, D-13 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 2 (Ref. A)
DDH G8162 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 10 (Ref. A)
DDH G8161 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 10 (Ref. A)
DDH D-4 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 10 (Ref. A)
DDH D-5, D-6, D-6A in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 11 (Ref. A)
DDH BA-2 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 34 (Ref. A)
DDH B2-1 in NE $\frac{1}{4}$, Sec. 3 (See Appendix)
DDH B2-13, B2-15 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 2 (See Appendix)
DDH B2-14 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 2 (See Appendix)
DDH B2-4, B2-8, B2-9, B2-11 in SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 2 (See Appendix)
DDH B2-10 in SW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 2 (See Appendix)
DDH B2-5, B2-6 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 2 (See Appendix)
DDH B2-2, B2-3, B2-12 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 2 (See Appendix)
DDH ELY-10, ELY-11, ELY-5, ELY-6, ELY-7, ELY-8, ELY-9, NM-33, NM-34, NM-35, NM-36, NM-41, NM-42, NM-43, NM-44, NM-48 in Sec. 2 (See Appendix)

DDH NM-60 in Sec. 3 (See Appendix)
 DDH DR-2, NM-24, NM-45, NM-46 in Sec. 10 (See Appendix)
 Iron Ores - Proterozoic in Sec. 2 and 34, see also summary in
 Appendix.
 Clay minerals in Sec. 2, see also summary in Appendix.

Location: St. Louis County
 Township 60N-13W, Sections 1, 29, 30, 36
 References: A) Grout, 1917, MGS Field Notebook #32, p. 2
 B) DNR Open File Drill Samples List
 Testpits: "Gold mine [prospect] 600 ft. W of SE corner of Sec. 29.
 Shaft finds pyrite in iron formation." (Ref. A, p. 2)
 Other Data: DDH 59029 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 30 (Ref. B)
 DDH 1 in Sec. 1 (See Appendix)
 Iron Ores - Proterozoic in Sec. 36, see also summary in
 Appendix.
 Clay minerals in Sec. 36, see also summary in Appendix.

Location: St. Louis County
 Township 60N-15W, Section 13
 Other Data: DDH UNK in Sec. 13 (See Appendix)

Location: St. Louis County
 Township 60N-17W, Section 31
 Other Data: DDH 31-C11, 31-C11A, UNK in Sec. 31 (See Appendix)

Location: St. Louis County
 Township 60N-18W, Sections 4, 5, 26, 36
 Other Data: DDH 4-M1, 4-N1, UNK in Sec. 4 (See Appendix)
 DDH 5-H1 in Sec. 5 (See Appendix)
 DDH UNK, UNK in Sec. 26 (See Appendix)
 DDH UNK in Sec. 36 (See Appendix)

Location: St. Louis County
 Township 60N-19W
 Other Data: Garnet and Staurolite, see also summary in Appendix.

Location: St. Louis County
 Township 60N-20W
 Other Data: Garnet, see also summary in Appendix.

Location: St. Louis County
 Township 60N-21W
 Other Data: Garnet, see also summary in Appendix.

Location: St. Louis County
 Township 61N-12W, Sections 12, 13, 24, 25, 26, 34, 35, 36
 References: A) DNR Open File Drill Samples List

B) Grout, 1950, Appendix F, p. 116

Occurrences: Titaniferous magnetite described in: (Ref. B, p. 116)
 "Here the east end of the Biwabik iron-formation is cut off by gabbro."
 - "Secs. 26, 34 and 35. Show thin, rather steeply inclined beds of the lower divisions, and in Sec. 35, even some of the upper divisions of Biwabik formation and Virginia slate. The gabbro near may have more magnetite than average, and include fragments of iron-formation. No segregations were noted."

Other Data: DDH 15 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 25 (Ref. A)
 DDH D-7 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 35 (Ref. A)
 DDH D-8 in NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 35 (Ref. A)
 DDH D-11, D-12 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 35 (Ref. A)
 DDH 9 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 36 (Ref. A)
 DDH 10 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 36 (Ref. A)
 DDH 11 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 36 (Ref. A)
 DDH KAF-1W in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 13 (See Appendix)
 DDH BF-4 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 35 (See Appendix)
 DDH B2-7 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 35 (See Appendix)
 DDH DR-8012, DR-8032, DR-8070, NM-23, NM-50, NM-51, NM-52, NM-53, NM-54, NM-55, NM-56, NM-57, NM-58, NM-59, NM-61, NM-62, NM-63, NM-64 in Sec. 26 (See Appendix)
 DDH NM-13, NM-13D, NM-14, NM-15, NM-16, NM-17, NM-18, NM-19, NM-20, NM-21, NM-22, NM-25, NM-26, NM-28, NM-29, NM-30, NM-31, NM-32, NM-37, NM-38, NM-39, NM-47 in Sec. 35 (See Appendix)
 Graphite in Sec. 12, see also summary in Appendix.
 Iron Ores - Proterozoic in Sec. 35, see also summary in Appendix.
 Clay minerals in Sec. 36, see also summary in Appendix.
 Titaniferous Magnetite in Sec. 24, see also summary in Appendix.

Location: St. Louis County
 Township 61N-13W, Section 23

Other Data: DDH DV-CR39 in Sec. 23 (See Appendix)

Location: St. Louis County
 Township 61N-14W, Sections 8, 27

References: A) DNR Terminated Lease Files
 B) Giangrande, 1981, UMD thesis, p. i
 C) DNR Project Files, 88-1,107 and 147
 D) DNR Report 107, 1977
 E) DNR General Exploration File

Summary: "Banded, semi-massive, and disseminated sulfide mineralization was intersected in three drill holes near Skeleton Lake . . . within a sequence of Archean metavolcanic rocks, primarily basaltic to andesitic flows, mafic to intermediate tuffs, and associated diabasic rocks . . . Algoman-type iron formation and porphyritic intrusive rocks. The sulfides were deposited 1) in a restricted horizon within a fine-grained, bedded quartz host rock; and more generally, 2) as hydrothermal stringers in favorable sites below the sulfide horizon (Ref. B, p. i)."

- Occurrences: DDH SL-1, SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 8, Lease Exxon CN-8038, has: (Ref. A and C)
- 19.5 ft. of 0.05-0.50% Cu
 - 2.2 ft. of 730 ppm Zn
 - 25 ft. of 2-3 ppm Ag
 - 1 ft. of 617 ppm Cu and 1.9 ppm Ag; DNR sample SL-2698
- DDH SL-2 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 8, Lease Exxon CN-8038, has: (Ref. A and C)
- 21.9 ft. of 0.05-3.38% Cu
 - 6.7 ft. of 0.06-0.1% Zn
 - 16.1 ft. of 2-13 ppm Ag
 - 1 ft. of 1517 ppm Cu & 1.9 ppm Ag; DNR sample SL-2693
 - 3 ft. of 130 ppb Au and 130 ppb Hg
 - 12 ft. of 5.3-23.9% S
- DDH SL-3 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 8, Lease Exxon CN-8038, has: (Ref. A and C)
- 6.4 ft. of 0.18-0.82% Cu
 - 5 selected samples of .115-1.3% Cu; DNR samples SL-2668, SL-2677, SL-2678, SL-2681, SL-2688
 - 17 selected samples of 1-10 ppm Ag; DNR samples
 - 1 selected sample of 580 ppm Co; DNR samples
 - 1 selected sample of 660 ppm Co & 800 ppm Ni; DNR samples
 - 6 selected samples of .009 to .19 Au oz/T; DNR samples
- Other Data: DDH 1 in Sec. 27 (Ref. E, see also Appendix)
For geophysical & geochemical surveys, see Ref. D.
Iron Ores - Archean in Sec. 8, see also summary in Appendix.

- Location: St. Louis County
Township 61N-15W, Sections 2, 3, 4, 5, 6, 10, 12
- References: A) DNR Terminated Lease File
B) Grout, 1937, pp. 62-63
C) Hansen Evesmith papers in the St. Louis County Historical Society "Iron Ore Mining - Vermilion Range Exploration" file, 1932: in Aguar, 1971, p. 28
D) DNR Open File Drill Samples List
E) DNR General Exploration File
- Summary: T-5 and T-6 are occurrences within the Ely Greenstone near the Lake Vermilion formation contact. The North American Mine is within the Lake Vermilion formation near the Ely Greenstone contact.
- Occurrences: DDH T-5 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 5, Lease Bear Creek CN-7583, has (Ref. A)
- 18 ft. of 640-2100 ppm Zn
- DDH T-6 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 6, Lease Bear Creek CN-7584, has (Ref. A)
- 4 ft. of 1200 ppm Zn
- "The North American [Gold] Mine in NW $\frac{1}{4}$ of Sec. 4 south of Tower Junction, the dump of the supposed ore is largely porphyry, but includes some vein matter of quartz, pyrite, carbonate and the fragments of walls with albite, actinolite and chlorite. The large gas bubbles of the liquid inclusions suggest that these veins also are hypothermal (Ref. B, p. 62-63)."
- "The North American Iron Mining Company, (Sec. 4) was one of the most extensive and costly developments on the

Vermilion Range. In 1910 the company was sinking the first concrete shaft on the Vermilion Range. In the camp there were six buildings in addition to the power house. The boarding house could feed sixty men at a time. A townsite was to be laid out, to be called "Walsh" after the shaft (which was named for T. Walsh). In 1910, rock containing gold, silver, copper, and iron ore was sent to smelters at Omaha and Denver. The gold was said to be worth \$22 to \$40 a ton. The mine was to begin shipping in 1911, and a smelter was going to be erected for the gold ores. The concrete shaft was completed at a cost of at least \$40,000. In January, 1912, a gold assay of \$210.80 a ton was reported. By 1915, the ore was admitted to be not rich in iron. Apparently the whole thing was a fraud." (Ref. C, p. 28)

"LaChance Iron Land Company, (Sec. 4). This company was incorporated in 1909 and drilling on the claim began. The property was owned by Michael LaChance, one of the pioneers who came over the Vermilion Trail from Duluth in 1882. Exploration was conducted in 1910 by the White Iron Lake Iron Company. In 1911 a rock carrying \$9.30 in gold and some silver was found in the diamond drill core." (Ref. C, p. 28)

Testpits: Mine in NW $\frac{1}{4}$, Sec. 4, see above
A shaft is reported in S $\frac{1}{2}$, Sec. 3 (Ref. A, Lease USS CN-7592 geology map, p. 1)
A testpit is reported in Sec. 12 (Ref. E, #1, map 1-1)

Other Data: DDH ET-1 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 10 (Ref. D)
Graphite in Sec. 2, 5, 6, and 12, see also summary in Appendix.
Clay minerals in Sec. 6, see also summary in Appendix.

Location: St. Louis County
Township 61N-16W, Section 12

References: A) DNR Open File Drill Samples List

Other Data: DDH 26517 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 12 (Ref. A)
Graphite, see also summary in Appendix.

Location: St. Louis County
Township 61N-18W, Sections 21, 28, 29, 31, 32

Other Data: DDH 21-N1 in Sec. 21 (See Appendix)
DDH 28-D1, 28-E1 in Sec. 28 (See Appendix)
DDH 29-R1 in Sec. 29 (See Appendix)
DDH 31-R1 in Sec. 31 (See Appendix)
DDH 32-N1, 32-R1 in Sec. 32 (See Appendix)

Location: St. Louis County
Township 61N-19W, Section 25

References: A) Thiel, 1922, MGS Field Notebook #92, pp. 65, 67

Testpits: A shallow testpit occurs in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 25 within a 10 ft. wide "dike of basalt porphyry. The porphyry is mineralized with pyrite plus a possible finely disseminated metallic mineral. The dike appears to be later than the granite." (Ref. A, p. 65; map p. 67)

Other Data: Garnet and Staurolite, see also summary in Appendix.

Location: St. Louis County
Township 61N-20W

Other Data: Garnet and Staurolite, see also summary in Appendix.

Location: St. Louis County
Township 62N-12W, Sections 2, 4, 7, 17, 18, 29

References: A) DNR Terminated Lease File
B) DNR General Exploration File
C) Sims & Mudrey, 1978, Shagawa Lake Quad Map GQ-1423
D) Composite map of Surveyor's Originals [circa 1900, see DNR Project File #189]
E) Meineke, Butz, and Vadis, 1977, DNR Minerals Map Set 148

Occurrences: There is a mafic tuff breccia (wetm map symbol) within the Ely Greenstone that locally contains as much as 5 percent sulfides, mainly pyrrhotite but including traces of chalcopyrite and sphalerite (Ref. C).

DDH TL-4 in Sec. 17, Lease Bear Creek CN-7555, has: (Ref. A)
- 80 ft. of 595-2900 ppm Zn

- 11 ft. of 2 ppm Ag

DDH TL-7 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 18, Lease Bear Creek CN-7556, has Ref. A)

- 10.5 ft. of 750-1700 ppm Zn

- 5 ft. of 585-610 ppm Cu

- 8.5 ft. of 2-5 ppm Ag

DDH M-1 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 4, Lease Humble CN-7399, has (Ref. A)

- 16 ft. of 1070-2070 ppm Zn

DDH M-2 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 7, has: (Ref. B, File 3-1)

- 6 ft. of 900-3000 ppm Zn

- 2 ft. of 900 ppm Cu

- 2 ft. of 3 ppm Ag

In SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 4, there are "possible silver bearing rocks" indicated on the map. (Ref. D)

Testpits: A testpit is reported in the SW $\frac{1}{4}$, Sec. 2 (Ref. A, Lease Humble CN-7404, geology map, p. 2)

Other Data: DDH TL-1 in Sec. 17 (Ref. B; see also Appendix)
Graphite in Sec. 29, see also summary in Appendix.
See Lake Sediment Geochemistry (Ref. E)

Location: St. Louis County
Township 62N-13W, Sections 1, 3, 4, 7, 12, 14, 18, 30

References: A) DNR Terminated Lease File
B) DNR Project Files
C) Sims, 1972, MGS Centennial Volume, pp. 70
D) Sims and Mudrey, 1978, Shagawa Lake Quad, USGS Map GQ-1423
E) DNR General Exploration File, 1 & 3
F) Meineke, Butz, Vadis, 1977, DNR Minerals Map Set 148

Summary: Reconnaissance mapping (see Ref. B) indicated various Archean rock types - basalts, granitic intrusives, dacites, sediments, and mafic intrusives - plus 5 outcrops of

- pyroclastic rocks, and numerous thin felsic volcanic units.
- Occurrences: DDH TL-8 in Sec. 12, Lease Bear Creek CN-7565, has:
(Ref. A)
- .5 ft. of 1400 ppm Cu, 735 ppm Zn, 2 ppm Ag in graphite
- DDH TL-9 in Sec. 14, Lease Bear Creek CN-7567, has: (Ref. A and E)
- 22 ft. of 980-1700 ppm Zn
- 9 ft. of 500 ppm Cu
- 17.5 ft. of 2-3 ppm Ag
- Outcrop samples in Sec. 18 & 30 has: (Ref. B)
- .12% Ni, .11% Zn, .05% Cu, .001 Au oz/T, and 0.5 ppm Ag in a metadacite (SL-1966)
- .003 oz/T Au, 0.74 ppm Ag in a basalt porphyry (SL-1973)
- 645 ppm Zn in a quartz sericite schist (SL-1831)
- "A thin lens of greenish-gray tuff-breccia occurs on the south side of the Wolf Lake fault, in secs. 3 and 4, T.62N., R.13W. This rock overlies and locally is interbedded with a remarkably continuous bed of dark gray, carbonaceous, siliceous siltstone that probably is a reworked tuff. The fragments in the tuff-breccia are dominantly fine-grained metadiabase but include a quartz-bearing hypabyssal rock. The rocks contain a small percentage of disseminated pyrrhotite and traces of chalcopryrite and sphalerite." (Ref. C, p. 70)
- "Mafic tuff-breccia -- Exposed in southwestern corner, adjacent to Wolf Lake fault, as a lens in the pillow flows (Webp) south of Ely, and as a thin bed in southeastern corner of map area. Unit is greenish gray generally massive and tough; it consists dominantly of clasts of metabasalt and metadiabase, generally 4 - 6 mm across, in a fine-grained mafic tuff matrix. Chert fragments are rare. Clasts as much as 3 cm across recognized in outcrops. Locally contains as much as 5 percent sulfides, mainly pyrrhotite but including traces of chalcopryrite and sphalerite." [Sec. 1, S $\frac{1}{2}$ Sec. 3, NE $\frac{1}{4}$, Sec. 4] (Ref. D. see map unit Wetm)
- Other Data: DDH 51, 52, 53, 54 in Sec. 7 (See Appendix)
DDH 1, 2 in Sec. 18 (See Appendix)
See Lake Sediment Geochemistry (Ref. F)

- Location: St. Louis County
Township 62N-14W, Sections 3, 4, 5, 11, 12, 13, 14, 15, 18
21, 22, 28, 33, 36
- References: A) DNR Terminated Lease File
B) Rowe, 1971, thesis, pp. ii, 57-63
C) Letter from Childs to Aguar, January 27, 1966: in Aguar 1971, p. 42
D) Winchell, 1900, Vol. 5, p. 339, 340, No. 377
E) Winchell, 1900, Vol. 5, p. 732, No. 1508
F) Vadis and Meineke, 1979, DNR Minerals Map 151
G) DNR Project File 151 and 105-1
H) Grout, 1937, p. 62
I) Peterson, 1952, p. 18
J) DNR Open File Drill Samples List

K) Wolff, Vanished Settlements of the Minnesota Arrowhead Country. February, 1954. (St. Louis County Historical Society, "Ghost Towns" file): in Aguar, 1971, p. 40.

L) Hansen Evesmith papers in the St. Louis County Historical Society "Vermilion Range Explorations" file (1932): in Aguar, 1971, p. 40

M) Meineke, Butz, Vadis, 1977, DNR Minerals Map Set 148

Summary:

"The rocks of the Clear Lake prospect area in Sections 11 and 12 are dominantly volcanic, primarily basaltic to andesitic flows with interbedded mafic tuffs, and two iron formations. Some sulfides were precipitated chemically with magnetite, but most were deposited by volcanic emanations (Ref. B, p. ii)." Rowe describes the massive pyrrhotite, minor pyrite and trace sphalerite (Ref. B, pp. 57-63).

Occurrences:

A trace of chalcopyrite in foliated greenstone outcrop was noted (on Hanna E-49 outcrop map) in NW corner of Sec. 4 (see Lease CN-7509, Hanna). (Ref. A)

DDH V-6 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 5, Lease Hanna CN-7510, has: (Ref. A)

- 5 ft. of 2 ppm Ag

DDH CL-1 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 11, Lease Humble CN-7412, has (Ref. A)

- sphalerite and chalcopyrite noted in the log, but assays are less than 500 ppm

- 4.5 ft. of 520 ppm Ni

DDH CL-2 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 11, Lease Humble CN-7412, has (Ref. A)

- 25 ft. of 1700 ppm Cu

DDH ARM-1 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 18, Lease Humble CN-7412, has: (Ref. A & F)

- 14 ft. of 1100-2000 ppm Zn

- 1 inch of 2 ppm Ag

- 4 inches of 1000 ppm Cu

- 0.4 ft. of .11 ppm Au and 1100 ppm As

- 0.4 ft. of 1.90 ppm Au and 10,500 ppm As and 1850 ppm Ba

- 0.6 ft. of 1400 ppm Zn and 34 ppm Mo

DDH ARM-2 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 18, Lease Humble CN-7415, has (Ref. A & F)

- 73.5 ft. of 700-2400 ppm Zn

- 0.7 ft. of 1.2-1.3 ppm Ag and 1950-6100 ppm Zn and 190-225 ppm As

- 0.4 ft. of 750 ppm Cu

- 0.3 ft. of 100 ppm Mo

- 0.3 ft. of 1400 ppm Ba

DDH V-1 in NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 15, Lease Phelps-Dodge CN-7087, has (Ref. A)

- chalcopyrite and sphalerite noted in the log

Grab samples were taken from the McComber Mine dumps, in Sec. 14, and the assays had up to 0.026 oz/t Au in iron-rich metasediments with up to 50% pyrite (Ref. F)

West end of Mud Lake at "an old mining location." Vein of quartz, calcite, pyrite, "green carbonate of copper," and limonite, sericite, feldspar, in a sheared quartz porphyry (or sericite schist?). [SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 3] (Ref. D, p. 340, No. 377).

"At Eagle Nest Lake a vein on the west side is probably similar" [to other hypothermal veins described on p. 62] (Ref. H, p. 62; location uncertain - possibly Sec. 22 or 28 or 33).

"The Leienderher shaft was sunk on Eagle Nest Lake in 1885 by an old prospector named Leienderher, and while Winchell was on his survey of the area in 1888, he took some samples with him to be assayed. He had two made, one assay reported no gold at all in one sample and one-twentieth of an ounce per ton in the other, which gave it a value of less than a dollar a ton. The other assay reported one-fortieth of an ounce per ton, estimated. The amount was too small to be measured." (Ref. I, p. 18, where Winchell, 18th Annual Report, pp. 21-22, is cited; location uncertain.)

"In 1885 a gold mine (Sec. 36) at Eagle Nest Lake was undertaken by a man named Leienderher, but no merchantable ore was found." (Ref. K, p. 40)

"The Armstrong Lake Iron Company (Section 13) was organized on August 17, 1909, and began drilling in 1909." (Ref. L, p. 40).

"McComber Mine, Lot 3, Sec. 13 and Lot 4, Sec. 14. In the 1880's Captain McComber sank a shaft 60' and got about 400 tons of the finest blue hematite ore. This was left in a stockpile. In 1910, George A. St. Clair secured the old mine and started exploration work. The 1890 ore body had been lost, but St. Clair unwatered the old shaft and retimbered it. Several buildings were constructed around the site. In 1913 the property was leased by the Mutual Iron Mining Co., of Duluth. A townsite was laid out and a hotel was built, fronting the beach with excellent boating and bathing facilities. The last shipment was in 1919." (Ref. L, p. 40)

"LaRue Mine. At the end of the D&IR spur that served the McComber and Mud Creek mines, another exploration was started near Armstrong Bay of Lake Vermilion. Many years ago, a deep drift into a cliff could still be found, and there used to be a caretaker at the site by the name of Napoleon Sandville." (Ref. C, p. 42)

"Consolidated Vermilion and Extension Mine. S $\frac{1}{4}$ of NW $\frac{1}{4}$, SW $\frac{1}{4}$ of NE $\frac{1}{4}$, and NW $\frac{1}{4}$ of SE $\frac{1}{4}$ (Sec. 5). This was originally known as the Sheridan homestead. In 1898, when the property was leased by Oliver Iron Mining Co. In 1912 ore was discovered by Captain Robert Powell of Consolidated Vermilion. The vein was discovered near an old exploratory shaft which had missed ore by 40' from one angle and 100' from another angle. It is exhausted, with the last shipment in 1923." (Ref. L, p. 40) [Location uncertain]

Testpits: Shaft on Eagle Nest Lake, location uncertain above (Ref. I). In Sec. 21, 62N-14W, (Ref. G, 105-1, see Listerud Outcrop Map)

In NW $\frac{1}{4}$, Sec. 21, 62N-14W, "Area of testpits and trenches"; (Different from the above shaft), (Ref. G, 105-1) (see Hanna Mining Company Outcrop Map)

In SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 3, 62N-14W, "An old mining location" (Ref. D p. 340)

In Sec. 3, 62N-14W, "pits north of Chester Peak, near Soudan" (Ref. E, p. 732)

In NW $\frac{1}{4}$, Sec. 4, testpits are reported (Ref. A, Lease Hanna CN-7509, map E-49).

In Sec. 7 and Sec. 8, testpits of the Armstrong Bay Mine are reported (Ref. C, #1, 7-1).

About 25 testpits are indicated, but the location is uncertain (Ref. C, #1, 9-1)

Other Data: DDH V-5 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 5 (Ref. J)
 DDH CL-3 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 11 (Ref. J)
 DDH 1 in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 13 (Ref. J)
 DDH ARM-3 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 18 (Ref. J)
 DDH M-1, 1, 2, 3, 4, 5 in Sec. 14 (Ref. C)
 DDH 1, 2, 2A, 3 in Sec. 4 (See Appendix)
 Graphite in Sec. 5, 15, and 18, see also summary in Appendix.
 Iron Ores - Archean in Sec. 7, 8, 11, and 12, see also summary in Appendix.
 Clay minerals in Sec. 11, see also summary in Appendix.
 See Lake Sediment Geochemistry (Ref. M)

Location: St. Louis County
 Township 62N-15W, Sections 2, 6, 15, 16, 17, 27, 28, 32

References: A) DNR Terminated Lease File
 B) Perry, 1970, p. 17, in MGS Summary of Fieldwork, 1970
 C) Ojakangas, Sims, and Hooper, 1978, Tower quadrangle geologic map, MGS Map GQ-1457
 D) Winchell, 1900, V. 5, pp. 361, 742, 885-887
 E) DNR Open File Drill Samples List
 F) Klinger, 1956, p. 132
 G) Sims, 1972, Cent. Vol., p. 172
 H) Stuntz, Evidences of Early Man in Northeastern Minnesota. December 2, 1884. (St. Louis County Historical Society, "Stuntz, George R" file): in Aguar, 1971, p. 43

Summary: Archean greenstone terrane

Occurrences: DDH P-1 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 6, Lease Humble CN-7423, has:
 (Ref. A)
 - 8 ft. of 970-1630 ppm Zn
 - 12 ft. of 84-230 ppm As
 - 4 ft. of 130 ppb Hg
 - 2 ft. of 2400 ppm Cu
 [This is in the Newton Lake formation near the Lake Vermilion formation contact.]
 DDH RL-10 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 2, Lease Bear Creek CN-7585, has:
 (Ref. A)
 - 42 ft. of 520-980 ppm Zn
 - 15 ft. of 500-565 ppm Cu
 - 30 ft. of 2 ppm Ag
 Outcrop on Ely Island, in Sec. 17, Lease Bear Creek CN-7586, a map has copper noted in the quartz feldspar porphyry. (Ref. A)
 Outcrop on Ely Island, in Sec. 15 & 16 has "extensive low-grade copper mineralization." "In the greenstone belts we find anomalously high, but not impressive, concentrations of Cu, Ni, & Cr but little gold" (location uncertain). (Ref. B, p. 17). [This is Lake Vermilion formation.]
 Outcrop in Sec. 32 has substantial sulfides in the Lake

Vermilion formation indicated on the map. (Ref. C)

A gold prospect called Rison's place on Ely Island [location uncertain in Sec. 15 or 16 or 17] is called an "altered quartz porphyry" and has "quartz, feldspar, sericite, pyrite, siderite, muscovite, & gray opaque" (Ref. D, # 428).

Referring to geology in the Soudan Iron Mine in Sec. 27 & 28, "The common mineral impurities include quartz, chlorite, sericite, kaolinite, chalcopyrite, and pyrite. Native copper, bornite, cuprite, and brochantite are occasionally found in one orebody, and some siderite in another. There appears to be no zonal distribution of mineral or chemical impurities in the orebodies. Variations occur across the orebody and along strike, but do not show regular patterns. It should also be noted that the nature of the ore shows no change in depth.

Wall rock alteration is not extensive. Chloritization appears to be more closely connected with ore deposition than does sericitization or oxidation, although all three types of alteration are found. Some rocks appear to be kaolinized adjacent to ore." (Ref. F, p. 132; also Ref. G).

Native copper occurred in the Montana Shaft of the Minnesota Iron Company at Soudan. It occurs in a vein-like sheet at 265 feet depth and was from $\frac{1}{4}$ to $\frac{1}{2}$ inch thick. It was accompanied by several thinner veins and also by malachite, azurite, and cuprite. (See further discussion and reference to a paper by Dr. C. P. Berkey). [N $\frac{1}{2}$ -SW and NW-SE, Sec. 27 and SE-NE and NE-SE, Sec. 28] (Ref. D, pp. 885-887).

(Lee Mine, Tower; No. 1549, Breccia) "A brecciated mass, cemented by quartz, composed of quartz and hematite, with some copper sulphide, probably both bornite and chalcopyrite; also a little azurite." [Probably Sec. 32] (Ref. D, p. 742).
 Testpits: "North side of the bluff, (Sec. 27). An excavation was made here in solid jasper. The sides have given way, and the pit is now partly full (as of 1884!). Masses of rock 3 to 10 cubic feet in size had been removed. A gravel walk extended from the pit to a dump, where jasper blocks were carried. A nearby vein of slate bore red and yellow ocher, which may have been the mineral mined. The vein was worked to the westward for a distance of several 100 feet." (Ref. H, p. 43)

A shaft is reported in SW $\frac{1}{4}$, Sec. 34 (Ref. A, Lease USS CN-7592, geology map, p. 1)

The Soudan Mine is in Sec. 27 and 28, see above.

Other Data: Graphite in Sec. 2 and 6, see also summary in Appendix.
 Native Copper in Sec. 27 and 28, see also summary in Appendix.
 Clay minerals in Sec. 6, see also summary in Appendix.

Location: St. Louis County
 Township 62N-16W, Sections 4, 5, 6, 7, 8, 9, 10, 11, 15, 26, 27

References: A) Grout, 1921, Field Notebook #74, MGS, p. 3
 B) Winchell, 1900, Vol. 5, p. 351

- C) Composite Map of Surveyor's Originals [circa 1900, see DNR Project File #189]
- D) Winchell, 1900, Vol. 5, p. 350
- E) Winchell & Grant, 1895, 23rd Annual Report, Part III, p. 44
- F) Winchell, 1900, Vol. 5, p. 359
- G) Grout, 1937, p. 62
- H) Grout, 1926, p. 131
- I) Peterson, 1952, pp. 5-18
- J) Elliot, 1923, 22 pp.
- K) Johnson, 1926, pp. 6-9
- L) Prospectus, North Star Gold & Silver Mining Company, 1867
- M) Ojakangas & Matsch, 1982, pp. 147-148
- N) History of Iron Ore Discovery: Mesabi & Vermilion Ranges. October 27, 1933. (St. Louis County Historical Society, "Iron Ore Mining Manuscripts II" file): in Aguar, 1971, p. 41
- O) Stuntz, The Mound Builders in Northern Minnesota. January 6, 1885. (St. Louis County Historical Society, "Stuntz, George" file): in Aguar, 1971, p. 43
- P) Survey notes by George Stuntz given by Albin Anderson, County Auditor; January 23, 1934. (St. Louis County Historical Society, "Gold Rush of the '60's" file): in Aguar, 1971, p. 43
- Q) Ojakangas & Sims, 1977, MGS Map M-17

Occurrences: Pyrite and chalcopyrite occur in quartz veins and in chloritic slates of Lake Vermilion formation which dominantly is metagraywacke and slate. Above biotite isograd and locally above garnet isograd. [Hole is about NW $\frac{1}{4}$ of NW $\frac{1}{4}$, Sec. 10, and SW corner of NE $\frac{1}{4}$ of NW $\frac{1}{4}$ of Sec. 9], (Ref. A, p. 3).

Two samples from the gold prospect on Vermilion Lake of Minnesota Company's mining location, location uncertain, "perhaps on Birch Point" [possibly Sec. 10, 11, or 15 of T62N-16W]. One sample was described as "chloritic slate", the other as "vein quartz with considerable pyrite" (Ref. B, p. 351, Nos. 297 and 398).

Two samples from the gold prospect on Vermilion lake [no location name] "perhaps NW $\frac{1}{4}$, Sec. 6". One sample was described as "quartz ore," the other as "mica schist" (Ref. F, p. 359, nos. 421 and 422).

In Sec. 9, "gold diggings" indicated on map near shore of Lake Vermilion (Ref. C).

"The veins prospected [for gold] are scattered at a number of points around the lake, partly in Keewatin greenstone and partly in the Ogishke-Knife Lake sediments overlying the greenstones. Evidently several prospects found the mineralized walls, both greenstone and porphyry, at least as promising as the veins. The veins are mostly quartz, with ankerite, pyrite, chalcopyrite (possibly some chalcocite), with some feldspar, rutile and fragments of chlorite and micaceous wall rocks. The mineralization is partly later than the quartz (Fig. 6). Two or more of the veins carry tourmaline, and probably all are hypothermal. These are the prospects and a mile west of the end of Birch Point, near

center of NW $\frac{1}{4}$ Sec. 9, T.62N., R.16W. (Fig. 2). [See other occurrence description in Sec. 9], (Ref. G, p. 62).

Sample No. 395 and 396 from New York Mining Company location at SW $\frac{1}{4}$ of SW $\frac{1}{4}$ of Sec. 26 called "clay slate" and "vein quartz", described as "assayed no gold." [Note: assay questioned when multiple samples mixed together] (Ref. D, p. 350).

"Beyond the traces of gold found in assaying the silver and copper ores of Michipicoten island and other localities around lake Superior, there was no gold discovery or "boom" until 1865. In this year gold ore was reported from Vermilion lake, Minnesota, by state geologist Eames and others. A wagon road was laid out from Duluth to the new Eldorado, a distance of 75 miles through the forest. Prof. N. H. Winchell speaks as follows about this Vermilion lake development."* "At that time a flush of feverish excitement led to the expenditure of considerable money in sinking shafts and erecting works for mining. Three steam stamp mills were erected, another running by water power. One was owned by the New York Mining Company, whose location was near the "Mission" on the south shore, another by Nobles and Company, further northwest, and another by Seymour and Company. The water power mill was owned by the Wabasha Company, and was located about two miles from Vermilion lake at Trout lake. Eight or ten mining companies were at work simultaneously in different parts, mainly on the southern shores or on islands. A townsite was laid out at the southern extremity of the lake, several large buildings put up, and stated communication made with Duluth. The village was named Winston. Above the village, at Pickerel falls, a lumber mill was projected and the foundations laid." The very land subsequently found so valuable for iron ore, where the hard hematite and jasper stood out in bald knobs, a hundred feet high, was taken for gold claims. The veins, however, proved to contain more pyrite, marcasite and pyrrhotite than gold, and by 1867 the country was deserted, iron deposits and all," *Seventh Ann. Rep. Minn. Geol. Sur., p. 73, 1878" [Seventh Ann. Rep. Minn. Geol. Sur., p. 73, 1878], (Ref. E) [Location uncertain]

Sample No. 423, from "NW $\frac{1}{4}$ of Sec. 9, Nobles mining location apparently on the south shore of Black Duck point" and titled "gold ore" consists of vein material in country rock. The vein "is largely of calcite, with quartz and a little pyrite" and the country rock "is green, fine, calcareous, pyritiferous, and apparently sericitic" (Ref. F).

"West of Tower some rock about 600 feet southwest of the east quarter post of Sec. 6 is mineralized with pyrite, tourmaline and carbonate" (Ref. G, p. 62).

"In a few places the greenstone and green slate are mineralized with pyrite and crossed by pyritic quartz veins. Gold has been reported but assays by the Minnesota School of Mines experiment station showed no gold, silver or copper." (Ref. H, p. 131) [Location uncertain, probably Sec. 4, 5, 7, 8 or 9.]

"Gold Stamping Mill. The boiler that is believed to have operated a gold stamping mill, piles of ore, cinders and

several deep pits are also to be found near Everett's Bay. It is reasonable to assume that the "gold rush" miners brought ore to this site by boat for crushing and processing and occupied what was left of the earlier fur trade post. A description and photo of the shell of the oil boiler, partially exposed in a mound of earth, appear in the Minnesota Archaeologist quarterly, Vol. XXVIII, #4, 1966." [location uncertain] (Ref. N, p. 41)

"Aboriginal mines. (Sec. 27). The Indians worked these ancient mines by heating the rocks and then dashing water on them and pounding them with stone hammers. This would cause the rock to crack and chip off. Ashes and charcoal used to be found in abundance around the diggings. Red and yellow ochers were probably the most often mined." (Ref. O, p. 43) [Location uncertain]

"Gold diggings. George Stuntz' survey notes reported deserted gold diggings between section 9 and 10 and a deserted stamp mill in section 9." (Ref. P, p. 43)

Testpits: Probably pit at Nobles mining location (see above) in NW $\frac{1}{4}$ of Sec. 9.

In SE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 9 there is a testpit for gold reported in metabasalt.

Minnesota Company's mining location is "perhaps on Birch Point" [Location uncertain, possibly Sec. 10, 11, or 15] (Ref. B, p. 351)

New York Mining Company's Location in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 26 (See above)

Other Data: Historical accounts of the Lake Vermilion activity include Ref. I, Ref. J, Ref. H, Ref. L, Ref. M.

Location: St. Louis County

Township 62N-17W, Sections 1, 29

References: A) DNR Terminated Lease File

B) DNR Open File Drill Samples List

C) Gruner, 1937, p. 62

Summary: Archean greenstone terrane.

Occurrences: DDH SC-1 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 29, Lease Bear Creek CN-7803, has (Ref. A)

- 5 ft. of 2.8 ppm Ag

Testpits: An old adit is reported on Gold Island in Lake Vermilion (Ref. C, p. 62) [Location uncertain, possibly Sec. 1]

Other Data: DDH SC-2 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 29 (Ref. B)

Graphite in Sec. 29, see also summary in Appendix.

Iron Ores - Archean in Sec. 29, see also summary in Appendix.

Location: St. Louis County

Township 62N-18W, Section 3

References: A) Grout, 1921, MGS Field Notebook #76, p. 59

Occurrences: "Ike Goodwill also has chunks of magnetite ore with hematite from Sec. 3. He says there are outcrops and testpits."

(Ref. A, p. 59)

Testpits: In Sec. 3, see above

Other Data: Clay minerals, see also summary in Appendix.

Iron Ores - Archean in Sec. 3, see also summary in Appendix.

Location: St. Louis County
Township 62N-20W, Sections 7, 11

References: A) Sims, Sinclair, Mudrey, 1972, p. 161, in MGS Cent. Vol.
B) Grout, 1921, MGS Field Notebook #76, p. 59

Occurrences: "Ike Goodwill drilled four holes (see sketch map) in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 11 and NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 11. The SW hole got quartzite iron formation. The NE hole got asbestos which he showed me a core of." (Ref. B, p. 59)

Testpits: There exists a "dump of small adit driven into a conspicuous outcrop on hill at bend in state hwy. 1, in south-central part of Sec. 7" (Ref. A, p. 161, as footnote in Table III-41).

Other Data: Iron Ores - Archean in Sec. 11, see also summary in Appendix.

Location: St. Louis County
Township 62N-21W, Sections 4, 9, 10, 29, 30

References: A) DNR Terminated Lease Files
B) Sims, Sinclair, Mudrey, 1972, p. 160, in MGS Cent. Vol.
C) DNR Open File Drill Samples List

Summary: "The Linden Pluton is a moderately small, probably composite body of alkali-lime syenite" (Ref. B, p. 160).

Occurrences: DDH LF-4, in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 4, Lease Humble CN-7451, has:
- 56 ft. of 240-1200 ppm F (Ref. A)
DDH LF-5, in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 10, Lease Humble CN-7457, has:
- 53 ft. of 250-850 ppm F

Other Data: DDH LFRAC-4 in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 4 (Ref. C)
DDH C-H-4 in NE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 29 (Ref. C)
DDH C.M.-5 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 30 (Ref. C)
DDH LP-1 in Sec. 4 (See Appendix)
DDH LP-2 in Sec. 9 (See Appendix)
Graphite in Sec. 30, see also summary in Appendix.
Clay minerals in Sec. 29 and 30, see also summary in Appendix.

Location: St. Louis County
Township 63N-12W, Sections 1, 4, 9, 11, 16, 25, 27, 30, 33, 35

References: A) DNR General Exploration File
B) DNR Terminated Lease File
C) Machamer, 1968, MGS SP-2, pp. 20-21, 30
D) Yeoman, 1984, UMD thesis, p. 6
E) Sims and Mudrey, 1978, Map USGS GQ-1423 (see Wm symbol)
F) Grout, 1926, pp. 69, 82
G) Winchell, 1899, p. 258, Vol. 4
H) Winchell, 1900, p. 842, Vol. 5
I) Grout, 1937, p. 62
J) Sims, MGS Cent. Vol., 1972, p. 176
K) Grout, 1924, MGS Field Notebook #112, pp. 37-39
L) Schulz, 1974, U of M Thesis, pp. 20, 29, 31, 37, 40, 44, 49, 51, 57
M) Emmons and Grout, 1943, MGS Bulletin 30, p. 32
N) DNR Open File Drill Samples List

Summary: The Raspberry Gold prospect occurs within the Archean age Newton Lake Formation and was recently drilled by Nicor and

Goldfields (29 DDH's). Yeoman (1984) wrote a thesis about the economic geology and petrology of the prospect. The exploration history (from Ref. D) includes: (1) 1890 MGS report of outcrop of a vein with gold assays that average "a dollar a ton"; (2) sporadic work in the area in 1894 through 1935; (3) in 1935, the owners sank a number of test shafts into several mineralized quartz veins, but only one shaft is accessible at present; it is approximately 15 ft. deep with a 20 foot adit extending NW at the bottom of the shaft; (4) in 1962 and 1963, R. V. Whiteside drilled nine holes into and around the granodiorite stock, but found only traces of gold and silver; (5) in 1969, Bear Creek Mining Company drilled three holes on geophysical conductors; (6) in 1972, American Shield and North Central Mineral Ventures drilled six holes. Yeoman (1984) cites ground E-M, ground magnetics, gravity, and IP geophysical surveys.

To summarize the lithologies (from Ref. D), the Archean Newton Lake formation has metabasalt flows, gabbro intrusives, phyllite, metagreywacke, rhyolite intrusions, a granodiorite with apophyses and dacite dikes and quartz veins and a contact aureole. The ore minerals occur as fracture fillings in complex quartz veins (with zoned alteration) within and surrounding the granodiorite. The ore minerals include visible gold, pyrite, sphalerite, chalcopyrite, galena, tetrahedrite, telluride, pyrostitpnite, malachite, azurite, covellite, neodigenite.

Occurrences: DDH LL-3 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 16, Lease Humble CN-7403, has (Ref. B)

- 19 ft. of 680-1400 ppm Cu

DDH LL-2 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 16, Lease Humble CN-7403, has (Ref. B)

- 31 ft. of 700-1000 ppm Zn

DDH LL-1 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 16, Lease Humble CN-7403, has (Ref. B)

- 10 ft. of 500-1200 ppm Zn

DDH WW-1 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 35, Lease Humble CN-7404, has (Ref. B)

- 69.5 ft. of 800-4500 ppm Zn

- 25 ft. of 800-900 ppm Cu

Note the alteration zones described and indicator minerals "tourmaline in chloritic lenses in thin layer of pyritic chert" (Ref. C, p. 30).

DDH (BC) S-1 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 30, Lease Bear Creek CN-7559, has: (Ref. A & B)

- 2 ft. of 665 ppm Zn

DDH (BC) S-3 in Sec. 30, #2, has: (Ref. A)

- 10 ft. of 505 ppm Cu

At Ely, west of the southwest bay of Long Lake is a large persistent vein that is probably of a similar origin. It extends through the SW $\frac{1}{4}$ of SW $\frac{1}{4}$ Sec. 30, T.63N., R.12W., and over into Sec. 25. The quartz vein is large and accompanies a granite dike, but is mineralized only locally with sulphides of copper, lead and zinc. The outcrop is rusty and copper stained at these places and assays showed variable amounts of gold (Ref. I, p. 62).

Auriferous quartz vein, \$8.64 from average dump sample

from SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 30. Vein traceable about 1/8 mile, max. 80 ft. wide (Ref. G, p. 258).

Vein quartz with pyrite, chalcopyrite, galena, sphalerite, malachite, azurite. An assay by Sharpless and Winchell showed 0.24 oz/t gold and 6.04 oz/t silver. [SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 30] (Ref. H, p. 842, #2127).

"In addition to hematite, the ores contain moderate amounts of magnetite, hausmannite, and pyrite and sparse goethite, pyrrhotite, chalcopyrite, covellite, chalcocite, and native copper." This refers to the Zenith Iron Mine in N $\frac{1}{2}$ -SE $\frac{1}{4}$, Sec. 27 (Ref. J, p. 176).

"The olivine [in the Archean Newton Lake Formation peridotite layer, location uncertain and examples in NE $\frac{1}{4}$ of Sec. 1 and in Sec. 9] occurs as . . . and constitutes from 35 to 85% of the rock (average about 65%)." (Ref. L, pp. 40 & 20). "Chromite constitutes no more than 3% of any sample." (Ref. L, pp. 44, 37 & 20).

"A reversal in the sequence has been noted in at least one sill based on an outcrop in the NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 11, T. 63N, R. 12W. Modes for seven chill margin samples are presented in Table 3.

The first unit encountered (nearest the contact; "Unit A") is typically about 5 feet thick. It is a fine-grained, dark green basaltic appearing rock, consisting of about 50% small (1mm) blocky amphibole pseudomorphs after clinopyroxene surrounded by a fine groundmass of intergrown altered plagioclase and pyroxene (Figure 8). The pyroxene pseudomorphs often have chlorite-filled centers suggesting that they were originally hollow, skeletal crystals possibly filled with glass. Small rounded grains of sulfide and oxide minerals are locally quite abundant in this unit forming up to 4 or 5% of the rock. The higher concentration appears more commonly in the lower chilled zone where the unit is characteristically highly oxidized and limonite stained." [Sec. 11 and NE $\frac{1}{4}$ of NW $\frac{1}{4}$ sec. 1] (Ref. L pp. 29, 31)

"In the layered, differentiated sills pyroxenite stratigraphically overlies the peridotite with the transition occurring over a few inches. The upper contact is gradational, involving an increase in plagioclase content upwards. The gradational nature of the upper contact has made thickness determinations imprecise, however, the unit is generally about 50 feet thick and is not more than 100 feet thick in any sill examined. Outcrops in association with peridotite are mostly low and grass-covered, whereas the upper portions are often encountered on topographically higher outcrops of the overlying bronzite gabbro . . .

In thin section the pyroxenites are found to be composed primarily of augite, plagioclase and orthopyroxene with minor magnetite, sulfide, quartz and hornblende. Textures vary from panidiomorphic granular to porphyritic with crystals of augite and orthopyroxene surrounded by interstitial plagioclase, quartz and hornblende. A few altered olivine grains are generally present near contacts of the pyroxenite with peridotite.

Quartz, magnetite, sulfide and hornblende form minor

interstitial phases, together making up no more than 3 to 4% of any rock sample. Table 3.

[SW $\frac{1}{4}$ of SE $\frac{1}{4}$, Sec. 9] (Ref. L, pp. 49, 51, 57)

"The ore bodies at Ely are composed principally of massive hematite, which has been brecciated and cemented by a later generation of hematite or by later carbonate minerals. They are tabular in shape, enclosed within walls of Ely Greenstone, and grade upwards into fractured and brecciated jaspilite. The lower limits of the ore bodies, where they have been reached by mining operations, are determined either by a decrease in width or by a decrease in iron content resulting from mineralogical changes in the ore.

The iron-bearing materials exclusive of the original iron-formation in the Zenith mine can be grouped into 5 types: (1) massive hematite, (2) brecciated massive hematite having a hematite cement, (3) brecciated massive hematite having a carbonate cement, (4) brecciated carbonate minerals cemented by a later carbonate, and (5) massive magnetite containing variable amounts of carbonate minerals and pyrite. All five types of ore are found in the Central ore body, but the West ore body is composed almost entirely of brecciated hematite cemented by hematite. The carbonate-bearing material is common only in the Central ore body. This material was first recognized on the eastern end of the 15th level; it increases in abundance with depth, and forms the major part of the Central ore body on the 18th level.

In addition to hematite, magnetite, hausmannite, and pyrite occur in the ore in significant amounts. Trace amounts of goethite, pyrrhotite, chalcopyrite, covellite, chalcocite, and native copper have also been found. Gangue minerals other than the carbonates are present in very small quantities, and include quartz, chlorite, kaolinite, apatite, and some very poorly crystalline phosphates of uncertain composition, topaz, tourmaline, and gypsum. The carbonate minerals include both calcite and dolomite (which contains variable amounts of ferrous iron in solid solution); in general the early carbonates are dolomite-rich whereas the later carbonates are calcite.

The distribution of the iron and manganese minerals within the Central ore body follows a well developed zonal pattern; hausmannite appears abruptly in the central part of the ore body just above the 17th level, and just below the hausmannite zone magnetite becomes the principal iron mineral.

Two alteration zones can be distinguished in the greenstone surrounding the ore bodies; an outer zone in which the rock is composed largely of chlorite, and an inner zone in which the rocks are colored red by the presence of significant amounts of hematite. Some of the rocks immediately adjacent to the ore bodies are composed almost entirely of hematite and kaolinite, and these rocks are separated from the common hematite-chlorite rocks of the inner zone by rocks composed of fine-grained muscovite and hematite. The most significant chemical change from the unaltered to the altered greenstone is a pronounced increase in iron content.

Both magnetite and hematite were formed throughout the period of ore deposition, but at any given time and place the first mineral to be deposited was magnetite. Pyrite and pyrrhotite also formed throughout the period of ore deposition; pyrrhotite was the first of these to be deposited. The majority of the hausmannite was deposited in the late stages of ore formation."

[N₂-SE₄, Sec. 27] (Ref. C, pp. 20-21)

"MONZONITE AND PORPHYRITIC GRANITE (PRECAMBRIAN W) - Exposed on west side of Shagawa Lake as small irregular epizonal pluton and associated dikes that cut basalt of the Newton Lake Formation. Principal rock type is pinkish gray mottled slightly inequigranular monzonite and quartz monzonite consisting, in order of decreasing abundance of strongly zoned sodic plagioclase, microcline microperthite, quartz, and altered clinopyroxene. The microperthite and quartz are late interstitial minerals. The monzonite is cut by dikelike bodies of pink porphyritic granite that contains strongly zoned plagioclase, microcline microperthite, quartz, and altered clinopyroxene. The quartz and microperthite are late, interstitial minerals. Both rock types are metamorphosed and deformed under greenschist-facies conditions. Associated with the granite are veins and pods of milky quartz that contain small amounts of gold, pyrite, tetrahedrite, and chalcopyrite."

[SW₄-SW₄, Sec. 30] (Ref E, see map unit Wm)

"Mafic tuff-breccia - Exposed in southwestern corner, adjacent to Wolf Lake fault, as a lens in the pillow flows (Webp) south of Ely, and as a thin bed in southeastern corner of map area. Unit is greenish gray generally massive and tough; it consists dominantly of clasts of metabasalt and metadiabase, generally 4 - 6 mm across, in a fine-grained mafic tuff matrix. Chert fragments are rare. Clasts as much as 3 cm across recognized in outcrops. Locally contains as much as 5 percent sulfides, mainly pyrrhotite, but including traces of chalcopyrite and sphalerite."

[Sec. 33] (Ref E, see map unit Wetm)

A rock called a porphyritic variety of greenstone was quarried for roofing stone for artificial shingles. Location is "3 miles west of Ely" [probably Sec. 31]. (See the picture of the Emeraldite Surfacing Products Company mill on p. 69, Ref. F; brief description p. 82, Ref. F)

Testpits: Three shafts, at least one adit, and more than 20 trenches (or testpits) are indicated on map. (Ref. D)

In Sec. 4, there are testpits reported (Ref. M, p. 32)

Testpits in SW₄-SW₄, Sec. 30, because a dump is mentioned. (See description above, Ref. G, p. 258)

In SW₄-NW₄, Sec. 4, there are four testpits marked on the sketch map and they are described as iron prospects. (Ref. K, pp. 37-39)

Other Data: See DNR General Exploration File 63-13 for hundreds of gold assays.

DDH S-2, EDH-1, EDH-7, EDH-8, EDH-10, EDH-11, EDH-12, EDH-13, EDH-14, EDH-16, EDH-18, EDH-20, EDH-21, EDH-22, EDH-23, EDH-24, in W₂-SW₄, Sec. 30 (Ref. N)
DDH R-3 in SW₄-SW₄, Sec. 30 (Ref. N)

DDH 5512, 5513, 5614 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 25 (See Appendix)
 DDH 108, 109, 112, 113, 114, 115, 116, 117, 118, 119, 120
 121, 122, 201, 202, 203, 204, 205, 206, 210, 211, 212, 213,
 214, 215, 216, 217 in SW $\frac{1}{4}$, Sec. 27 (See Appendix)
 Graphite in Sec. 16 and 35, see also summary in Appendix.
 Iron Ores - Archean in Sec. 30 and 35, see also summary in
 Appendix.
 Clay minerals in Sec. 16, see also summary in Appendix.

Location: St. Louis County
 Township 63N-13W, Sections 25, 26, 27, 36

References: A) Sims & Mudrey, 1978, Shagawa Lake Quad Map GQ-1423.
 B) DNR Open File Drill Samples List
 C) DNR General Exploration File

Occurrences: Five small fuchsite-bearing siliceous marble bodies occur
 within the upper part of the Newton Lake formation in Sec.
 25, 26, 27. (Ref. A, symbols Wnsm)

Testpits: 3 pits on outcrop map in Sec. 25 near lines 36W, 32W, 4W
 (Ref. C, #3, Fig. 1, outcrop map)
 Eleven testpits and one shaft are reported in NW $\frac{1}{4}$, Sec. 35
 (Ref. E, Lease Humble CN-7408, geology map, p. 1)

Other Data: DDH EDH-2, EDH-3, EDH-4, EDG-5, EDH-6, EDH-9, EDH-15, EDH-17,
 EDH-19 in E $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 25 (Ref. B)
 DDH 1, 2, 3, 4, 5, 6, 7, 8, 9 in Sec. 36 (Ref. C; see also
 Appendix)
 DDH 7, 8, 9 in Sec. 25 (Ref. B; see also Appendix)
 DDH R-2, R-4, R-5 in Sec. 25 (Ref. B)
 DDH R-1 in SE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 25 (Ref. B)

Location: St. Louis County
 Township 63N-14W, Sections 32, 33

References: A) Schulz, 1977, Ph.D. dissertation, p. 53
 B) Wolff, Vanished Settlements of the Minnesota Arrowhead
 Country, February, 1954 (St. Louis County Historical
 Society, "Ghost Towns" file): in Aguilar, 1971, p. 42
 C) DNR Open File Drill Samples List

Occurrences: Pyrite is particularly abundant (up to several percent with
 massive sulfide locally) in a volcaniclastic unit in the
 southern portion of Sec. 32 & Sec. 33. (Ref. A, p. 53)
 "The Consolidated Vermilion and Extension Company operated
 the property known as the Mud Creek Mine, four miles north
 east of Armstrong Bay. During the World War I period over
 22,000 tons of iron ore were mined and shipped. Adequate
 precautions were apparently not taken, and the muck bottom of
 Mud Creek burst into the mine. At the first flooding, the
 crew had just gone to dinner and no one was hurt. Mining
 continued after the water was pumped out. In 1916 a second
 flood drowned six miners, who are still entombed. The mine
 was abandoned, the mine head-frame was tipped over, and the
 settlement of nine buildings was torn down, except for the
 old boarding house and warehouse which the mine clerk
 converted into a private home." (Ref. B, p. 42) [Location
 uncertain]

Other Data: DDH V-2 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 32 (Ref. C)
Graphite in Sec. 32, see also summary in Appendix.

Location: St. Louis County
Township 63N-15W, Section 33

References: A) Sims, Morey, Green, 1969, 42nd Annual AIME Meeting at Duluth, p. 82.
B) Grout, 1920, MGS Field Notebook #58, p. 1

Occurrences: Silicification, milky quartz and pyrite occur locally along most faults...It is particularly conspicuous just north of Matson Island, near the east end of Vermilion Lake (NW $\frac{1}{4}$, Sec. 33). A 20-ft. thick silicified zone exists. Schist adjacent to the quartz veins is stained reddish brown. (Ref. A, p. 82)

Testpits: Four testpits in SE $\frac{1}{4}$ of Sec. 36 are dug in the Lake Vermilion formation in an area of metagraywacke and slate. Pits seem to be targeted on outcrops of jaspilite. (Ref. B, p. 1 with sketch map)

Location: St. Louis County
Township 63N-16W, Sections 10, 31, 35, 36

References: A) Winchell, 1900, Vol. 5, p. 351
B) Sims, Morey, Green, 1969, 42nd Annual AIME Meeting at Duluth, p. 82
C) History of Iron Ore Discovery: Mesabi and Vermilion Ranges. October 27, 1933 (St. Louis Co. Historical Society, "Iron Ore Mining Manuscripts II" file): in Aguar, 1971, p. 43
D) Grout, 1921, Field Notebook #74, MGS, p. 3
E) Composite Map of Surveyors' Originals [circa 1900, see DNR Project File #189]

Occurrences: At Simond's location, chalcocite in quartz vein in chlorite schist. Location uncertain, may be SW corner of Sec. 31. (Ref. A, p. 351, No. 399)
Silicification, milky quartz & pyrite occur locally along most faults . . . In NW $\frac{1}{4}$ of Sec. 36, strands of the fault contain quartz-pyrite veins as much as several inches thick. The schist wall rock adjacent to the veins is bleached and altered. (Ref. B, p. 82)
Pyrite and chalcopyrite occur in quartz veins and in chloritic slates of Lake Vermilion formation which dominantly is metagraywacke and slate. Above biotite isograd and locally above garnet isograd. [NE $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 10] (Ref. D, p. 3)
In Sec. 23, there is a "deserted gold stamp mill" indicated on the map. (Ref. E)

Testpits: "Gold Island. In 1933 Gold Island still had a shaft and old boiler in existence from the time of the great gold rush in this area." (Ref. C, p. 43) [Location uncertain]
Probable testpit at Simond's location [See above, but location uncertain].

Other Data: Garnet in Sec. 35, see also summary in Appendix.

Native Copper, see also summary in Appendix.

Magnetite Pegmatites, see also summary in Appendix.

Location: St. Louis County
Township 63N-17W, Sections 11, 36

References: A) Grout, 1937, p. 62

Occurrences: "The veins prospected [for gold] are scattered at a number of points around the lake, partly in Keewatin greenstone and partly in the Ogishke-Knife Lake sediments overlying the greenstones. Evidently several prospects found the mineralized walls, both greenstone and porphyry, at least as promising as the veins. The veins are mostly quartz, with ankerite, pyrite, chalcopyrite (possibly some chalcocite), with some feldspar, rutile and fragments of chlorite and micaceous wall rocks. The mineralization is partly later than the quartz (Fig. 6). Two or more of the veins carry tourmaline, and probably all are hypothermal. These are the prospects on Gold Island, at the southeast corner of T.63N., R17W" (Ref. A, p. 62).

Other Data: Garnet in Sec. 11 and 36, see also summary in Appendix.

Location: St. Louis County
Township 63N-18W, Section 13

References: A) Composite Map of Surveyors Originals [circa 1900, see DNR Project File #189]

Occurrences: On the islands in Lake Vermilion in Sec. 13, the map indicates "islands worked for gold" (Ref. A).

Location: St. Louis County
Township 63N-20W, Sections 4, 5, 36

References: A) 1939 Annual Report, Lands & Minerals (DNR), p. 218
B) Grout, 1926, MGS Bull. 21, p. 193

Occurrences: "In previous years the research section has been called to examine a region north of the Willow River Road and northeast of Greaney west of Gheen, Minnesota. Permits for gold had been taken in this district by Alex Watt and Joe Stussman, and by Dr. Whittenberg.

In the early part of the year, samples taken by Joe Stussman supposedly in that area, were sent to the Honorable Governor Harold E. Stassen, who transmitted them to the Conservation Department for study.

Three of these samples were tested at Hibbing and showed considerable lead and copper, as well as gold and silver. One of the samples showed 31.9 oz. of silver per ton and 0.9 oz. of gold per ton.

When these results were known, an investigation was started and visits made again in the region.

At this time, however, a boom in real estate occurred due to newspaper articles written by some Virginia people interested in this district and at the present time, many applications have been filed with the Conservation Department for permits to explore for gold.

The various permits applied for are in the Section 25-64-21, Section 31-64-20, and Sections 4 and 5 of 63-20." (Ref. A, p. 218)

"Gold has been reported from one phase of the basic intrusive in Section 36, just mentioned. During 1922 and 1923 several samples were received by state officials and local assayers in most of which no gold could be found. Most of the samples were dark gray medium grained igneous rock, with no sign of mineralization, but with much coarse poikilitic biotite, which on weathered surfaces has a yellow color and a somewhat metallic luster" (Ref. B, p. 193).

Location: St. Louis County
Township 63N-21W, Sections 21, 28, 32, 35

References: A) DNR Terminated Lease Files
B) Sims, Sinclair, Mudrey, 1972, p. 160, in MGS Cent. Vol.
C) DNR Open File Drill Samples List
D) DNR General Exploration File

Summary: "The Linden Pluton is a moderately small, probably composite body of alkali-lime syenite" (Ref. B, p. 160).

Occurrences: From "south edge of hill in Sec. 35," a sample had a "calculated chemical composition" of 2.3 wt.% P_2O_5 (Ref. B, p. 161, Table III-41).
DDH LF-1, in NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 21, Lease Humble CN-7466, has (Ref. A):
- 55 ft. of 400-700 ppm F; apatite reported
DDH LF-2, in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 28, Lease Humble CN-7468, has: (Ref. A):
- 55 ft. of 360-600 ppm F
DDH LF-3, in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 32, Lease Humble CN 7471, has (Ref. A):
- 50 ft. of 370-1400 ppm F

Other Data: DDH LFRAC-2 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 28 (Ref. C)
DDH LFRAC-3 in SE $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 32 (Ref. C)
DDH 2 in Sec. 35 (Ref. D)

Location: St. Louis County
Township 64N-12W, Section 36

References: A) DNR Terminated Lease File

Occurrences: DDH BL-1, NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 36, Lease Humble CN-7407 has: (Ref. A)
-Average 296 ft. of 1118 ppm Ni, high was 30 ft. of 1450 ppm Ni

Other Data: Native Copper, see also summary in Appendix.
Magnetite Pegmatite, see also summary in Appendix.

Location: St. Louis County
Township 64N-17W

Other Data: Native Copper, see also summary in Appendix.
Magnetite Pegmatite, see also summary in Appendix.

Location: St. Louis County
Township 64N-20W, Sections 25, 31

References: A) Winchell, Vol. 4, 1899, pp. 243-245
B) 1938 Annual Report, Lands & Minerals, DNR, pp. 218-219
C) 1939 Annual Report, Lands & Minerals, DNR, p. 218
D) 1940 Annual Report, Lands & Minerals, DNR, p. 295

Occurrences: "At the northeast end of the island there are siliceous beds in the schist containing pyrite, hornblende, malachite, chalcopyrite and a greenish-yellow mineral that was not determined (No. 322H). These beds are a foot or two feet wide, and continue for some distance, disappearing under the lake." [location uncertain, (T64N-R20W?)], (Ref. A, pp. 243-245).

"Dr. Whittenberg's [gold] permit B-57 E₁-NE₁, Sec. 31-64-20. The rock ledge situated on the premises covered by this permit appear to be of a rather highly basic type, though instead of being carbonated as at the Hanson lease, this ledge is siliceous. This ledge consists in a gabbro or basalt type of finely grained rock.

Spectrographic tests made on some of this material showed the presence of the following elements: Iron, Silica, Aluminum, Calcium, Sodium, Zinc, Potassium, Cadmium, Bismuth, Molybdenum, Zirconium, Tungsten, Rhodium, Magnesium, and probably Cerium.

Qualitative determinations: Confirmation of the following elements has been obtained by this method: Iron, Silicon, Aluminum, Calcium, Sodium, Zinc, Cadmium, Bismuth, Titanium, and Magnesium.

Assay work: No gold was ever found on Dr. Whittenberg's samples so that no assays were attempted.

Conclusions: A magnetic survey was suggested to Dr. Whittenberg in order to find out if any irregularities existed in the magnetic field around the ledge. His conclusions were negative in this respect." (Ref. B, pp. 218-219.)

"In previous years the research section has been called to examine a region north of the Willow River Road and northeast of Greaney west of Gheen, Minnesota. Permits for gold had been taken in this district by Alex Watt and Joe Stussman, and by Dr. Whittenberg.

In the early part of the year, samples taken by Joe Stussman supposedly in that area, were sent to the Honorable Governor Harold E. Stassen, who transmitted them to the Conservation Department for study.

Three of these samples were tested at Hibbing and showed considerable lead and copper, as well as gold and silver. One of the samples showed 31.9 oz. of silver per ton and 0.9 oz. of gold per ton.

When these results were known, an investigation was started and visits made again in the region.

At this time, however, a boom in real estate occurred due to newspaper articles written by some Virginia people interested in this district and at the present time, many applications have been filed with the Conservation Department for permits to explore for gold.

The various permits applied for are in the Sec. 25-64-21, Sec. 31-64-20, and Sec.s 4 and 5 of 63-20." (Ref. C, p. 218.)

"Permits B-58 SE $\frac{1}{4}$ -SW $\frac{1}{4}$ Sec. 4-63-20) St. Louis County

B-59 SE $\frac{1}{4}$ -NW $\frac{1}{4}$ Sec. 5-63-20) Stussman Company

B-60 NE $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 31-64-20)

B-61 SE $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 31-64-20)

Permits B-62 NE $\frac{1}{4}$ -SE $\frac{1}{4}$ and SE $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 25-64-21

Aug. Ketola, St. Louis County

Stussman Company and Ketola Forties

The mineralization in the district though similar in many regards, to the Hanson Bros. lease, is less intense and contains mainly carbonates, sulphides, diorite, and pink granite. The general direction of the various claims seems to follow a veining parallel to the main veining of the region, and these indications might lead to discoveries if surveyed and prospected properly. The proximity of the granites at a short distance from the Knife Lake slates, as well as the proximity of more basic rocks, makes the district interesting geologically, for precious metals, and base metals." (Ref. D, p. 295.) [Probably pertains to both Sec. 25 and 31, see above.]

Location: St. Louis County

Township 64N-21W, Section 25

References: A) 1939 Annual Report, Lands & Minerals (DNR), p. 218

B) 1940 Annual Report, Lands & Minerals (DNR), p. 18

Occurrences: "In previous years the research section has been called to examine a region north of the Willow River Road and northeast of Greaney west of Gheen, Minnesota. Permits for gold had been taken in this district by Alex Watt and Joe Stussman, and by Dr. Whittenberg.

In the early part of the year, samples taken by Joe Stussman supposedly in that area, were sent to the Honorable Governor Harold E. Stassen, who transmitted them to the Conservation Department for study.

Three of these samples were tested at Hibbing and showed considerable lead and copper, as well as gold and silver. One of the samples showed 31.9 oz. of silver per ton and 0.9 oz. of gold per ton.

When these results were known, an investigation was started and visits made again in the region.

At this time, however, a boom in real estate occurred due to newspaper articles written by some Virginia people interested in this district and at the present time, many applications have been filed with the Conservation Department for permits to explore for gold.

The various permits applied for are in the Section 25-64-21, Section 31-64-20, and Sections 4 and 5 of 63-20." (Ref. A, p. 218)

Other Data: A "gold state lease" was "in effect" to August Ketola for a prospect in NE-SE, SE-NE, Sec. 25 for 1940 & 41 (Ref. B, p. 18).

Location: St. Louis County
Township 65N-17W, Sections 3, 33

References: A) Grout, 1937, p. 67

Occurrences: "The prolonged active [gold] exploration has stimulated some prospecting at several similar outcrops in the district. Specimens have been examined from Sec. 33, T.66N., R.17W., and from Sec. 3, T.65N., R17W. They show sulphides in migmatite resulting from injection of mica schist.

These prospects may be classed as hypothermal deposits because of the abundant pyrrhotite, but some are aplite and pegmatite, and they are notably different from the tourmaline veins. They seem to be less promising." (Ref. A, p. 67)

Other Data: Native Copper, see also summary in Appendix.
Magnetite Pegmatites, see also summary in Appendix.

Location: St. Louis County
Township 65N-18W

Other Data: Native Copper, see also summary in Appendix.
Magnetite Pegmatite, see also summary in Appendix.

Location: St. Louis County
Township 65N-20W

Other Data: Garnet, see also summary in Appendix.

Location: St. Louis County
Township 65N-21W

Other Data: Garnet, see also summary in Appendix.

Location: St. Louis County
Township 66N-16W

Other Data: Magnetite Pegmatites, see also summary in Appendix.
Native Copper, see also summary in Appendix.

Location: St. Louis County
Township 66N-17W, Sections 3, 4, 33, 36

References: A) Southwick, 1969, in MGS I.C. 7, pp. 7-8
B) 1938 Annual Report, Lands & Minerals (DNR), pp. 216-218
C) 1939 Annual Report, Lands & Minerals (DNR), p. 216
D) 1940 Annual Report, Lands & Minerals (DNR), p. 295
E) 1941 Annual Report, Lands & Minerals (DNR), pp. 288-289
F) 1936 Annual Report, Lands & Minerals (DNR), pp. 159-162
G) Grout, 1937, p. 67
H) Reference Unknown, with attached maps, see copies in DNR Project File #192
I) Grout, 1922, MGS Field Notebook #21, pp. 25-33
J) Wilde, 1935, letter, (now in DNR General Exploration Files)

Occurrences: Pyrrhotite and chalcopyrite are sparsely disseminated in amphibolite in Sec. 33. (Ref. A, pp. 7 and 8)
"The prolonged active [gold] exploration has stimulated some prospecting at several similar outcrops in the district."

Specimens have been examined from Sec. 33, T66N-R17W, and from Sec. 3, T65N, R17W. They show sulphides in migmatite resulting from injection of mica schist. These prospects may be classed as hypothermal deposits because of the abundant pyrrhotite, but some are aplite and pegmatite, and they are notably different from the tourmaline veins. They seem to be less promising." (Ref. G, p. 67)

"GOLD ORE PERMITS AND LEASES:

Hanson Bros. Lease B-17

NE $\frac{1}{4}$ -NE $\frac{1}{4}$ Sec. 33-66-17

In August 1938, the writer set up a general summary of the work done on the former permit and present lease taken by the Hanson Bros., and this report will reproduce the high lines of this summary, and the conclusions reached since then by further work done on some of the materials sampled there.

New shaft opened up in 1938:

Ten feet East of the shaft which went down 34 feet with only traces of mineralization in 1937, a new shaft of the inclined type was opened up in 1938. The new shaft is driven in a general Northeast direction, following the veins or cavities encountered during the work. The general direction followed is one that was given after a rapid magnetic needle survey showing that in this direction a sharp change existed in the magnetic characteristics. Pump, boiler, and mechanical equipment are used in the present operation, steam being used instead of compressed air for the drilling of holes. Some buildings have been erected by the brothers in the neighborhood of their operations as storage rooms and boiler room. A little tram is used for the transportation of the mined products to the dump. In the new shaft, as in the old one, the unaltered vein material encountered consists mainly of carbonates of calcium, iron and manganese and epidote and garnets. A contact metamorphic material found in limestone in Sweden, at the contact with eruptive rocks contains the same mineral and is called "Skarn". The rocks of Sweden are, however, of a sedimentary type, while the limestone material at the Hanson Bros. must be of an eruptive type.

Below the first feet of unaltered material, this rock suddenly shows signs of oxidation, and at this point forms a series of caves probably formed by the leaching of the original rock material by descending carbonated waters. On the roof of the caves the material shows composed of cores of unaltered carbonates surrounded by oxides of iron and manganese. This roof material is interspersed with pyrites, in their unaltered form or partially or completely oxidized. At the bottom of some of the caves, the mineral seems to be formed by ankerites or by largely crystalline pink carbonates containing a little manganese. These rocks also contain some pyrites. The new shaft operation shows more mineralization than the former one, and the caves found are encouraging in that they indicate some secondary enrichment. The workings have now attained the water table, but some caves ahead of the workings are yet to be explored, in the general Northeast direction. The encasing rocks of the vein are coarse and fine grained granites.

Results of various tests made on the samples from this lease:

Spectrographic determinations: The elements recognized on various spectrograms are the following: Iron, Manganese, Silicon, Calcium, Titanium, Zinc, Tin, Barium, Strontium, Magnesium, Cadmium, Aluminum, Sodium, Potassium, and Zirconium. Traces or uncertain indications were found for: Gold, Silver, Molybdenum, Tungsten, Palladium, and Radium.

Qualitative Determinations: The qualitative dry and wet methods have confirmed the presence of: Iron, Manganese, Silicon, Calcium, Titanium, Zinc, Tin, (in some samples), Barium and Strontium in only two samples, Magnesium, in three samples, Cadmium in most samples, Gold was shown probable in three samples, Silver was not tested by this method.

Assays for gold and silver:

Using the small electric furnace mentioned elsewhere in this report, the assays were made on most of the products examined by the former methods of investigation and buttons of silver and gold were found in two samples. One of these samples subjected to a 2-assay ton test, showed enough gold to be inquarted and this gold was later photographed. This latter product was the crust material containing original carbonates leached and oxidized to manganese and iron oxides.

Quantitative determinations:

Some of the oxidized materials were tested by the chemical section and gave various amounts of manganese and iron. The iron content varied from traces to 20%, the manganese from traces to 40.37% and the silica generally low showed from 5 to 17%.

Radioactive tests:

The radioactive tests conducted to check the presence of radium, did not indicate any.

Samples tested since the August report was written, show conclusively the presence of silver in many products and traces of gold in some. The other elements found previously have been confirmed by the new tests. The later samples show richer than the former in pyrites and other sulphides and mainly in zinc sulphides.

Conclusions:

The tests made in 1938 indicate that besides the precious metals, gold and silver, the materials examined are highly mineralized and that by a combination of primary mineralization, supergene enrichment, contact metamorphism and later by leaching and oxidation, by descending waters, these products have been enriched to a great degree.

The caves continue ahead of the present workings and the zone near the water table should at least be examined for possible great enrichment in sulphide minerals of all types.

The gold seems to be associated with altered pyrites containing some zinc sulphides. Silver must be intimately associated with the carbonates and with the sulphides.

The signs are indicative of the fact that if no commercial gold deposit is found, at least some concentration in iron, manganese, and probably zinc, will result." (Ref. B, pp. 216-218). [Note: See the 1939, 1940, 1941 Annual

Reports for similar information. The 1941 Report, p. 288, has the results of flotation tests.]

"Mine of the International Iron and Steel Company

The International Iron and Steel Company with offices in Minneapolis have explored a property in Sec. 3, T.66N., R.15W., for several years. The leader of the enterprise was for a time Mr. Charles Eden, who had previously explored a similar deposit near Ash River Falls. A camp was built, and a series of test pits and drill holes was put down. One shaft northeast of the camp is said to be 90 feet deep. Four holes, drilled in 1921, are located on the sketch, (Fig. 11). Dr. J. H. Bong, vice president of the company, reported to the Survey as follows: the hole southeast of the shaft is said to have been drilled 1,200 feet and found 32 feet of "ore"; a hole a short distance north of the shaft is 89 feet deep; a hole northwest of the shaft is said to have been drilled over 500 feet, finding 57 feet of "ore"; the hole farther west was deep but found only "lean ore." Some further drilling was planned, but nothing was done in the summer of 1924." (Ref. H, and map) [location of shaft on map is NW $\frac{1}{4}$ -NE $\frac{1}{4}$ -SW $\frac{1}{4}$ -Sec. 3].

- Testpits: See above description of two shafts in NW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 33. There are 2 shafts and 8 testpits in the NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 3 and NW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 3. They apparently were iron ore prospects. [Ref. I, pp. 25-33, see sketch maps.]
- Other Data: 1935 gold ore state lease permit for Lot 2, Sec. 6, to Ellsworth Colburn. (Ref. J)
1935 gold ore state lease permit for Lot 3, Sec. 6, to Black Rock Holding Company (Ref. J)
Magnetite Pegmatites in Sec. 3, 4, and 36, see also summary in Appendix.
Iron Ores - Archean in Sec. 3, see also summary in Appendix.
Native Copper in Sec. 3, 4, and 36, see also summary in Appendix.

Location: St. Louis County
Township 66N-18W

Other Data: Magnetite Pegmatites, see also summary in Appendix.
Native Copper, see also summary in Appendix.

Location: St. Louis County
Township 67N-16W

Other Data: Native Copper, see also summary in Appendix.

Location: St. Louis County
Township 67N-17W, Sections 3, 33, 36

References: A) Cleland, "Vermilion River Gold", Ely Miner, January 5, 1934. (St. Louis County Historical Society. "Gold Rush of the '60's" file): in Aguar, 1971, p. 48
B) "Develop Commercial Gold Mine in the State", Duluth News Tribune, January 21, 1934. (St. Louis County Historical Society, "Gold Rush of the '60's" file): in Aguar, 1971, p. 48

- C) Wilde, 1935, letter (now DNR General Exploration File)
- Occurrences: "Gold Mines. Near Crane Lake on the Canadian border, gold was discovered. Mrs. Ole Hanson, widow of a pioneer farmer, made the discovery. Traces of gold, silver, and molybdenum (used to toughen steel) were found. The family brought an electric power plant formerly used at Orr to use in the mine and in their home. Not far from here. William Pachale, purchased land in 1930 for a lake shore resort. Mrs. Pachale also found signs of gold. Mr. Pachale, hearing the results of the assay, immediately bought drills, hammers, and dynamite. Lacking a forge, he had to frequently drive several miles to have a truckload of drills sharpened by the nearest blacksmith." (Ref. A, p. 48) [Location uncertain]
- "The Hansen claim is 8 miles from the Pachala's. Near the mouth of the Vermilion River, a few miles away from the Hansen Claim is another vein." (Ref. B, p. 48) [Location uncertain]
- Other Data: Magnetite pegmatites in Sec. 33, see also summary in Appendix.
- 1935 gold ore state lease permit for SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 3 to Ellsworth Colburn (Ref. C);
- 1935 gold ore state lease permit for Lots 5 & 6, SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 36, to Harry S. Quiggle (Ref. C).
- Native Copper in Sec. 33, see also summary in Appendix.

- Location: St. Louis County
Township 67N-18W, Section 36
- References: A) Southwick, 1969, in MGS I.C. 7, pp. 7-8
B) DNR Map Files - many plan maps and cross sections for the Vermilion River Mines from 1932 and earlier
C) Grout, 1937, p. 66
D) 1938 Annual Report, Lands & Minerals (DNR), p. 206
E) 1937 Annual Report, Lands & Minerals (DNR), p. 217
F) DNR General Exploration File for Sec. 34 & Sec. 36, File #1
G) Ojakangas & Matsch, 1982, p. 149
H) Prospectus, 1932, Vermilion River Mines, Letter to Stockholders (MN Historical Society Files)
I) 1934 Annual Report, Lands & Minerals (DNR), pp. 126-132
J) 1935 Annual Report, Lands & Minerals (DNR), pp. 122-124
K) "Gold Rush in Crane Lake District Started by Woman," Duluth News Tribune, April 3, 1932. (St. Louis county Historical Society. "Gold Rush of the '60's" file), in Aguar, 1971, p. 48
- Summary: The Vermilion River Mines occurs in schist inclusions and roof pendant (?) in the Archean-age Vermilion Granitic Complex. The location was Lots 7 & 8, S $\frac{1}{2}$ -SW $\frac{1}{4}$, Sec. 36.
- Occurrences: "The latest elaborate exploration for gold in the state is known as the Vermilion River Mines. The property lies along the banks of Vermilion River in Sec. 36, T.67N., R.18W. The work has been rather extensive and a shaft has been sunk deep enough to run off two levels and cross cuts. The district is in the midst of the largest batholith of the state, the

Vermilion granite, but at a place where schist inclusions and possibly roof pendants are abundant, and where pegmatites and quartz veins complicate the structure. The ore has proved so lean and irregular that work has been abandoned. It consists largely of the several rocks just mentioned, with visible pyrrhotite, chalcopryrite and pyrite. These may be primary in the pegmatite, aplite, silicite and quartz veins, but are introduced into the biotite schist of sedimentary origin and into the gneisses formed by lit-by-lit injection of such schist. One mineralized schist specimen consists largely of tremolite and pale biotite, and may be an altered greenstone rather than a sediment. Most of the material is much the same as has been described in reports on the batholith, and the granite is very light pink in color, except where contaminated by schist. Where injection has been so extensive that half or more of the gneiss is igneous material the sulphides seem to be primary as they are in the pegmatite and aplite, leaving a little uncertainty whether they were constituents of the schist before injection, or later additions and replacements. Several specimens from underground, however, show pyrrhotite and pyrite in pegmatite and aplite where there is no sign of contamination and it is therefore believed that most of the mineralization is related to injection (Figs. 3 and 4). Much of the pyrrhotite here is highly magnetic." (Ref. C, p. 66)

"Legend calls this a fraudulent stock venture" (Ref. G, p. 149). Both a mining and milling operation existed there in the 1920's.

Old gold mine site in SW $\frac{1}{4}$, Sec. 36 in biotite gneiss with disseminated pyrrhotite and chalcopryrite. (Ref. A, pp. 7-8)

"Gold Mine on the shore of Vermilion River: 28 miles north of Orr, 6 miles from Buyck, and 7 miles from the Canadian border. A shaft was sunk to a depth of 300' through volcanic rock. The ore was believed to be richer in gold than many of the historic finds. By 1935 the mine was expected to ship gold. The property was discovered in 1907 by Mr. Albion M. Fenton of Minneapolis, who was hunting and saw an outcropping of rusty red rock. Thinking it might be iron ore, he shipped some off. After several months, he sent the ore to be assayed; he found that it was gold but had already forgotten the location of the site. He hunted by himself for it until 1919, when he hired a Mr. Eden to look for it. Eden first consulted Mr. Stephen Gheen; who recalled that he had seen a similar outcrop of rock in 1892. A systematic search was made by Eden and Gheen resulted in the discovery of the spot in November, 1924. It was the same outcropping that Gheen had seen. A company was formed and a road begun. Since there was no placer mining (all operations were underground) there was no chance of a gold rush. This mine was earlier reported to be in Section 36, 7 miles from Crane Lake and on the south bank of the Vermilion River." (Ref. K, p. 48) [Location uncertain]

Testpits:

Three shafts were sunk. Shaft No. 3 has two crosscuts (each 200 to 300 ft. long), one at 100 foot level and the other at the 175 foot level. Numerous assays (by the

operator) are listed on the maps. The highest assay appears to be

- 6 ft. true width of 0.9 oz/t gold. Many other assays indicate significant amounts of gold. (Ref. B & H)

"Permits B-31 and B-32 for Lots 7, 8, 9, 10 Sec.

36-67-18:

At this property the camp buildings were repaired and new bunk house was completed. A new compressor was installed and a pilot mill of 10 tons per day capacity was placed in operation. The plant uses flotation process. It started up November 1st.

The first mill runs will be made on certain mineralized areas on the 175 foot level. Sections approximately 20 feet in length will constitute a separate test. Two such tests have been made, but the results as yet have not been assembled. On the 175 foot level approximately 1145 feet of drifting and 800 feet of crosscutting has been completed of the underground work, north of the shaft. During this year approximately 1109 feet of development was completed on this level" (Ref. I, p. 126; see also Ref. D, E, J)

In Secs. 34, 35, 36, there are some reported trenches, pits and shafts. (Ref. F)

Other Data: Magnetite Pegmatites, see also summary in Appendix.
Native Copper, see also summary in Appendix.

Location: St. Louis County

Township 67N-20W, Sections 15, 16, 17

Other Data: Magnetite Pegmatites in Sec. 15, 16, and 17, see also summary in Appendix.

Native Copper in Sec. 15, 16, and 17, see also summary in Appendix.

Location: St. Louis County

Township 67N-21W

Other Data: Magnetite Pegmatites, see also summary in Appendix.

Native Copper, see also summary in Appendix.

Location: St. Louis County

Township 68N-19W, Sections 29, 32

Other Data: Magnetite Pegmatite in Sec. 29 and 32, see also summary in Appendix.

Native Copper in Sec. 29 and 32, see also summary in Appendix.

Location: St. Louis County

Township 69N-18W, Section 6

References: A) Furterer, (MGS) oral communication, 8-1-82

Testpits: There is a testpit on Mica Island in Sec. 6 in a pegmatite within a biotite-quartz-plagioclase schist and metagraywacke. The formation locally contains garnet, sillimanite, staurolite and cordierite. The rocks weather rusty brown. (Ref. A)

Other Data: Native Copper in Sec. 6, see also summary in Appendix.
Magnetite Pegmatites in Sec. 6, see also summary in Appendix.

Location: St. Louis County
Township 69N-20W

Other Data: Garnet and Staurolite, see also summary in Appendix.

Location: St. Louis County
Township 69N-21W

Other Data: Garnet and Staurolite, see also summary in Appendix.

Location: St. Louis County
Township 70N-20W

Other Data: Garnet, see also summary in Appendix.

Location: St. Louis County
Township 70N-21W

Other Data: Garnet, see also summary in Appendix.

Location: St. Louis County
Township 71N-21W, Sections 19, 28, 30

References: A) Grout, 1937, p. 61
B) Sims, 1972, p. 176, MGS Centennial Vol.

Occurrences: "Elsewhere in the Rainy Lake greenstone belt, gossans were observed during mapping at (1) the southwest end of the island east of Cranberry Island," [Sec. 28], "(2) in the chloritic schist on the west end of the island south of Steamboat Island," [Sec. 28], "and (3) in the chloritic schist at the northeast tip of Dryweed Island [Sec. 19]. At the last locality, pyrite occurs in quartz-siderite veins in sheared and altered country rock. Similar veins occur on the dump of the so-called Lyle mine, on the small island just north of the north tip of Dryweed Island." [Sec. 19] (Ref. B, p. 176).

Testpits: Veins prospected for gold similar to Bushy Head Islet (see T71N-22W) are "opened" on Cranberry Islet and Steamboat Islet on the east and west sides of Sec. 28 (Ref. A, p. 61).
". . . and on the island composed of mixed chloritic and biotitic schist that is south of the east end of Dryweed Island there is a shaft, now filled and covered by a small building." [Sec. 30] (Ref. B, p. 176).

Location: Stearns County
Township 121N-29W, Sections 2, 3

Other Data: DDH W-4, W-6 in Sec. 2 (See Appendix)
DDH W-1, W-2, W-2A, W-3, W-5 in Sec. 3 (See Appendix)

Location: Stearns County
Township 122N-32W, Section 24
Other Data: Clay minerals in Sec. 24, see also summary in Appendix.

Location: Stearns County
Township 123N-30W
References: A) Woyski, 1949, GSA Bull., Vol. 60, No. 6, p. 1009
Occurrences: "Norite crops out near the Sauk River in T123N-30W and is cut by dikes and apophyses of Rockville quartz monzonite and forms inclusions in the quartz monzonite. Accessory minerals include magnetite, pyrite, chalcopyrite." (Ref. A, p. 1009)

Location: Stearns County
Township 123N-31W, Sections 22, 23, 25
References: A) Winchell, 1888, Vol. 2, pp. 460-461
Testpits: "Repeated fruitless observations for lignite have been made, however, by shafts in the Cretaceous beds on the southwest side of the Sauk river in the N.W.¼ of section 23, Munson, a fourth to a half of a mile west of Richmond. In 1871, at a point some thirty rods west of the bridge and less than a hundred feet from the river, a shaft was dug and bored to the depth of 120 feet. Its top is about 25 feet above the river. Black clay or shale with some lignite, which is seen here in the river's bank, was penetrated and found to be three feet thick. A drift dug in 1865, starting about twenty-five feet farther northwest and following the lignitic layer sixty feet, found it to dip westward about four feet in this distance. It was said to contain "a seam of lignite four inches thick, which kept increasing in thickness, but remained impure and was considerably mixed with shale." Above and below the lignitic stratum is bluish gray clay or shale containing rarely crystals of selenite (gypsum) up to three inches long. Mr. J. H. Kloos* found in the material brought up from the shaft "several fragments of shale containing scales of cycloid fishes, which had been met with near the surface." At a depth of 112 feet, according to Kloos, this boring reached "a hard rock, which proved to be granite. It was drilled for eight feet, and the fragments brought to light by the pump consist of feldspar, quartz and pyrites, such as are found in varieties of pegmatite or graphic granite, which I also found at the nearest outcropping ridges of the crystalline rocks." Nearly a quarter of a mile west from this place and about 75 feet above the river, another shaft was dug and bored in 1871 to the depth of 180 feet. This passed through a considerable thickness of drift, below which were blue, white and yellowish plastic clays, and shale. No more lignite was encountered than in the drift and the other shaft."
"Again, in 1880 and 1881, the Richmond mining company claim to have bored to the depth of 125 feet at a point only ten feet distant from the shaft and boring first described, close to the river. The only lignite found is the layer seen above the river-level; blue clay, with thin laminae of white and yellow clay, lies above the lignite; and bluish or

greenish gray clay and shale extend below to the bottom of this section. No sand nor gravel, nor any hard rock, was encountered. In respect to these explorations, it must be added that it seems certain that no valuable deposits of lignite exist in this region, nor indeed in any portion of this state"

*"A Cretaceous basin in the Sauk valley, Minnesota," Amer. Jour. of Science (3), iii, 17-26; 1872. (Ref. A, p. 460)

To summarize the above, four shafts were dug in a search for lignite as outlined here. (See above Ref. A, pp. 460-461)

- one shaft in NW $\frac{1}{4}$, Sec. 23, was sunk in 1871 to a depth of 120 feet;
- one drift was dug in NW $\frac{1}{4}$, Sec. 23 in 1865;
- one shaft [in NE $\frac{1}{4}$, Sec. 22] "nearly a quarter of a mile west from this place and about 75 feet above the river" was dug in 1871 to a depth of 180 feet.
- one shaft was dug [in NW $\frac{1}{4}$, Sec. 23] by "the Richmond Mining Company" in 1880-81].

Other Data: Clay minerals in Sec. 23 and 25; see also summary in Appendix.

Location: Stearns County
Township 124N-28W, Section 17
Other Data: DDH T-1, T-1A, T-2, T-3 in Sec. 17 (See Appendix)

Location: Stearns County
Township 124N-29W
Other Data: Clay minerals, see also summary in Appendix.

Location: Stearns County
Township 124N-30W
References: A) Krum, 1935, Thesis, p. 16 & 22
Occurrences: In reference to no specific sample site within the "Gray St. Cloud Intrusive, the author states: "zircon, pyrite, chalcopyrite, and apatite are common accessories; the latter is locally abundant" (p. 16). Chalcopyrite and pyrite occur in most sections; the former is normally more abundant and in smaller grains than the pyrite" (Ref. A, p. 22).

Location: Stearns County
Township 124N-31W, Sections 22, 33
References: A) DNR Open File Drill Samples List
Other Data: DDH 27010 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 22 (Ref. A)
DDH 27011 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 33 (Ref. A)
Iron Ores - Archean in Sec. 22 and 33, see also summary in Appendix.
Clay minerals in Sec. 33, see also summary in Appendix.

Location: Stearns County
Township 124N-32W, Sections 6, 15
References: A) DNR Open File Drill Samples List

Other Data: DDH 27012 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 15 (Ref. A)
 DDH T-1, T-2 in Sec. 6 (See Appendix)
 Clay minerals in Sec. 15, see also summary in Appendix.

Location: Stearns County
 Township 125N-32W, Section 6
 Other Data: Clay minerals in Sec. 6, see also summary in Appendix.

Location: Stearns County
 Township 126N-33W, Section 33
 Other Data: DDH T-3, T-4 in Sec. 33 (See Appendix)

Location: Stearns County
 Township 126N-34W, Section 8
 Other Data: DDH T-1, T-3 in Sec. 8 (See Appendix)

Location: Steele County
 Township 107N-20W, Sections 8, 9, 20, 21, 23, 29, 32
 Other Data: DDH T-1, T-2 in Sec. 8 (See Appendix)
 DDH T-1, T-1A, T-1B, T-2, T-2A, T-3 in Sec. 9 (See Appendix)
 DDH T-1, T-2, T-3 in Sec. 20 (See Appendix)
 DDH T-1, T-1A, T-2, T-3, T-3A in Sec. 21 (See Appendix)
 DDH T-1 in Sec. 23 (See Appendix)
 DDH T-1, T-2, T-2A in Sec. 29 (See Appendix)
 DDH T-2, T-3, T-4 in Sec. 32 (See Appendix)

Location: Steele County
 Township 107N-21W, Section 11
 Other Data: DDH T-1, T-2 in Sec. 11 (See Appendix)

Location: Stevens County
 Township 124N-42W, Section 30
 References: A) DNR Open File Drill Samples List
 Other Data: DDH 27004 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 30 (Ref. A)
 Iron Ores - Archean in Sec. 30, see also summary in Appendix.

Location: Stevens County
 Township 125N-42W, Section 23
 References: A) DNR Open File Drill Samples List
 Other Data: DDH 27005 in NE $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 23 (Ref. A)

Location: Stevens County
 Township 125N-43W, Section 16
 References: A) DNR Open File Drill Samples List
 Other Data: DDH 27006 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 16 (Ref. A)

Location: Stevens County
Township 125N-44W, Section 34
Other Data: DDH RRVD-31A in Sec. 34 (See Appendix)

Location: Swift County
Township 121N-43W, Section 29
Other Data: Clay minerals in Sec. 29, see also summary in Appendix.

Location: Todd County
Township 128N-34W, Section 30
Other Data: DDH 1648 in Sec. 30 (See Appendix)

Location: Todd County
Township 129N-35W, Section 25
Other Data: DDH 1649 in Sec. 25 (See Appendix)

Location: Todd County
Township 130N-33W, Section 34
Other Data: DDH 2000 in Sec. 34 (See Appendix)

Location: Todd County
Township 130N-35W, Sections 13, 36
Other Data: DDH 1650 in Sec. 13 (See Appendix)
DDH 1651 in Sec. 36 (See Appendix)

Location: Todd County
Township 131N-32W, Section 34
Other Data: DDH 1999 in Sec. 34 (See Appendix)

Location: Todd County
Township 131N-34W, Section 19
Other Data: DDH 1645 in Sec. 19 (See Appendix)

Location: Todd County
Township 132N-33W, Sections 14, 25, 36
References: A) DNR General Exploration File
Other Data: DDH 1912 in Sec. 14 (See Appendix)
DDH FL-1, FL-2, FL-3, FL-4 in Sec. 36 (See Appendix)

Location: Todd County
Township 132N-34W, Section 30
Other Data: DDH 1644 in Sec. 30 (See Appendix)

Location: Todd County
 Township 133N-32W, Section 16
 References: A) DNR Open File Drill Samples List
 B) Grout, 1950, Appendix F, p. 117
 Occurrences: Titaniferous magnetite described in: (Ref. B, p. 117)
 - "Gabbro, with some segregations of titaniferous magnetite
 and apatite, crops out near Philbrook, T.133 N., R.32 W."
 [location uncertain]
 Other Data: DDH TC-101, TC-102 in Sec. 16 (Ref. A; see also Appendix)

Location: Todd County
 Township 133N-34W, Sections 4, 29
 Other Data: DDH 1640 in Sec. 4 (See Appendix)
 DDH 1641 in Sec. 29 (See Appendix)

Location: Todd County
 Township 133N-35W, Section 30
 Other Data: DDH 1643 in Sec. 30 (See Appendix)

Location: Traverse County
 Township 129N-47W, Sections 10, 11
 Other Data: DDH D-4 in Sec. 10 (See Appendix)
 DDH D-1 in Sec. 11 (See Appendix)

Location: Wabasha County
 Township 109N-10W, Section 11
 Other Data: DDH T-1, T-10, T-3, T-9 in Sec. 11 (See Appendix)

Location: Wabasha County
 Township 109N-13W, Section 21
 References: A) Heyl & West, 1982, Econ. Geol., Vol. 77, p. 1810;
 citation of Owen, 1852, pp. 62-63; see also map p. 1804
 Occurrences: "East-trending galena vein along Zumbro River in Prairie
 du Chien Group (Ref. A, p. 1810)."
 [Occurrence is in the Lower Ordovician Series.]

Location: Wabasha County
 Township 109N-14W, Sections 6, 27, 35
 References: A) Winchell, 1888, Vol. 2, p. 19
 Occurrences: "Gold has been washed out of the drift on the SE $\frac{1}{4}$ of Sec. 25,
 Chester and at other points southeastwardly to Zumbro Falls;
 also on Sections 6 and 27 Mazeppa" (Ref. A, p. 19, and map
 facing page 1).
 Other Data: Clay minerals in Sec. 35, see also summary in Appendix.

Location: Wabasha County
 Township 110N-10W, Section 17
 References: A) Heyl & West, 1982, Econ. Geol., Vol. 77, p. 1810;
 citation of Owen, 1852, p. 63

B) Zumbro Lead Mining Company, Wabasha, MN, Prospectus, 1868, (MN Historical Society Files)

Occurrences: "Galena vein in Prairie du Chien Group; red Prairie du Chien residuum of veins 0.3 m wide in former reservation." (Ref. A, p. 1810) [Sec. 17] ("On north side of Zumbro River, Greenfield Hills south of Wabasha", on "Half Breed Tract"; see also map p. 1804, Ref. A.)

"On the Zumbro, Mr. B. C. Macy of the Geology Corps, saw a vein of lead ore of 4 inches in width, bearing nearly east & west & ranging apparently for the distance of one-half or three-fourths of a mile through the lower magnesia limestone. Some float lead ore was found." (Ref. B)

Summary: Occurrence is in Lower Ordovician series.

Location: Wabasha County
Township 110N-12W, Section 29
Other Data: DDH T-1 in Sec. 29 (See Appendix)

Location: Wabasha County
Township 110N-14W, Section 25
References: A) Winchell, 1888, Vol. 2, p. 19
Occurrences: "Gold has been washed out of the drift on the SE $\frac{1}{4}$ of S25, Chester and at other points southeastwardly to Zumbro Falls; also on sections 6 and 27 Mazeppa" (Ref. A, p. 19, and map facing page 1).

Location: Waseca County
Township 106N-22W, Sections 8, 32
Other Data: DDH T-1 in Sec. 8 (See Appendix)
DDH T-1, T-2 in Sec. 32 (See Appendix)

Location: Waseca County
Township 108N-22W, Sections 4, 6, 20, 28
Other Data: DDH 1 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 6 (See Appendix)
DDH 1 in SW $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 4 (See Appendix)
DDH 1 in NE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 20 (See Appendix)
DDH 1 in SE $\frac{1}{4}$ -SW $\frac{1}{4}$, Sec. 28 (See Appendix)

Location: Waseca County
Township 108N-23W, Section 2
Other Data: DDH 1 in SW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 2 (See Appendix)

Location: Washington County
Township 26N-20W, Sections 4, 8, 9
Other Data: DDH TP-1, TP-2 in Sec. 4 (See Appendix)
DDH THB-9 in Sec. 8 (See Appendix)
DDH T-A, T-B in Sec. 9 (See Appendix)

Location: Washington County
 Township 27N-20W, Section 15

References: A) Matsch, 1962, M.S. Thesis, p. 25

Occurrences: "A number of gravel pit operators have reported nuggets of native copper" [probably SE $\frac{1}{4}$, Sec. 15, T27N-R20W], (Ref. A, p. 25).

Other Data: Native Copper in Sec. 15, see also summary in Appendix.

Location: Washington County
 Township 27N-21W, Section 35

Other Data: DDH THA-1, THA-2 in Sec. 35 (See Appendix)

Location: Washington County
 Township 28N-20W

References: A) Tyler, 1956, U. of M. Thesis, p. 5

Occurrences: "There are several gravel pits now in operation in the eastern third of the quadrangle. According to several of the native Aftonians some gold has been found in pockets of outwash till. The deposits were small and yielded very little if any profit. One farm hand mentioned a small pocket of concentrated magnetite, along an intermittant stream valley. He had samples to verify the discovery" (Ref. A, p. 5) [location uncertain].

Location: Washington County
 Township 29N-17W, Sections 22, 27

Other Data: Native Copper in Sec. 22, 27, see also summary in Appendix.

Location: Washington County
 Township 29N-20W, Sections 22, 27, 31, 32, 34

References: A) Winchell, 1888, Vol. 2, p. 392
 B) Tyler, 1956, U of M thesis, p. 138

Occurrences: Native copper: $\frac{1}{2}$ pound piece found [Lakeland township, Sec. 27 (near north line)], (Ref. A, p. 392).
Native copper also found at this locality [Lakeland township, Sec. 22], (Ref. A, p. 392).
 In the SE $\frac{1}{4}$ or Sec. 30 in the Pecatonic Member, with 1.2 feet exposed, there is "Dolomitic limestone . . . pyritic, black phosphatic grains concentrated in lower 6 inches ..." (Ref. B, p. 138)

Other Data: DDH T-2 in Sec. 31 (See Appendix)
 DDH T-3 in Sec. 32 (See Appendix)
 DDH T-1, T-2, T-3 in Sec. 34 (See Appendix)

Location: Washington County
 Township 29N-21W, Sections 8, 17, 32, 35

Other Data: DDH T-2 in Sec. 8 (See Appendix)
 DDH T-4 in Sec. 17 (See Appendix)
 DDH T-1 in Sec. 32 (See Appendix)
 DDH T-1 in Sec. 35 (See Appendix)

Location: Washington County
Township 30N-20W, Sections 15, 20, 22, 34

References: A) Winchell, 1888, Vol. 2, pp. 394-397
B) Froelich, 1961, p. 23

Occurrences: "Tripoli was once developed at Stillwater, but the deposit has not supplied any large industry. It was apparently a silt deposited in a glacial lake and is at least partially interlaminated with clay." (Ref. B, p. 23) [Location uncertain, possibly Sec. 20; note that Ref. A has a lengthy description, some assays and a location described as "the bed of Brown's creek about 2 miles from Lake St. Croix."]

Other Data: Tripoli, see also summary in Appendix.
DDH T53-1, T53-2, T53-3, T53-5 in Sec. 15 (See Appendix)
DDH T53-4 in Sec. 22 (See Appendix)
DDH T52-1, T52-2, T52-3 in Sec. 34 (See Appendix)

Location: Washington County
Township 30N-22W

Other Data: Native Copper, see also summary in Appendix.

Location: Washington County
Township 32N-21W, Section 5

Other Data: DDH T-1 in Sec. 5 (See Appendix)

Location: Watonwan County
Township 107N-31W, Section 11

References: A) DNR Open File Drill Samples List

Other Data: DDH SQ-8 in SW $\frac{1}{4}$ -NW $\frac{1}{4}$, Sec. 11 (Ref. A)
Clay minerals in Sec. 11, see also summary in Appendix.

Location: Watonwan County
Township 107N-33W, Section 23

References: A) DNR Open File Drill Samples List

Other Data: DDH SQ-13 in NW $\frac{1}{4}$ -NE $\frac{1}{4}$, Sec. 23 (Ref. A)
Clay minerals in Sec. 23, see also summary in Appendix.

Location: Wilkin County
Township 131N-46W, Section 6

Other Data: DDH RRVD-23 in Sec. 6 (See Appendix)

Location: Winona County
Township 105N-4W, Sections 18, 19, 33

References: A) Heyl & West, 1982, Econ. Geol., Vol. 77, p. 1810; citation of Winchell, 1884, p. 258; and Heyl et al., 1959, p. 296. (see also map p. 1804)
B) Tabor, 1930, thesis, U of M - Minneapolis, p. 9.
C) DNR General Exploration File #1
D) Heyl, 1968, USGS, file report [not searched]

Occurrences: "N70°E fissure vein of galena and pyrite in vertical strike-slip fault in Cambrian sandstone of Dresbach Group

(Ref. A, p. 1810, and D)" describes the Dresbach lead mine.
[E₁, NE₁-NE₁, Sec. 18]

"Galena and pyrite in pits and breccia zones along fault in Lower Ordovician Oneota Dolomite" describes the Mineral Bluff Prospects. (Center, Sec. 18) (Ref. A, p. 1810)

Testpits: See above description.
In Sec. 18, a shaft with galena ore is reported (Ref. C).
Other Data: DDH T-3, T-4, T-5, T-6, T-7, T-8 in Sec. 19 (See Appendix)
DDH T-2, T-6, T-7, T-8 in Sec. 33 (See Appendix)

Location: Winona County
Township 105N-5W, Sections 2, 4, 12
Other Data: DDH T-1, T-2, T-3, T-4, T-5, T-6 in Sec. 2 (See Appendix)
DDH T-1, T-100, T-101, T-103, T-104, T-2, T-3, T-4, T-53 in
Sec. 4 (See Appendix)
DDH T-6 in Sec. 12 (See Appendix)

Location: Winona County
Township 105N-6W, Sections 1, 7, 8, 9
Other Data: DDH T-1, T-10, T-3, T-5, T-6, T-7, T-8 in Sec. 1 (See
Appendix)
DDH T-2 in Sec. 8 (See Appendix)
DDH T-1 in Sec. 9 (See Appendix)
DDH T-1, T-2, T-3, T-4 in Sec. 7 (See Appendix)

Location: Winona County
Township 105N-7W, Section 1
Other Data: DDH T-1, T-2, T-3, T-4, T-5 in Sec. 1 (See Appendix)

Location: Winona County
Township 105N-9W, Sections 1, 2, 3, 6
Other Data: DDH T-11, T-21, T-22, T-23, T-25, T-25A, T-26, T-27 in Sec. 1
(See Appendix)
DDH T-1, T-1, T-2, T-2, T-3, T-5, T-5, T-6 in Sec. 2 (See
Appendix)
DDH T-3, T-4 in Sec. 3 (See Appendix)
DDH T-1, T-2, T-3 in Sec. 6 (See Appendix)

Location: Winona County
Township 106N-7W, Sections 16, 29
Other Data: DDH T-50 in Sec. 16 (See Appendix)
DDH T-1 in Sec. 29 (See Appendix)

Location: Winona County
Township 106N-8W, Sections 32, 35, 36
Other Data: DDH T-1, T-2, T-3, T-4, T-5 in Sec. 32 (See Appendix)
DDH T-1 in Sec. 35 (See Appendix)
DDH T-1, T-2, T-3 in Sec. 36 (See Appendix)

Location: Winona County
Township 106N-9W, Section 36
Other Data: DDH T-4 in Sec. 36 (See Appendix)

Location: Winona County
Township 106N-10W, Sections 3, 30, 34
Other Data: DDH T-1, T-2 in Sec. 3 (See Appendix)
DDH T-1, T-2, T-3 in Sec. 30 (See Appendix)
DDH T-1, T-3, T-4, T-5, T-6 in Sec. 34 (See Appendix)

Location: Winona County
Township 107N-7W
Other Data: Clay minerals, see also summary in Appendix.

Location: Winona County
Township 107N-8W, Section 11
Other Data: DDH T-1, T-2 in Sec. 11 (See Appendix)

Location: Winona County
Township 107N-10W, Section 11
Other Data: DDH T-1 in Sec. 11 (See Appendix)

Location: Winona County
Township 108N-8W, Sections 21, 34
Other Data: DDH T-5 in Sec. 21 (See Appendix)
DDH T-2 in Sec. 34 (See Appendix)

Location: Wright County
Township 122N-25W, Section 33
Other Data: DDH BOR-31, BOR-32, BOR-33, BOR-35, BOR-36, BOR-36A, BOR-38,
BOR-39, BOR-40, BOR-41, BOR-42, BOR-42A, BOR-43, BOR-44,
BOR-44A, BOR-45, BOR-45A, BOR-6 in Sec. 33 (See Appendix)

Location: Yellow Medicine County
Township 113N-39W, Section 29
References: A) Morey, Southwick, Lively, & Beltrame, 1982 MGS New Ulm
Quad, National Uranium Resource Evaluation
Occurrences: Uranium values in Sec. 29 of: (Ref. A)
- 27 ppm for granite
- 34 ppm for granite
- 83 ppm for pegmatite
- 95 ppm for pegmatite
were reported. The anomalous exposure outcrop has late stage
pegmatites within the late syntectonic batholith in Archean
gneiss terrane.

- Location: Yellow Medicine County
Township 115N-39W, Sections 3, 4, 9, 10, 11, 14
- References: A) DNR Project File 206; MGS Samples
B) Bauer, 1980, GSA Special Paper 182, p. 4
C) Himmelberg, 1968, MGS SP-5, p. 9, 15
D) Grout, 1937, p. 65
- Occurrences: Sample number MFG-818, in Sec. 10, is a weathered mafic gneiss with: (Ref. A)
- 2 ppm Ag, 505 ppm Cu (Ref. A) This is from part of the Cretaceous weathering profile on Archean gneiss terrane.
"Outcrops of garnet-biotite gneiss form a single, outer, stratiform layer of the Granite Falls antiform. The contact between the hornblende-pyroxene gneiss and the garnet-biotite gneiss on the southern limb of the antiform is concordant and is well exposed in a road cut along Highway 67 in Sec. 3, T.115N., R.39W. The southern contact of this unit on the south limb is a fault contact, as noted previously. The contact between the garnet-biotite gneiss and the hornblende-pyroxene gneiss on the northern limb of the fold is not exposed." (Ref. B, p. 4 and see map p. 4.)
At Granite Falls Memorial Park in NW $\frac{1}{4}$, Sec. 3, there is a hornblende-pyroxene gneiss with: (Ref. C, p. 9)
- 12% garnet (modes, vol. %)
- 7.7 magnetite-ilmenite
- 0.4% apatite
In NW $\frac{1}{4}$ -SE $\frac{1}{4}$, Sec. 11 there is a garnet-biotite gneiss with: (Ref. C, p. 15)
- 17.8% biotite (modes, vol. %)
- 6.8% garnet
A vein was prospected for gold. "One at Granite Falls, 1500 paces north of the southeast corner of Sec. 4, T.115N., R.39W., is mainly quartz cutting a garnetiferous gabbro gneiss. Recrystallization near the vein has made the wall rock quite massive. Thin sections show that the vein carries andesine and antiperthite, such as are found in the wall rock, but the texture indicates a pegmatitic relation to the wall rather than a modification of wall rock fragments. Pyrite is the only noteworthy metallic mineral. These (two) veins are probably pegmatitic but may have later hypothermal quartz added and they are old enough to have suffered considerable deformation" (Ref. D, p. 65).
- Other Data: Garnet in Sec. 3, see also summary in Appendix.
Clay minerals in Sec. 9, 10, and 14, see also summary in Appendix.

- Location: Yellow Medicine County
Township 116N-39W, Sections 33
- References: A) Goldich and Wooden, 1980, Precambrian Research, 11, pp. 279, 282
- Occurrences: "The Archean rocks of the Granite Falls (Fig. 8) area may be divided into two simple major groups: mafic and felsic gneisses. The mafic gneisses include amphibolite, metagabbro, and layered mafic rocks of which two principal types are hornblende-pyroxene gneiss and biotite-pyroxene gneiss.

The amphibolites range from tholeiitic to basaltic komatiite in composition. They are of igneous origin as is the metagabbro. Some of the layered mafic gneisses are metasedimentary with graywacke precursors."

Sample 763 is an amphibolite from the Granite Falls area with values of 1300 ppm chromium and 660 ppm nickel. [Probably Sec. 33] (Ref. A pp. 279 & 282)

Other Data: Garnet, see also summary in Appendix.

APPENDIX A. SUMMARIES OF SELECTED COMMODITIES

For the commodities listed below, the references often did not provide accurate descriptions or locations, but a brief bibliography is presented for each one. The collection of the data for these commodities has been much more difficult than for the other ore minerals for a number of reasons. Therefore, these bibliographies should not be viewed as complete, nor in-depth, but as a starting point.

Summary bibliographies and general locations are presented for the following commodities:

1. clay minerals
2. garnet, staurolite, and tripoli
3. graphite
4. iron ores (other than the Biwabik, Gunflint, Cuyuna, or Vermilion)
5. magnetite pegmatites
6. native copper
7. olivine
8. titaniferous magnetites in the Duluth Complex
9. zeolites

APPENDIX A
SUMMARY - CLAY MINERALS

Aase & Leonhard, 1968, USBM RI 7206, 17 pages	St. Louis	62N-18W	bonding clay
Austin, 1963, MGS RI 2, 23 pages	Goodhue	111N-15W	ceramic clay
Bell, 1954, pages 1230-1231	Goodhue	111N-14W	ceramic clay
Grogan, 1940, Ph.D., p. 106	no location		bentonite
	Lake	53N-10W	red clay
	Lake	54N-9W	red clay
Grosh and Hamlin, 1963, 30 pages	Becker	S4 -138N-41W	gray clay
	Beltrami	S21-146N-33W	yellow-gray clay
	Beltrami	S4 -148N-33W	gray clay
	Beltrami	S3 -148N-33W	gray clay
	Carlton	S28- 48N-16W	gray clay
	Dakota	S28- 28N-23W	green shale
	Goodhue	S28-111N-16W	gray shale
	Goodhue	S29-111N-16W	gray shale
	Goodhue	S21-110N-16W	gray shale
	Olmsted	S32-107N-13W	gray shale
	Ottertail	133N-43W	yellow clay
	Polk	150N-46W	dark-blue clay/ gray clay
	Polk	S20-147N-44W	gray clay
	Redwood	S35-113N-35W	black shale
	Stearns	S24-122N-32W	yellow clay
	Stearns	S23-123N-31W	gray shale
	Stearns	S35-123N-31W	gray clay
	St. Louis	S3 - 58N-15W	gray argillites
	Swift	S29-121N-43W	blue clay
Hogberg, 1964, MGS I.C.1, 32 pages	Winona	107N-7W	bricks
	Brown	109N-34W	lightweight aggregates
	Brown	109N-34W	bricks
	Redwood	113N-35W?	bricks
	Scott	115N-23W	brick
	Carlton	46N-19W	tile & pottery
	Hennepin	118N-23W?	lightweight aggregates
	Goodhue	111N-14W?	vitrified sewer pipe
	Ramsey	28N-23W?	bricks
Kelley and Karner, 1980	no specific townships		kaolin clay
Parham, 1969, p. 12	no location		kaolin, illite montmorillonite
Parham, 1969, MGS SP-10 142 Pages (K = kaolin, I = illite, M = montmorrillonite; see reference for other symbols)			

<u>Sample #</u>	<u>County</u>	<u>Location</u>	<u>K</u>	<u>M-I</u>	<u>Mont</u>	<u>G</u>	<u>O</u>
325	Benton	S11-36N-31W	K	I			
326	Benton	S11-36N-31W	K				
110	Blue Earth	S25-108N-27W	K				
1	Brown	S26-109N-35W	K	I	Mont		C
2	Brown	S26-109N-35W	K	I	Mont		C
3	Brown	S26-109N-35W	K	I	Mont		C
4	Brown	S26-109N-35W	K	I	Mont		C

5	Brown	S26-109N-35W	K	I		C?,Q,Mx
7	Brown	S26-109N-35W	K	I	Mont	C,Q,Gyp
8	Brown	S26-109N-35W	K	I	Mont	Q
246	Brown	S26-109N-35W	K	I	Mont	
45	Brown	S31-110N-30W	K	I	Mont	C?
46	Brown	S33-112N-33W	K	I	Mont	
47	Brown	S33-112N-33W	K	I		Mx-V
48	Brown	S33-112N-33W	?	I		Mx,C,Q
49	Brown	S3-111N-33W	K	I		
114	Brown	S4-109N-30W	K	I	Mont	
145	Brown	S4-109N-30W	K	I	Mont	Mx,Q
323	Brown	S4-109N-30W		I	Mont	C
111	Mower	S32-103N-17W	K	I		Q,Goe,Mx
112	Mower	S35-103N-17W	K	I		Q,Mx,Goe
113	Mower	S33-101N-18W	K	I		Mx
114	Mower	S28-101N-18W	K	I		Q,MX,Goe
166	Mower	S23-103N-18W	K	I		Q,Mx,Goe
266	Mower	S25-102N-18W	K	I		Q,Mx
269	Mower	S23-103N-18W	K	I		Q,Mx,Goe
142	Nicollet	S35-110N-30W		I	Mont	
143	Nicollet	S35-110N-30W	K?	I	Mont	Cal, C?
304-A	Nicollet	S6-111N-32W	K	I		
304-B	Nicollet	S6-111N-32W	K			
304-C	Nicollet	S6-111N-32W	K	I		
304-D	Nicollet	S6-111N-32W	K	I		
304-E	Nicollet	S6-111N-32W	K	I		
304-F	Nicollet	S6-111N-32W	K	I		
304-G	Nicollet	S6-111N-32W	K	I		
304-H	Nicollet	S6-111N-32W	K	I		
304-I	Nicollet	S6-111N-32W	K	I		
304-J	Nicollet	S6-111N-32W	K	I		
304-K	Nicollet	S6-111N-32W	K	I		
304-L	Nicollet	S6-111N-32W	K	I		
304-M	Nicollet	S6-111N-32W	K	I	Mont	
304-N	Nicollet	S6-111N-32W	K	I	Mont	
304-O	Nicollet	S6-111N-32W	K	I	Mont	
304-P	Nicollet	S6-111N-32W	K	I	Mont	Pot. & plag.feld.
304-Q	Nicollet	S6-111N-32W	K	M	Mont	Pot. & plag.feld.
304-R	Nicollet	S6-111N-32W	K	M	Mont	Q,Pot.& plag.feld.
304-S	Nicollet	S6-111N-32W	K	M	Mont	Pot. & plag.feld.
304-T	Nicollet	S6-111N-32W	K	I	Mont	Q,Pot.& plag.feld.
304-U	Nicollet	S6-111N-32W	K	I	Mont	Q,Pot.& plag.feld.
20	Goodhue	S26-111N-15W	K	I		Mx,Q
21	Goodhue	S3,10-111N-15W	K	I		Mx
30	Itasca	S24-57N-22W		I	Mont	C
259	Lyon	S16-110N-39W	K	I	Mont	
291	Morrison	S20-39N-32W	K			
10	Redwood	S35-113N-35W	K			

11	Redwood	S35-113N-35W	K			G	
12	Redwood	S35-113N-35W	K	I	Mont		
13	Redwood	S35-113N-35W	K				
14	Redwood	S35-113N-35W	K			G	
15	Redwood	S35-113N-35W	K		Mont		
33	Redwood	S34-113N-35W	K		Mont		
34	Redwood	S33-113N-35W	K				
38	Redwood	S2-112N-35W	K				
39	Redwood	S2-112N-35W	K				
40	Redwood	S2-112N-35W	K				
41	Redwood	S2-112N-35W	K				G
43	Redwood	S8-112N-34W	K				
53	Redwood	S32-113N-35W	K				
54	Redwood	S32-113N-35W	K	I			
55	Redwood	S34-113N-35W	K	I			
56	Redwood	S34-113N-35W	K		Mont		
57	Redwood	S34-113N-35W	K	I	Mont		Q
58	Redwood	S2-112N-35W	K			G	
59	Redwood	S2-112N-35W	K		Mont	G	
60	Redwood	S2-112N-35W	K			G	
69	Redwood	S35-113N-35W	K		Mont?		
70	Redwood	S1-112N-35W	K	I			
71	Redwood	S1-112N-35W	K	I			
72	Redwood	S2-112N-35W	K				
73	Redwood	S2-112N-35W	K				
74	Redwood	S2-112N-35W	K				
75	Redwood	S2-112N-35W	K	I			
77	Redwood	S2-112N-35W	K				
78	Redwood	S2-112N-35W	K			G	
79	Redwood	S30-112N-35W	K				
103	Redwood	S34-113N-35W	K				
104	Redwood	S34-113N-35W	K				
125	Redwood	S8-112N-35W		I	Mont		Cr
126	Redwood	S2-112N-35W	K		Mont		
128	Redwood	S34-113N-35W	K				
129	Redwood	S34-113N-35W	K			G	
130	Redwood	S34-113N-35W	K		Mont		Q
131	Redwood	S34-113N-35W	K		Mont	G	
132	Redwood	S34-113N-35W	K		Mont	G	
146	Redwood	S2-112N-35W	K				
270	Redwood	S24-113N-36W	K	M			
271	Redwood	S24-113N-36W	K				
272	Redwood	S24-113N-36W	K	M			
274	Redwood	S4-113N-36W	K	I	Mont		
275	Redwood	S4-113N-36W	K	I	Mont		
276	Redwood	S4-113N-36W	K	I			
277	Redwood	S31-113N-35W	K				
282	Redwood	S23-112N-34W			Mont		
283	Redwood	S23-112N-34W			Mont		
320	Redwood	S29-113N-35W	K				
35	Renville	S3-112N-34W	K				
36	Renville	S11-112N-34W	K				
37	Renville	S27-112N-33W	K				
42	Renville	S3-112N-34W	K				

44	Renville	S31-112N-32W	K				
50	Renville	S11-112N-34W	K				
51	Renville	S11-112N-34W	K				
52	Renville	S3-112N-34W	K				
76	Renville	S3-112N-34W	K	I	Mont		Q
80	Renville	S30-113N-35W	K			G	
81	Renville	S30-113N-35W	K				
105	Renville	S21-112N-33W	K	I			V,Mx
106	Renville	S21-112N-33W	K	I	Mont		
107	Renville	S21-112N-33W	K	I	Mont		Q
108	Renville	S21-112N-33W	K	I	Mont		Q
134	Renville	S3-112N-34W	K				
142	Renville	S35-110N-30W		I	Mont		
143	Renville	S35-110N-30W	K	I	Mont		Feld?
278	Renville	S3-112N-34W	K				
279	Renville	S3-112N-34W	K			G	
280	Renville	S3-112N-34W	K			G	
281	Renville	S3-112N-34W	K	I		G	V
324	Renville	S33-113N-34W	K				
338	Renville	S3-112N-34W	K	I			V
27	Stearns	S23-123N-31W	K			G	B
28	Stearns	S23-123N-31W	K			G	
29	Stearns	S23-123N-31W	K			G	
295	Stearns	124N-29W	K				
297	Stearns	124N-29W	K				
298	Stearns	124N-29W					
299	Stearns	124N-29W	K				
300	Stearns	124N-29W	K				
301	Stearns	124N-29W	K				
302	Stearns	124N-29W	K	I	Mont		V?,Q
303	Stearns	124N-29W	K	I	Mont		Q,V?
327	Stearns	S6-125N-32W	K	I			
328	Stearns	S6-125N-32W	K	M			
329	Stearns	S6-125N-32W	K	I	Mont		
330	Stearns	S6-125N-32W	K	I	Mont		
331	Stearns	S6-125N-32W	K	I	Mont		
332	Stearns	S6-125N-32W	K	I	Mont		
289	Wabasha	S35-109N-14W	K	I			
247	Yellow Medicine	S14-115N-39W	K				
249	Yellow Medicine	S14-115N-39W	K	I	Mont		
257	Yellow Medicine	S9-115N-39W		I	Mont		
258	Yellow Medicine	S10-115N-39W	K	I			
260	Yellow Medicine	S10-115N-39W	K				
261	Yellow Medicine	S10-115N-39W	K	I			
262	Yellow Medicine	S10-115N-39W	K		Mont		
263	Yellow Medicine	S10-115N-39W	K				

Parham and Austin, 1969,
MGS RI 10, 32 pages
Parham & Hogberg, 1964,
43 pages

no location		illite, kaolin
Brown	111N-32W	kaolin clays
Brown	111N-33W	kaolin clays
Nicollet	111N-33W	kaolin clays
Renville	112N-33W	kaolin clays
Renville	112N-34W	kaolin clays

	Renville	113N-34W	kaolin clays
	Renville	113N-35W	kaolin clays
	Redwood	113N-35W	kaolin clays
	Redwood	112N-35W	kaolin clays
	Redwood	112N-34W	kaolin clays
	Redwood	113N-36W	kaolin clays
DNR Terminated Lease File (CN-7913)	Beltrami	S29-150N-31W	DDH BID-3, clay
DNR Terminated Lease File (CN-7864)	Beltrami	S36-151N-32W	DDH RL-25, clay
DNR Terminated Lease File (CN-7881)	Beltrami	S24-157N-36W	DDH FT-15, clay
DNR Terminated Lease File (CN-7881)	Beltrami	S24-157N-36W	DDH FT-17, clay
DNR Terminated Lease File (CN-7882)	Beltrami	S31-157N-36W	DDH FT-6, clay
DNR Terminated Lease File (CN-7884)	Beltrami	S7-158N-36W	DDH FT-10, clay
DNR General Exploration File	Carlton	S32-48N-17W	DDH KRCH-4, Clay in Thomson Formation
DNR General Exploration File	Carlton	S32-48N-17W	DDH KRCH-5, Clay in Thomson Formation
DNR General Exploration File	Carlton	S19-46N-19W	DDH PS-2, Clay in Thomson Formation
DNR General Exploration File	Carlton	S21-46N-20W	DDH WL-1, clay in Thomson Formation
DNR General Exploration File	Carlton	S24-46N-20W	DDH KRCH-2, clay in Thomson Formation
DNR General Exploration File	Carlton	S6-46N-21W	DDH SL-1, clay in Denham Formation
DNR General Exploration File	Cottonwood	S5-107N-34W	DDH SQ-3A, clay
DNR General Exploration File	Cottonwood	S7-107N-34W	DDH SQ-6, clay in Sioux Qtzite
DNR General Exploration File	Cottonwood	S6-107N-35W	DDH SQ-3, clay in Sioux Qtzite
DNR General Exploration File	Cottonwood	S6-105N-37W	DDH SQ-11, clay
DNR General Exploration File	Cottonwood	S29-105N-37W	DDH SQ-12, clay
DNR Terminated Lease File (CN-7714)	Itasca	S30-62N-24W	DDH 40927, clay
DNR General Exploration File	Jackson	S4-104N-35W	DDH SQ-10, clay
DNR General Exploration File	Jackson	S11-102N-36W	DDH SQ-5, clay
DNR General Exploration File	Jackson	S31-102N-36W	DDH SQ-14, clay
DNR General Exploration File	Jackson	S8-104N-36W	DDH SQ-4, clay
DNR Terminated Lease File (CN-7794)	Koochiching	S35-63N-25W	DDH FL-30-1, clay
DNR General Exploration File	Koochiching	S16-159N-27W	DDH NCB-1, clay
DNR Terminated Lease File (CN-7835-N)	Lake of Woods	S9-160N-30W	DDH B-57, clay
DNR Terminated Lease File (CN-7679)	Lake of Woods	S5-157N-34W	DDH B31-2, clay
DNR Terminated Lease File (CN-7231)	Lake	S4-61N-11W	DDH 18, clay in Duluth Complex
DNR Terminated Lease File (CN-7231)	Lake	S4-61N-11W	DDH 5, clay in Duluth Complex

DNR General Exploration File	Lake	S17-61N-11W	DDH 17, clay in Duluth Complex
DNR Terminated Lease File (CN-7236)	Lake	S36-62N-11W	DDH 7, clay in Duluth Complex
DNR General Exploration File	Marshall	S1-155N-39W	DDH Star-3, clay
DNR General Exploration File	Marshall	S4-155N-39W	DDH Star-2, clay
DNR General Exploration File	Martin	S1-104N-32W	DDH SQ-9, clay
DNR General Exploration File	Murray	S34-105N-43W	DDH SQ-7, clay
DNR General Exploration File	Nobles	S20-101N-39W	DDH RL-2, clay
DNR General Exploration File	Norman	S15-145N-44W	DDH ST-2, clay
DNR General Exploration File	Norman	S20-145N-44W	DDH RK-1, clay
DNR General Exploration File	Norman	S5-143N-45W	DDH W-1, clay
DNR General Exploration File	Norman	S14-145N-45W	DDH FL-1, clay
DNR General Exploration File	Norman	S12-143N-46W	DDH W-1, clay
DNR General Exploration File	Norman	S1-144N-46W	DDH K-1, clay
DNR General Exploration File	Pine	S19-45N-20W	DDH DRP-2, clay in Denham Formation
DNR General Exploration File	Pine	S20-45N-20W	DDH ML-42C, clay in Denham Formation
DNR General Exploration File	Pine	S28-45N-20W	DDH ML-55CA, clay in Fond du Lac Sandstone (Denham Formation)
DNR General Exploration File	Pine	S29-45N-20W	DDH ML56C, clay in Denham Formation (Fond du Lac S.S.) (McGrath Gneiss)
DNR General Exploration File	Pine	S29-45N-20W	DDH ML-54C, clay in Denham Formation (Fond du Lac S.S.) (McGrath Gneiss)
DNR General Exploration File	Pine	S29-45N-20W	DDH ML-53C, clay in Denham Formation (Fond du Lac S.S.)
DNR General Exploration File	Pine	S29-45N-20W	DDH ML-51C, clay in Denham Formation (Fond du Lac S.S.)
DNR General Exploration File	Pine	S29-45N-20W	DDH ML-50C, clay in Denham Formation (Fond du Lac S.S.)
DNR General Exploration File	Pine	S29-45N-20W	DDH ML-49C, clay in Denham Formation (Fond du Lac S.S.)
DNR General Exploration File	Pine	S29-45N-20W	DDH ML-45C, clay in Denham Formation (Fond du Lac S.S.)
DNR General Exploration File	Pine	S29-45N-20W	DDH ML-43C, in clay Denham Formation (Fond du Lac S.S.)
DNR General Exploration File	Pine	S29-45N-20W	DDH ML-44C, clay in Denham Formation (Fond du Lac S.S.)
DNR General Exploration File	Pine	S29N-45N-20W	DDH MLCH-6, clay in Denham Formation (Fond du Lac S.S.)

DNR General Exploration File	Pine	S10-44N-21W	DDH RS-1, clay in McGrath Gneiss (Fond du Lac S.S.)
DNR General Exploration File	Pine	S9-45N-21W	DDH D-1, clay in Denham Formation
DNR General Exploration File	Pine	S11-45N-21W	DDH ML-26, clay in Denham Formation
DNR General Exploration File	Pope	S21-124N-39W	DDH 27009, clay
DNR General Exploration File	Pope	S32-123N-40W	DDH 27008, clay
DNR General Exploration File	Roseau	S31-162N-36W	DDH BD-1, clay
DNR General Exploration File	Stearns	S33-124N-31W	DDH 27011, clay
DNR General Exploration File	Stearns	S15-124N-32W	DDH 27012, clay
DNR General Exploration File	St. Louis	S4-59N-12W	DDH BA-1, clay in Duluth Complex (Biwabik FeFm) (Virginia Fm)
DNR General Exploration File	St. Louis	S2-60N-12W	DDH D-1, clay in Duluth Complex (Giants Range)
DNR Terminated Lease File (CN-7239)	St. Louis	S36-61N-12W	DDH 10, clay in Duluth Complex (Giants Range)
DNR Terminated Lease File (CN-7239)	St. Louis	S36-61N-12W	DDH 11, clay in Duluth Complex (Giants Range)
DNR Terminated Lease File (CN-7403)	St. Louis	S16-63N-12W	DDH LL-2, Clay
DNR General Exploration File	St. Louis	S31-56N-13W	DDH HL-2, clay in Duluth Complex
DNR General Exploration File	St. Louis	S31-56N-13W	DDH HL-1A, clay in Duluth Complex
DNR General Exploration File	St. Louis	S14-59N-13W	DDH BA-3, clay in Duluth Complex
DNR General Exploration File	St. Louis	S36-60N-13W	DDH 59029, clay in Duluth Complex (Virginia Fm)
DNR Terminated Lease File (CN-7026)	St. Louis	S14-54N-14W	DDH VIII-4A, clay in Duluth Complex
DNR Terminated Lease File (CN-7030)	St. Louis	S16-54N-14W	DDH I-9, clay in Duluth Complex
DNR Terminated Lease File (CN-7030)	St. Louis	S16-54N-14W	DDH I-8, clay in Duluth Complex
DNR Terminated Lease File (CN-7030)	St. Louis	S16-54N-14W	DDH I-7, clay in Duluth Complex
DNR Terminated Lease File (CN-7030)	St. Louis	S16-54N-14W	DDH I-4, clay in Duluth Complex
DNR Terminated Lease File (CN-7030)	St. Louis	S16-54N-14W	DDH I-3, clay in Duluth Complex
DNR Terminated Lease File (CN-7030)	St. Louis	S16-54N-14W	DDH I-2, clay in Duluth Complex
DNR Terminated Lease File (CN-7070)	St. Louis	S16-57N-14W	DDH II-3, clay in Duluth Complex
DNR Terminated Lease File (CN-7070)	St. Louis	S16-57N-14W	DDH II-2, clay in Duluth Complex (Virginia Fm)

DNR Terminated Lease File (CN-7070)	St. Louis	S16-57N-14W	DDH II-5, clay in Duluth Complex
DNR Terminated Lease File (CN-7070)	St. Louis	S16-57N-14W	DDH II-4, clay in Duluth Complex
DNR Terminated Lease File (CN-7070)	St. Louis	S16-57N-14W	DDH II-1, clay in Duluth Complex
DNR Terminated Lease File (CN-8402)	St. Louis	S34-57N-14W	DDH BC-80-1, clay in Virginia Fm
DNR Terminated Lease File (CN-7412)	St. Louis	S11-62N-14W	DDH CL-3, clay in Ely Greenstone
DNR Terminated Lease File (CN-7584)	St. Louis	S6-61N-15W	DDH T-6, clay in Ely Greenstone
DNR Terminated Lease File (CN-7423)	St. Louis	S6-62N-15W	DDH P-1, clay in Lake Vermilion Fm
DNR Terminated Lease File (CN-7608)	St. Louis	S29-62N-21W	DDH C-H-4, clay
DNR Terminated Lease File (CN-7609)	St. Louis	S30-62N-21W	DDH C.M.-5, clay
DNR General Exploration File	Watonwan	S11-107N-31W	DDH SQ-8, clay
DNR General Exploration File	Watonwan	S23-107N-33W	DDH SQ-13, clay in Sioux Qtzite

GARNET, STAUROLITE, AND TRIPOLI

Weiblen, 1964, Thesis, pp. 26, 27, 43-46	Pine	45N-20W	Garnet & staurolite
Himmelberg, 1965, Ph.D.	Chippewa	Uncertain	Garnet
	Yellow Medicine	115N-39W	Garnet
	Yellow Medicine	116N-39W	Garnet
Todd, 1942, Ph.D., p. 18	Morrison	40N-32W	Staurolite
Griffin, 1967, Thesis, pp. 102-103	St. Louis	Uncertain	Garnet in slate
Morey, 1979, MGS Guidebook #9 pp. 13-28	Carlton	Uncertain	Garnet in Denham Fm
Morey, 1979, MGS Guidebook #12 38 pages	Pine	Uncertain	Garnet in Denham Fm
	Carlton	Uncertain	Garnet
	Pine	Uncertain	Garnet
	Mille Lacs	Uncertain	Garnet
	Morrison	Uncertain	Garnet
	Benton	Uncertain	Garnet
	Stearns	Uncertain	Garnet
Keighin, Morey, Goldich, 1972 in Centennial Volume, pp. 240-255	Carlton	Uncertain	Garnet & staurolite
	Aitkin	Uncertain	Garnet & staurolite
	Pine	Uncertain	Garnet & staurolite
	Kanabec	Uncertain	Garnet & staurolite
	Mille Lacs	Uncertain	Garnet & staurolite
	Benton	Uncertain	Garnet & staurolite
	Stearns	Uncertain	Garnet & staurolite
	Morrison	Uncertain	Garnet & staurolite
	Crow Wing	Uncertain	Garnet & staurolite
Himmelberg, 1968, MGS SP-5 33 pages	Yellow Medicine	115N-39W	Garnet
Lund, 1956, GSA Bulletin pp. 1475-1490	Yellow Medicine	116N-39W	Garnet
Lund, 1950, Ph.D., pp. 68-69	Lac Qui Parle	120N-45W	Garnet
Grant, 1972, MGS Guidebook # 5 pp. 1-52	Yellow Medicine	115N-39W	Garnet
	Chippewa	Uncertain	Garnet
	Lac Qui Parle	Uncertain	Garnet
	Swift	Uncertain	Garnet
Bauer, 1980, in GSA Special Paper 182, pp. 1-17	Yellow Medicine	S3-115N-39W	Garnet
Davidson, 1977, MGS Map M-30	Cook	S30-63N-3W	Staurolite & garnet
	Cook	S25-63N-4W	Staurolite & garnet
Southwick & Ojakangas, 1979, MGS Geol. Map, International Falls Sheet	St. Louis	69N-20W	Garnet & staurolite
	St. Louis	69N-21W	Garnet & staurolite
	Koochiching	69N-22W	Garnet & staurolite
	Koochiching	69N-23W	Garnet & staurolite
	Koochiching	69N-24W	Garnet & staurolite
	Koochiching	68N-25W	Garnet & staurolite
	Koochiching	68N-26W	Garnet & staurolite
	Koochiching	156N-25W	Garnet & staurolite
Harder & Johnston, 1918, MGS Bulletin 15, p. 60	Morrison	S7-40N-32W	Garnet
Winchell, 1888, Vol. 2, pp. 593-598, 459	Morrison	S32-129N-32W	Garnet & staurolite
	Morrison	40N-32W	Staurolite
	Morrison	39N-32W	Staurolite

Winchell, 1900, Vol. 5, p. 568, No. 849	Stearns	Uncertain	Garnet
p. 756, No. 1670;	Morrison	129N-30W	Staurolite
p. 805, No. 1895	Morrison	129N-30W	Garnet
p. 352, No. 401	Cook	Uncertain	Garnet
p. 356, No. 413	St. Louis	S36-63N-17W	Garnet
p. 357, No. 417	St. Louis	S11, 63N-17W	Garnet
p. 588, No. 881	St. Louis	Uncertain	Garnet
p. 854, No. 2189	St. Louis	S35-63N-16W	Garnet
Green, 1971, 17th LSI Proceedings, p. 76-96	St. Louis	S26-64N-9W	Garnet
	Lake	Uncertain	Garnet
	Cook	Uncertain	Garnet
Griffin, 1967, Thesis pp. 102-103	St. Louis	Uncertain	Garnet
Viswanathan & Ojakangas, 1974 MGS Map M-20	St. Louis	59N-21W	Garnet
Viswanathan, 1974, MGS Map M-18	St. Louis	60N-21W	Garnet
	St. Louis	60N-20W	Garnet
Viswanathan, 1974, MGS Map M-23	St. Louis	61N-20W	Garnet & staurolite
	St. Louis	61N-19W	Garnet & staurolite
	St. Louis	60N-19W	Garnet & staurolite
Alt, 1958, Thesis, Map Plate 2	Koochiching	Uncertain	Garnet
Goldich and Peterman, 1980, pp. 307-327	Koochiching	Uncertain	Garnet & staurolite
Winchell, 1888, Vol. 2, pp. 459, 597-598	Morrison	40N-32W	Staurolite
Winchell, 1899, Vol. 4 pp. 236, 238, 239, 245 259	Stearns	Uncertain	Garnet
	St. Louis	70N-20W	Garnet
	St. Louis	70N-21W	Garnet
	St. Louis	65N-21W	Garnet
	St. Louis	65N-20W	Garnet
Winchell, 1888, Vol. 2, pp. 394-397	Washington	30N-20W	Tripoli

GRAPHITE SUMMARY

Grout & Schwartz, 1933, MGS Bulletin 24, p. 92	Cook	S32- 64N-5E	graphite nodules in red rock
Grout, 1933, p. 69	Cook	S36- 64N-5E	graphite nodules in red rock
	Cook	S32- 64N-5E	graphite nodules in red rock
Winchell, 1899, V. 4, p. 23	Carlton	49N-16W	vein of graphite
Winchell, 1899, V. 4, p. 520	Cook	64N-7E	round small masses
Winchell, 1900, V. 5, pages 417 and 294	Cook	64N-7E	graphitic quartzite
Winchell, 1900, V. 5, p. 731	St. Louis	S2 - 61N-15W	pyrite-graphite rock
Listerud, 1978, DNR Project 164 file	Beltrami	S7 -151N-30W	DDH RL 42-1
	Beltrami	S8 -151N-30W	DDH RL 43-1
	Beltrami	S1 -155N-38W	DDH FT-20
	Beltrami	S31-156N-37W	DDH FT-9
	Beltrami	S33-151N-32W	DDH BID-1
	Beltrami	S13-150N-32W	DDH BID-2
	Beltrami	S29-150N-31W	DDH BID-3
	Beltrami	S30-152N-30W	DDH RL-39
	Beltrami	S10-150N-30W	DDH RL-31
	Beltrami	S29-150N-31W	DDH RL-28-1
	Beltrami	S36-151N-32W	DDH RL-25
	Beltrami	S31-157N-36W	DDH FT-6
	Beltrami	S24-157N-36W	DDH FT-17
	Beltrami	S36-157N-36W	DDH FT-18
	Beltrami	S24-158N-38W	DDH FT-19
	Beltrami	S19-158N-37W	DDH T20-1
DNR Terminated Lease File (CN-7803)	St. Louis	S29-62N-17W	DDH SC-1, Massive graphite, 173-175 ft. interval
DNR Terminated Lease File Graphitic (CN-7585)	St. Louis	S2-62N-15W	DDH RL-10, chert - 84-112 and 123-138 ft. interval with about 20% graphite in bands.
DNR Terminated Lease File (CN-7583)	St. Louis	S6-61N-15W	DDH T-6, Graphitic sediments 94-98 ft. interval
DNR Terminated Lease File (CN-7584)	St. Louis	S5-61N-15W	DDH T-5, Graphitic sediments 145-163 ft. interval
DNR Terminated Lease File (CN-7597)	St. Louis	S12-61N-15W	DDH-26517, Pyritic- graphitic slaty argillite with moderate graphite along bedding planes - 738-834 ft. interval

DNR Terminated Lease File	St. Louis	S30-62N-21W	DDH C-M-5, Locally graphitic sediments - 170-260 ft. intervals with highly graphitic zone - 207-212 ft. interval
DNR Terminated Lease File (CN-7608)	St. Louis	S29-62N-12W	DDH C-H-4, Graphite, 335-340 ft. interval
DNR Terminated Lease File (CN-7525)	St. Louis	S32-63N-14W	DDH V-2, 75% graphite 146-183 and 231-246 ft. interval, 50% graphite - 276-305 ft. interval
DNR Terminated Lease File (CN-7512)	St. Louis	S15-62N-14W	DDH V-1, Thin bedded graphitic sediment 87-115 ft. interval
DNR Terminated Lease File (CN-7510)	St. Louis	S5-62N-14W	DDH V-5, 30% graphite 7-13 ft. interval
DNR Terminated Lease File (CN-7510)	St. Louis	S5-62N-14W	DDH V-6, 30% graphite 6-16½ ft. interval
DNR Terminated Lease File (CN-7423)	St. Louis	S6-62N-15W	DDH P-1, Graphitic and pyritic slate 89-99½ ft. interval
DNR Terminated Lease File (CN-7415)	St. Louis	S18-62N-14W	DDH ARM-3, Massive 17-27 and 141½-148 ft. interval
DNR Terminated Lease File (CN-7415)	St. Louis	S18-62N-14W	DDH ARM-2, Graphite-rich zones - 152-160, 196-204½, 242-249 and 304½-307½ ft. interval
DNR Terminated Lease File (CN-7415)	St. Louis	S18-62N-14W	DDH ARM-1, Graphite-rich zone - 152-159 ft. interval
DNR Terminated Lease File (CN-7404)	St. Louis	S35-63N-12W	DDH WW-1, Graphitic sediments - 103-133 ft. interval
DNR Terminated Lease File (CN-7403)	St. Louis	S16-63N-12W	DDH LL-1, Graphitic sediments - 204-252 ft. interval
DNR Terminated Lease File (CN-7403)	St. Louis	S16-63N-12W	DDH LL-2, Graphitic sediments - 376-393, 404-423 and 486-506 ft. interval
DNR Terminated Lease File (CN-7791)	Koochiching	S27-63N-25W	DDH FL-32-1, Graphitic schists - 346-387 ft. interval with massive graphite - 358-376 ft. interval

DNR Terminated Lease File (CN-7794)	Koochiching	S35-63N-25W	DDH FL-30-1, Siliceous graphite - 232-412, 432-437 and 441-458 ft interval consisting of about 80% graphite and 20% quartz DNR
Terminated Lease File (CN-7306)	Koochiching	S4-158N-27W	DDH R-4-3, Graphitic greywacke - 240-403 ft. interval with some heavy graphite zones.
DNR General Exploration File	Koochiching	S15-159N-27W	DDH R-2-1A, Graphitic metasediments - 233-422 ft. interval with some massive graphite.
DNR Terminated Lease File (CN-7319)	Koochiching	S15-159N-27W	DDH R-2-1, Graphitic metasediments - 116-178 ft. intervals with some massive graphite.
DNR Terminated Lease File (CN-7322)	Koochiching	S21-159N-27W	DDH R-2-2, Massive graphite - 152-159 ft. interval.
DNR Terminated Lease File (CN-7272)	Koochiching	S10-159N-28W	DDH RR-12-1, Graphitic metasediments with flake graphite observed 221-280 ft. interval with some barren zones.
DNR Terminated Lease File (CN-7272)	Koochiching	S10-159N-28W	DDH RR-12-2, Graphitic shale with flake graphite - 228-232 ft. interval.
DNR Terminated Lease File (CN-7939)	Koochiching	S32-157N-29W	DDH A-4-1, Graphitic metasediments - 349-365 and 398-503 ft. intervals.
DNR Terminated Lease File (CN-7940)	Koochiching	S33-157N-29W	DDH A-4-2, Graphitic metasediments - 421-480 ft. interval.
DNR Terminated Lease File (CN-7360)	Koochiching	S26-159N-28W	DDH R-5-2, Graphitic greywacke units - 201-246, 261-270, 433-519 and 577-593 ft. interval.
DNR Terminated Lease File (CN-7360)	Koochiching	S26-159N-28W	DDH R-5-1, Graphitic greywacke - 285-465 and 560-800 ft. interval.
DNR Terminated Lease File (CN-7746)	Lake of Woods	S14-157N-34W	DDH 40926, Graphite shear zone - 351-355 ft. interval, graphite argillite - 362-368 ft. interval.

DNR Terminated Lease File (CN-7832)	Lake of Woods	S14-159N-32W	DDH BD-3, Intermittent layers of graphitic tuff and graphitic chlorite schist 270'8" to 314 ft. interval; graphitic layer with strong graphite sublayer - 370-373 ft. interval; alternating strong graphitic and tuff layer - 372-418 ft. interval.
DNR Terminated Lease File (CN-7955)	Lake of Woods	S16-160N-30W	DDH B-3-3, Graphitic metasediments - 250-284 ft. interval.
DNR General Exploration File	Lake of Woods	S3-158N-33W	DDH B-21-1, Graphitic metasediments - 185-200 ft. interval.
DNR General Exploration File	Lake of Woods	S21-157N-34W	DDH B-35-1, Graphitic metasediments - 275-291 ft. interval with massive graphite - 284-289 ft. interval.
DNR Terminated Lease File (CN-7615)	Itasca	S4-61N-23W	DDH C-B-1, Argillite with 2-3 cm graphite layers - 350-361 ft. interval.
DNR Terminated Lease File (CN-7539)	Itasca	S17-61N-23W	DDH C-K-2, Graphite 245-251 ft. interval.
DNR Terminated Lease File (CN-7824)	Itasca	S6-61N-24W	DDH 26516, Graphitic slates - 324-412 ft. interval.
DNR Terminated Lease File (CN-7827)	Itasca	S12-61N-25W	DDH 26503, Graphitic to very graphitic slate 905-933, 988-1021, and 1036-1041 ft. intervals.
DNR Terminated Lease File (CN-7827)	Itasca	S12-61N-12W	DDH 26506, Graphitic slate - 280-327, 327-356 and 575-577 ft. intervals.
DNR Terminated Lease File (CN-7827)	Itasca	S12-61N-12W	DDH 26508, Graphitic slate - 326-330, 337-339, 345-367, 375-385, 392-398, 401-413, 437-444, 452-456, 459-472 and 481-485 ft. intervals.
DNR Terminated Lease File (CN-7825)	Itasca	S10-61N-25W	DDH 26512, Graphite at 153, 154, 160, 161 and 162 ft. intervals.

DNR Terminated Lease File (CN-7828)	Itasca	S16-61N-25W	DDH 26514, Graphitic argillite - 182-208 ft. interval - 40% graphite.
DNR Terminated Lease File (CN-7828)	Itasca	S16-61N-25W	DDH 26515, Graphitic argillite - 186-192, 384-395 ft. intervals (very high graphite); 413-423 ft interval (very high graphite).
DNR Terminated Lease File (CN-7770)	Itasca	S17-62N-24W	DDH T-7, Argillaceous graphite - 194-213 ft. interval; graphitic argillite - 276-278, 301-303, and 326-331 ft. intervals.
DNR Terminated Lease File (CN-7763)	Itasca	S11-61N-24W	DDH T-13, Graphite and cherty-graphite breccia-149-170½ ft. interval.
DNR General Exploration File	Carlton	S4-47N-18W	DDH MLCH-9, Graphite in Thomson Formation
DNR General Exploration File	Carlton	S7-46N-19W	DDH J.A.-1, Graphite in Thomson Formation
DNR General Exploration File	Carlton	S7-46N-19W	DDH MM-1, Graphite in Thomson Formation
DNR General Exploration File	Carlton	S21-47N-19W	DDH ML-7, Graphite in Thomson Formation
DNR General Exploration File	Carlton	S3-46N-20W	DDH CL-1, Graphite in Thomson Formation
DNR General Exploration File	Carlton	S24-46N-20W	DDH KRCH-2, Graphite in Thomson Formation
DNR General Exploration File	Carlton	S33-46N-20W	DDH KRCH-9, Graphite in Thomson Formation

APPENDIX A
SUMMARY: IRON ORES - ARCHEAN

<u>Reference</u>	<u>County</u>	<u>Location</u>	<u>Remarks/Description</u>
Ojakangas, Sims, Morey, Green, 1971, LSI, pp. 141-162 Green, 1970	St. Louis Lake Lake Lake Lake Lake	uncertain S1-63N-10W S14-63N-11W S26-64N-10W S34-64N-11W S20-63N-11W S12-65N-6W	Ely Greenstone Assays Assays Assays Assays Assays Lenses with graywacke
DNR Project File #192 Sims, 1969, MGS I.C. 7, pp. 25-26	St. Louis St. Louis	S3-66N-17W Uncertain	Iron ore & testpits Two layers of iron formation in Knife Lake Group
Reid, 1956, GSA Guidebook No. 1, pp. 109-119	St. Louis	Uncertain	Vermilion Range
Jahn, Shih, Murthy, 1974 pp. 611-627	St. Louis	Uncertain	In Newton Lake Formation
Allison, 1924-25, Thesis p. 493	St. Louis	S19-57N-22W	Inclusions in batholith
Giangrande, 1981, Thesis	St. Louis	S8-61N-14W	Skeleton Lake Project
Grout, 1921, MGS Fieldbook #76 p. 59 p. 59	St. Louis St. Louis	S3-62N-18W S11-62N-20W	In Graywacke Iron formation drilled
Rowe, 1971, Thesis	St. Louis	S11,12-62N-14W	Clear Lake Prospect
Schulz, 1977, Thesis, p. 53	St. Louis	S7,8-62N-14W	Sulfide iron formation
Anderson, 1957, Thesis pp. 36-39	Becker	138N-37W	
Sims, Morey, Green, 1969 pp. 75-87	St. Louis	Uncertain	
DNR General Exploration File	Stearns	S22-124N-31W	DDH 27010, Magnetite
DNR General Exploration File	Stearns	S33-124N-31W	DDH 27011 Magnetite
DNR General Exploration File	Stevens	S30-124N-42W	DDH 27004 Magnetite
DNR Terminated Lease File (CN-7886)	Beltrami	S23-158N-36W	DDH FT-1 Magnetite
DNR Terminated Lease File (CN-7811)	Itasca	S34-60N-23W	DDH BL-D-1, Magnetite
DNR General Exploration File	Koochiching	S7-159N-26W	DDH R.R.-80-2 Magnetite
DNR Terminated Lease File (CN-7874)	Koochiching	S22-152N-27W	DDH MIZA-1 Magnetite
DNR Terminated Lease File (CN-8038)	St. Louis	S8-61N-14W	DDH SL-3, Magnetite in Ely Greenstone DNR

Terminated Lease File (CN-7803)	St. Louis	S29-62N-17W	DDH SC-2, Magnetite in Soudan FeFm (Lake Vermilion Formation)
DNR Terminated Lease File (CN-7803)	St. Louis	S29-62N-17W	DDH SC-1, Magnetite in Soudan FeFm (Lake Vermilion Formation)
DNR General Exploration File	Beltrami	S7-151N-30W	DDH RL42-1, FeFm
DNR Terminated Lease File (CN-7913)	Beltrami	S29-150N-31W	DDH BID-3, FeFm
DNR Terminated Lease File (CN-7914)	Beltrami	S13-150N-32W	DDH BID-2, FeFm
DNR Terminated Lease File (CN-7015)	Beltrami	S33-151N-32W	DDH BID-1, FeFm
DNR Terminated Lease File (CN-7864)	Beltrami	S36-151N-32W	DDH RL-25, FeFm
DNR Terminated Lease File (CN-7884)	Beltrami	S7-158N-36W	DDH FT-13, FeFm
DNR Terminated Lease File (CN-7884)	Beltrami	S7-158N-36W	DDH FT-7, FeFm
DNR Terminated Lease File (CN-7884)	Beltrami	S7-158N-36W	DDH FT-12, FeFm
DNR Terminated Lease File (CN-7884)	Beltrami	S7-158N-36W	DDH FT-22, FeFm
DNR Terminated Lease File (CN-7884)	Beltrami	S7-158N-36W	DDH FT-21, FeFm
DNR Terminated Lease File (CN-7885)	Beltrami	S13-158N-36W	DDH FT-14, FeFm
DNR Terminated Lease File (CN-7645)	Itasca	S29-60N-25W	DDH CN-16, FeFm
DNR Terminated Lease File (8407-F)	Koochiching	S3-158N-27W	DDH KC-1, FeFm
DNR Terminated Lease File (8408-F)	Koochiching	S4-158N-27W	DDH KC-3, FeFm
DNR Terminated Lease File (8396-F)	Koochiching	S34-159N-27W	DDH KC-4, FeFm
DNR Terminated Lease File (8397-F)	Koochiching	S35-159N-27W	DDH KC-2, FeFm
DNR Terminated Lease File (CN-7360)	Koochiching	S26-159N-28W	DDH R-5-2, FeFm
DNR Terminated Lease File (CN-7941)	Koochiching	S1-158N-29W	DDH A-10-1, FeFm
DNR Terminated Lease File (CN-7947)	Koochiching	S19-158N-29W	DDH A-6-1, FeFm
DNR General Exploration File	Lake of Woods	S32-158N-33W	DDH MED-1, FeFm
DNR Terminated Lease File (CN-7744)	Lake of Woods	S25-159N-33W	DDH 40919, FeFm
DNR General Exploration File	Norman	S12-143N-46W	DDH W-1, FeFm
DNR General Exploration File	St. Louis	S30-63N-12W	DDH R-3, FeFm
DNR Terminated Lease File (CN-7404)	St. Louis	S35-63N-12W	DDH WW-1, FeFm in Ely Greenstone
DNR Terminated Lease File (CN-8038)	St. Louis	S8-61N-14W	DDH SL-3, FeFm in Ely Greenstone DNR

Terminated Lease File (CN-7412)	St. Louis	S11-62N-14W	DDH CL-1, FeFm in Ely Greenstone DNR
Terminated Lease File (CN-7412)	St. Louis	S11-62N-14W	DDH CL-3, FeFm in Ely Greenstone
DNR Terminated Lease File (CN-7803)	St. Louis	S29-62N-17W	DDH SC-2, FeFm in Soudan FeFm (Lake Vermilion Formation)
DNR Terminated Lease File (CN-7803)	St. Louis	S29-62N-17W	DDH SC-1, FeFm in Soudan FeFm (Lake Vermilion Formation)

APPENDIX A
SUMMARY: IRON ORES - PROTEROZOIC

DNR General Exploration File	St. Louis	S35-61N-12W	DDH D-8, FeFm in Duluth Complex (Giants Range)
DNR General Exploration File	St. Louis	S35-61N-12W	DDH D-11, FeFm in Duluth Complex (Giants Range)
DNR Terminated Lease File (CN-7120)	St. Louis	S16-59N-13W	DDH A4-11, FeFm in Duluth Complex
DNR General Exploration File	St. Louis	S17-59N-13W	DDH W-1, FeFm in Duluth Complex (Biwabik FeFm) (Virginia Fm)
DNR General Exploration File	St. Louis	S17-59N-13W	DDH W-6, FeFm in Duluth Complex (Biwabik FeFm) (Virginia Fm)
DNR General Exploration File	St. Louis	S17-59N-13W	DDH W-7, FeFm in Duluth Complex (Biwabik FeFm)
DNR General Exploration File	St. Louis	S17-59N-13W	DDH W-8B, FeFm in Duluth Complex (Biwabik FeFm)
DNR General Exploration File	St. Louis	S17-59N-13W	DDH W-9, FeFm in Duluth Complex (Biwabik FeFm)
DNR General Exploration File	St. Louis	S17-59N-13W	DDH W-11, FeFm in Duluth Complex (Biwabik FeFm)
DNR General Exploration File	St. Louis	S17-59N-13W	DDH W-10, FeFm in Duluth Complex (Biwabik FeFm)
DNR General Exploration File	St. Louis	S17-59N-13W	DDH W-14, FeFm in Duluth Complex (Biwabik FeFm) (Virginia Fm)
DNR Terminated Lease File (P8386)	Aitkin	S22-46N-25W	DDH 85, FeFm in Glen Township
DNR General Exploration File	Carlton	S6-46N-21W	DDH SL-1, FeFm in Denham Formation
DNR General Exploration File	St. Louis	S18-59N-13W	DDH W-13, FeFm in Duluth Complex (Biwabik FeFm) (Virginia Fm)
DNR General Exploration File	St. Louis	S19-59N-13W	DDH W-12, FeFm in Duluth Complex (Biwabik FeFm) (Virginia Fm)
DNR Terminated Lease File (CN-7121)	St. Louis	S20-59N-13W	DDH A4-14, FeFm in Duluth Complex (Biwabik FeFm)

DNR General Exploration File	St. Louis	S30-59N-13W	DDH BA-6, FeFm in Duluth Complex (Biwabik FeFm) Virginia Fm)
DNR General Exploration File	St. Louis	S36-60N-13W	DDH 59029, FeFm in Duluth Complex (Virginia Fm)
DNR General Exploration File	St. Louis	S3-58N-14W	DDH W-5, FeFm in Duluth Complex (Virginia Fm) (Biwabik FeFm)
DNR Terminated Lease File (CN-7136)	St. Louis	S25-59N-14W	DDH A4-12, FeFm in Duluth Complex (Virginia Fm)
DNR General Exploration File	St. Louis	S25-59N-14W	DDH W-3, FeFm in Duluth Complex (Virginia Fm)
DNR General Exploration File	St. Louis	S4-59N-12W	DDH BA-1, FeFm in Duluth Complex (Biwabik FeFm) (Virginia Fm)
DNR General Exploration File	St. Louis	S2-60N-12W	DDH D-9, FeFm in Duluth Complex (Giants Range) (Biwabik FeFm)
DNR General Exploration File	St. Louis	S2-60N-12W	DDH D-10, FeFm in Duluth Complex (Giants Range)
DNR General Exploration File	St. Louis	S2-60N-12W	DDH D-2, FeFm in Duluth Complex (Giants Range)
DNR Terminated Lease File (CN-7159)	St. Louis	S34-60N-12W	DDH BA-2, FeFm in Duluth Complex (Giants Range) (Pokegama Fm)
Morey, 1972, in Cent. Volume pp. 262-263	Aitkin	46N-25W	Sulfide facies
Theil, 1922, MGS Fieldbook #93a, p. 13	Carlton	S21-46N-20W	Hematite stain
Connolly, 1981, Thesis	Carlton	Uncertain	Cherty iron-formation
Morey, 1979, MGS Guidebook #12, 38 pages	Carlton	Uncertain	Randall
	Pine	Uncertain	Glenn Township
	Mille Lacs	Uncertain	Denham Formation
	Morrison	Uncertain	Denham Formation
Morey, 1979, MGS Guidebook #9, pp. 13-28	Carlton	Uncertain	Randall
	Pine	Uncertain	Glenn Township
			Denham Formation
Skillman, 1946, Ph.D. Thesis	Pine	S25,26-44N-23W	Others also cited
Lucente, 1978, Thesis pp. 17 and 41	St. Louis	Uncertain	In Virginia Formation
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 12, CDH-1, Magnetite in Glenn Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 48, FeFm in Glen Township

DNR General Exploration File	Aitkin	S28-46N-25W	DDH 28, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 27, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 26, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 17, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 13, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 76, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 70, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 58, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 56, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 36, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 35, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 34, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 33, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 32, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 31, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 16, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 12, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 54, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 53, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 52, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 50, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 47, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 46, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 45, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 44, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 43, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 42, FeFm in Glen Township

DNR General Exploration File	Aitkin	S28-46N-25W	DDH 41, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 40, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 39, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 38, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 37, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 68, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 66, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 64, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 62, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 60, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 23, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 22, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 20, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 71, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 25, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 24, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 19, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 63, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 57, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 55, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 51, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 49, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 15, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH 14, FeFm in Glen Township
DNR General Exploration File	Aitkin	S28-46N-25W	DDH CDH-1, FeFm in Glen Township

APPENDIX A
SUMMARY: MAGNETITE PEGMATITES

Grout, 1923, E.G., pages 253-269	Locations uncertain	
Grout, 1926, MGS Bull. 21, 218 pages	St. Louis S3&4-66N-17W	listed here are "better-looking exposures with 10-100 acres"
	St. Louis S29&32-68N-19W	
	St. Louis S15,16,17-67N-20W	
	St. Louis S33- 67N-17W	
	St. Louis S36- 66N-17W	
There are 60-70 occurrences of magnetite pegmatites described in:		
	St. Louis 66N-16W	
	St. Louis 66N-17W	
	St. Louis 66N-18W	
	St. Louis 67N-18W	
	St. Louis 67N-17W	
Wheeler, thesis, 20 pages	St. Louis 66N-17W	
	St. Louis 66N-18W	
	St. Louis 67N-17W	
	St. Louis 67N-18W	
Hansen, 1922, 52 pages	St. Louis 67N-21W	
Grout, 1919, MGS Fieldbook #56	St. Louis 64N-17W	4 occurrences
Grout & Johnston, 1920, MGS Fieldbook #61	St. Louis 63N-16W	5 occurrences in these 2 townships
Grout, 1921, MGS Fieldbook #76	St. Louis 65N-17W	3 occurrences
Wheeler, 1919, MGS Fieldbook #54	St. Louis 67N-20W	29 occurrences in these 5 townships
	St. Louis 65N-18W	
	St. Louis 66N-16W	
	St. Louis 66N-17W	
	St. Louis 67N-16W	
	St. Louis 67N-17W	
Johnston, 1919, MGS Fieldbook #53	St. Louis 65N-17W	14 occurrences in these 3 townships
	St. Louis 66N-18W	
	St. Louis 67N-16W	
Lowering, 1921, MGS Fieldbook #80	St. Louis 67N-20W	1 occurrence
Lowering, 1921, MGS Fieldbook #77	St. Louis 64N-12W	5 occurrences in these 2 townships
Eldman, 1922, MGS Fieldbook #90	St. Louis 68N-19W	1 occurrence
Furterer, 1982, MGS personal communication	St. Louis 68N-19W	1 occurrence
	St. Louis S6-69N-18W	1 occurrence

APPENDIX A

SUMMARY: NATIVE COPPER

Green, 1972, in Cent. Volume pp. 294-332	St. Louis	S17-51N-12W	Up to 15# masses
	St. Louis	S25-52N-12W	Up to 15# masses
	Lake	Uncertain	
	Cook	Uncertain	
Hall, 1889, pp. 105-111	Cook	S24-61N-1W	100's lbs.
	Cook	60N-2W	1200-1500 lbs.
	St. Louis	51N-12W	
	Chisago	34N-19W	Taylor's Falls
	Le Sueur	111N-25W	Blue Earth River
	Le Sueur	112N-25W	Blue Earth River
Ileichen & Grimes, 1908, Thesis	Pine	S19-40N-19W	Cu/Ag assay's
	Pine	S19,29-41N-19W	Cu/Ag assay's
	Pine	41N-20W	Cu/Ag assay's
	Pine	S34-40N-20W	Near Hinckley
	Carlton	Uncertain	
	Chisago	Uncertain	
Foster, 1963, pp. 796-803	Cook	62N-2W	
	Cook	61N-2W	
	Cook	63N-2W	
	Cook	S29-64N-6W	Cpy, native Cu
Grout & Schwartz, 1933, MGS Bulletin #24, p. 94			
Klinger, 1956, Guidebook for Fieldtrip 1, p. 120-134	St. Louis	62N-15W	In Soudan, Mine
Schwartz & Sandberg, 1938, MGS Fieldbook #257, p. 2	Lake	S12-52W-11W	With zeolites
Winchell, 1900, Vol. 5, pp. 885-886; 163; 294	Lake	S2-52N-11W	With zeolites
	St. Louis	62N-15W	In Montana Shaft
	St. Louis	51N-12W	With zeolites
	St. Louis	S32-64N-7W	
Sims, 1972, in Cent. Vol., pp. 172-176	St. Louis	S27,28-62N-15W	In Soudan Mine
Schwartz, 1949, MGS Bulletin 33, pp. 132-133	St. Louis	S27-63N-12W	In Zenith Mine
	St. Louis	S36-52N-12W	In float
	St. Louis	S26-52N-12W	Drill core
	St. Louis	S4-51N-12W	
	St. Louis	50N-14W	
Taylor, 1964, MGS Map Series GM-1			
Matsch, 1962, Thesis, p. 25	Washington	S15-27N-20W	In float
Johnson, 1933, Thesis, p. 38	Rice	S33-110N-20W	In float
Eng, 1984, pers. comm.	Pine	S22-43N-16W	In float
	Pine	S26-41N-20W	Shaft
Winchell, 1888, Vol. II, pp. 634; No. 407	Pine	S33-40N-19W	Shaft
Winchell, 1900, Vol. #5, pp. 252-255	Chisago	34N-19W	
Green, 1972, MGS Guidebook #3 p. 30	Cook	S24-61N-1W	Shaft with zeolites
Green, 1972, MGS Guidebook #6 pp. 20-22, 65	Cook	S34-61N-1W	With zeolites
Cordua, Bauer, Gilbertson, Koskelin, Oberli, 1979, GSA [abs] Vol. 11, 5, p. 227	St. Louis	Uncertain	
	Cook	Uncertain	
	Chisago	34N-19W	
Anderson, 1957, thesis, pp. 39-43	Otter Tail	S22-137N-39W	DDH 3-1, @ 459 ft. depth

Morey & Mudrey, 1972, in Cent. Volume, pp. 425-430	Pine	Uncertain	In fragmental, amygdaloidal & conglomerate
	Carlton	Uncertain	In fragmental, amygdaloidal & conglomerate
	Chisago	Uncertain	In fragmental, amygdaloidal & conglomerate
DNR Terminated Lease File (CN-7070)	St. Louis	S16-57N-14W	DDH II-6
Green, 1979, MGS Guidebook 11	St. Louis	.Uncertain	
	Lake	Uncertain	
	Cook	Uncertain	
Green, 1977, GSC Special Paper 16, pp. 407-422	St. Louis	Uncertain	Plateau volcanism
	Lake	Uncertain	Plateau volcanism
	Cook	Uncertain	Plateau volcanism
Ojakangas & Matsch, 1982 pp. 140-141	St. Louis	51N-12W	
Grye, 1942, Thesis, p. 54	Pine	41N-20W	
Grout, 1917, Ph.D.	Cook	S17-63N-5E	
Winchell, 1899, Vol. 4, pp. 23, 216	St. Louis	50N-14W	Downtown
	Carlton	46N-19W	50 lb. float
	Carlton	49N-17W	Float
	Carlton	S19-48N-17W	Float
Winchell, 1888, Vol. 2, p. 48	St. Louis	S17-51N-12W	With zeolite
	Goodhue	110N-15W	Float
	Goodhue	110N-16W	Float
	Goodhue	110N-17W	Float
	Goodhue	S20-112N-17W	Float
p. 95	Dakota	S8-113N-18W	Float
p. 131	Carver	115N-23W	Float
p. 392	Washington	S27-29N-17W	Float
	Washington	S22-29N-17W	Float
p. 421	Chisago	34N-19W	Float
	Chisago	35N-19W	Float
p. 623	Mille Lacs	38N-27W	Float
	Kanabec	S5,6-42N-22W	Float
p. 643	Pine	39N-20W	Float
p. 372	Washington	30N-22W	Float
	Ramsey	Uncertain	Float
pp. 372, 303	Hennepin	Uncertain	Float
	Ramsey	29N-23W	Float
Emmons & Grout, 1943, MGS Bulletin 30, pp. 138, 61	St. Louis	52N-12W	
	Uncertain	Uncertain	

APPENDIX A
SUMMARY: OLIVINE

Lister, 1966, E.G., p. 275-310	Cook	64N-3W	much chem	14.6-44.9
	Cook	63N-4W	data	mode %
Ripley, 1978, MGS R.I. 20	Itasca	61N-25W	"olivine clinopyroxenite"	
Bonnichsen, 1969, pp. 89-93	St. Louis	S20-55N-12W	Probe data for olivines	
			"locally abundant olivine"	
Taylor, 1955, thesis	St. Louis	S25-50N-15W	"olivine melagabbro"	
	St. Louis	S14-49N-15W	"banded olivine gabbro"	
	St. Louis	S17-50N-15W	"diabasic olivine gabbro"	
	St. Louis	S27-50N-15W	"olivine gabbro"	
	St. Louis	S26-50N-15W	"feldspathic olivine norite"	
	St. Louis	S25-50N-15W	"olivine melagabbro"	
	St. Louis	S6 -49N-14W	"olivine gabbro"	
	St. Louis	S14-49N-15W	"banded feldspathic olivine gabbro"	
	St. Louis	S6 -49N-14W	magnetic olivine melagabbro	
	St. Louis	S23-49N-15W	olivine gabbro	
	St. Louis	Bardon's peak	olivine gabbro	
Ernst, 1960, pp. 286-303	St. Louis	50N-14W	14.3 mode % olivine in diabase	
			peridotite	
Bonnichsen, 1972, Cent. Vol., pp. 361-387	St. Louis	49N-14W	"olivine gabbro"	
	St. Louis	50N-13W	"	"
	St. Louis	50N-14W	"	"
	St. Louis	S36-53N-15W	Peridotite & dunite	
Mudrey, 1976, pp. 877-888	Cook	63N-6E	olivine diabase dikes	
	Cook	64N-6E	olivine diabase dikes	
	Cook	64N-7E	olivine diabase dikes	

APPENDIX A
SUMMARY: TITANIFEROUS MAGNETITE IN DULUTH COMPLEX

Bonnichsen, Delano, Forbes 1972, abstract	St. Louis	53N-14W	Titaniferous peridotite
Broderick & Levorsen, 1916, Fieldbook #17, pp. 45-57	Cook	S21-63N-4W	Magnetite gabbro
pp. 65-81	Cook	S21-63N-4W	Magnetite gabbro
pp. 1-29	Cook	S26-63N-4W	Magnetite gabbro
pp. 29-37	Cook	S27-63N-4W	Magnetite gabbro
Broderick, 1915, Fieldbook #8	Cook	S4,9-64N-4W	Magnetite in gabbro
pp. 19-27	Cook	S7-64N-5W	Magnetite in gabbro
Broderick, 1917, Ph.D.	St. Louis	Uncertain	Titaniferous magnetite
	Lake	Uncertain	Titaniferous magnetite
	Cook	Uncertain	Titaniferous magnetite
Broderick, 1917, Econ. Geol. Vol. 12, pp. 663-696	Lake	Uncertain	Titaniferous magnetite
Broderick, 1916, MGS Fieldbook #24, pp. 33-49	Cook	Uncertain	Titaniferous magnetite
Broderick, 1916, MGS Fieldbook #22, pp. 41, 81-83, 85-93	Cook	S22-64N-2W	Magnetite
	Cook	S3-64N-2W	Magnetite
	Cook	S1-64N-2W	Magnetite
	Cook	S2-64N-2W	Magnetite
	Cook	S35,36-65N-2W	Magnetite
Broderick, 1915, MGS Fieldbook #14 & 15	Cook	S7-64N-5W	Magnetite
Bonnichsen, 1972, in Cent. Volume, pp. 361-387	St. Louis	50N-13W	Ilmenite
Bonnichsen, 1969, pp. 84-93	St. Louis	S20-55N-12W	Oxides
Davidson, 1972, in Cent. Volume pp. 354-360	Lake	Uncertain	3 groups of bodies
Davidson, 1977, MGS Misc. Map M-26	Cook	Uncertain	3 groups of bodies
	Cook	62N-4W	Titaniferous magnetite
	Cook	62N-5W	Titaniferous magnetite
Davidson, 1977, MGS Map M-33	Lake	S9-62N-7W	Magnetite in gabbro
Edwards, 1915, MGS Fieldbook #13	Cook	S13-63N-4W	Magnetite in gabbro
p. 39	Cook	S24-63N-4W	Magnetite in gabbro
p. 41	Cook	S1,2-64N-3W	Magnetite in gabbro
Edwards, 1915, Fieldbook #11 pp. 3-7, 12-15, 71, 83	Cook	S5-64N-4W	Magnetite in gabbro
	Lake	S2-63N-8W	Magnetite in gabbro
	Lake	S6-63N-7W	Magnetite in gabbro
	Cook	S29,31,32-65N-4W	Magnetite in gabbro
	Lake	S6-64N-6W	Magnetite in gabbro
	Cook	S1,12,13-64N-5W	Magnetite in gabbro
Edwards, 1915, MGS Fieldbook #12, pp. 50-79	Cook	S2,26-64N-2W	Magnetite
	Cook	S11-64N-2W	Magnetite
	Cook	S3-64N-5W	Magnetite
	Cook	S1,2,12,13-64N-4W	Magnetite
Emmons & Grout, 1943, MGS Bulletin 30, p. 29	Lake	Uncertain	Titaniferous magnetite
Feenstra, in preparation, UMD Thesis	Cook	Uncertain	Titaniferous magnetite
	Cook	64N-2W	Titaniferous magnetite
	Cook	65N-3W	Titaniferous magnetite
	Cook	64N-3W	Titaniferous magnetite
	St. Louis	S8-53N-14W	Titaniferous magnetite
	St. Louis	S34-58N-14W	Titaniferous magnetite
	St. Louis	57N-14W	Titaniferous magnetite
Grout, 1917, Ph.D.	St. Louis	S25-50N-15W	

Grout, 1937, MGS Field Note- book #300, pp. 9, 29, 37, 39	Cook Cook Cook	S4,9-62N-4W S26-63N-4W S7-64N-5W	Titaniferous magnetite Titaniferous magnetite Titaniferous magnetite
Grout, 1949-50, pp. 78-79 (See also entire book)	Cook (Lake) (St. Louis)	S3-64N-3W	Up to 30% ore minerals
Grout, Sharp, and Schwartz, 1959, pp. 80-86	Cook Cook Cook Cook Cook Cook Cook Cook Cook Cook	65N-5W 64N-5W 64N-4W 64N-3W 64N-2W 63N-4W 63N-3W 62N-5W 62N-4W	Titaniferous magnetite Titaniferous magnetite Titaniferous magnetite Titaniferous magnetite Titaniferous magnetite Titaniferous magnetite Titaniferous magnetite Titaniferous magnetite Titaniferous magnetite
Grout, 1913, MGS Fieldbook #0 pp. 44-45	Cook	S31-64N-2W	Magnetite
Grout, 1935, MGS Fieldbook #30 p. 13	Cook	S6-64N-2W	Magnetite
Grye, 1942, Thesis	Cook Cook Cook Cook Cook Cook	S34-65N-5W 62N-6E 63N-6E 63N-6E 62N-5E 63N-5E 64N-5E	Magnetite in anorthositic gabbro
Green, 1979, MGS Guidebook 11 22 pages	St. Louis Lake Cook	Uncertain Uncertain Uncertain	Assays Assays Assays
Herz, 1976, USGS P.P. 959-D, pp. D1-D6	St. Louis Lake	Uncertain Uncertain	Titaniferous magnetite Titaniferous magnetite
Jones, 1963 Thesis	Cook Cook Cook Cook	62N-3E 63N-3E 62N-4E 63N-4E	
Kilburg, 1972, Thesis	St. Louis St. Louis St. Louis	50N-15W 49N-115W 48N-15W	
Lehman, 1980, Thesis, pp. 67-72	Lake	S20,29-60N-6W	Titaniferous magnetite in gabbro
Levorsen, 1917, Thesis	Cook Cook	63N-4W 63N-3W	Titaniferous magnetite Titaniferous magnetite
Levorsen, Schwartz, Grout, 1922 Fieldbook #20, pp. 36-45; pp. 21-35; pp. 27029	Cook Cook Cook	S25-63N-4W S28-63N-4W S33-63N-4W	Magnetite gabbro Magnetite gabbro Magnetite gabbro
Linscheid, in progress UMD Thesis	St. Louis	S30-59N-13W	Titaniferous magnetite
Lister, 1966, pp. 275-310	Cook	64N-3W 63N-4W	20-66 vol.% oxide minerals
Mainwaring & Naldrett, 1974, p. 21	St. Louis	S27,28, 33-57N-14W	Titaniferous magnetite
Mathez, 1971, Thesis, p. 14	Cook	64N-1W	Titaniferous magnetite
Mathez, Nathan, Morey, 1977 MGS Map M-38	Cook	64N-2W	Titaniferous magnetite

Morey, and Nathan 1978, MGS Map M-39	Cook	64N-3W	Titaniferous magnetite
DNR General Exploration File	St. Louis	S31-56N-13W	DDH HL-2, Magnetite in Duluth Complex
DNR General Exploration File	St. Louis	S30-59N-13W	DDH BA-6, magnetite in Duluth Complex (Biwabik FeFm) (Virginia Fm)
DNR Terminated Lease File (CN-7007)	St. Louis	S7-53N-14W	DDH IV-9, magnetite in Duluth Complex
DNR Terminated Lease File (CN-7007)	St. Louis	S7-53N-14W	DDH IV-6, magnetite in Duluth Complex
DNR General Exploration File	Lake	S15-63N-9W	DDH S-2, magnetite in Duluth Complex (Knife Lake FM)
DNR General Exploration File	Lake	S10-57N-11W	DDH S-1, Magnetite
DNR Terminated Lease File (CN-7232)	Lake	S5-61N-11W	DDH 2, magnetite in Duluth Complex
DNR General Exploration File	St. Louis	S22-52N-15W	DDH MPL-1, magnetite in Duluth Complex
DNR Terminated Lease File (CN-7087)	St. Louis	S36-53N-15W	DDH V-1, magnetite in Duluth Complex
DNR Terminated Lease File (CN-7008)	St. Louis	S8-53N-14W	DDH IV-1, magnetite in Duluth Complex
DNR Terminated Lease File (CN-7026)	St. Louis	S10-54N-14W	DDH I-5A, magnetite in Duluth Complex
DNR Terminated Lease File (CN-7026)	St. Louis	S10-54N-14W	DDH I-5A, magnetite in Duluth Complex
DNR Terminated Lease File (CN-7026)	St. Louis	S10-54N-14W	DDH I-1A, magnetite in Duluth Complex
DNR Terminated Lease File (CN-7026)	St. Louis	S14-54N-14W	DDH VIII-4A, magnetite in Duluth Complex
DNR Terminated Lease File (CN-7030)	St. Louis	S16-54N-14W	DDH I-8, magnetite in Duluth Complex
DNR Terminated Lease File (CN-7037)	St. Louis	S23-54N-14W	DDH VIII-2, magnetite in Duluth Complex
DNR Terminated Lease File (CN-8001)	St. Louis	S29-55N-14W	DDH CV-1, magnetite in Duluth Complex
Nathan, 1966, Ph.D., pp. 186-188	Cook	S36-65N-3W	Unit T contains 14-19 wt. % TiO ₂
	Cook	S4-64N-2W	Titaniferous magnetite
	Cook	S3-64N-5W	Titaniferous magnetite
	Cook	S14-64N-1W	Titaniferous magnetite
	Cook	S1-64N-2W	Titaniferous magnetite
p. 189	Cook	S22-64N-2W	Titaniferous magnetite
Peterson, 1966, USBM I.C. 8290 65 pages	Cook	65N-3W	Titaniferous magnetite
Phinney, 1972, in Cent. Vol. pp. 346-353	Cook	64N-1E	Magnetite & apatite
	Cook	64N-2E	Magnetite & apatite
	Cook	64N-3E	Magnetite & apatite
Phinney, 1969, N.Y.S.M. & S.S. Memoir 18, pp. 135-147	Cook	Uncertain	Magnetite
	Lake	Uncertain	Magnetite
	St. Louis	Uncertain	Magnetite
Phinney, 1972, in Cent. Volume pp. 335-345	Lake	S1-61N-11W	Magnetite and assays

Ruotsala and Tufford, 1965 MGS I.C.2, 87 pages	Cook Lake St. Louis	Numerous Numerous Numerous	Fe, Cr, B Assays Assays
Sanders, 1923, MGS Fieldbook #98, p. 29	Lake	S12-63N-9W	Magnetite
Schwartz, 1925, MGS Fieldbook #141, pp. 79-81	Cook	S8-64N-2E	Titaniferous Magnetite
Schwartz, 1949, MGS Bull. 33	St. Louis	Uncertain	Magnetite
Schwartz, 1936, MGS Fieldbook #197, pp. 6, 9, 17	Lake	S10-16,22-58N-6W	Magnetite
Sims, Morey, Green, 1969 pp. 75-87	Cook	65N-3W	Titaniferous magnetite
Sims and Morey, 1974, Econ. Geol. Vol. 12, No. 14, pp. 1, 6-9	Lake Cook	Uncertain Uncertain	
Taylor, 1955, Thesis	St. Louis Lake Cook	S25-50N-16W Uncertain Uncertain	Titaniferous magnetites Titaniferous magnetites Titaniferous magnetites
Taylor, 1955, Thesis	St. Louis	50N-14W	Magnetite
Weiblan, Mathex, Morey, 1972 in Cent. Vol., pp. 394-406	Cook	65N-3E	Ilmenite - rich gabbroic rocks
	Cook	65N-4E	Ilmenite - rich gabbroic rocks
Weiblan, Morey, Mudrey, 1971 pp. 97-123	Cook	Uncertain	Titaniferous magnetite
Winchell, 1899, Vol. 4, p. 260 p. 285	St. Louis Lake	S24-61N-12W S3-062N-10W	Magnetite Magnetite
p. 285	Lake	S14-64N-7W	Magnetite
p. 303	Lake	S64-8W	Magnetite
p. 326	Cook	S21,22-63N-4W	Titaniferous magnetite
Winchell, 1900, Vol. 5, p. 496 No. 695	Cook	S36-65N-3W	Titaniferous magnetite

APPENDIX A
SUMMARY: ZEOLITES*

Grogan, 1940, Ph.D.	Lake	S27-54N-9W	Thomsonite
	Lake	S31-53N-10W	Thomsonite
Rennebaum, 1978, Thesis	St. Louis	Uncertain	Many zeolite minerals
	Lake	Uncertain	Many zeolite minerals
	Cook	Uncertain	Many zeolite minerals
Marmaduke, 1941, Thesis, p. 10	Cook	62N-1E	Zeolites in amygdules
Green, 1971, LSI, pp. 76-96	St. Louis	Uncertain	Laumontite
	Lake	Uncertain	Laumontite
	Cook	Uncertain	Laumontite
Schwartz & Sandberg, 1938, MGS Fieldbook #257, p. 2	Lake	S12-52N-11W	Prehnite laumontite & native copper
	Lake	S2-52N-11W	Prehnite laumontite & native copper
Green, 1972, MGS Guidebook #3, p. 30	Cook	S34-61N-1W	With native copper
Winchell, 1900, Vol. 5, pp. 252-255	Cook	S24-61N-1W	With native copper
Green, 1972, MGS Guidebook #6 p. 65	St. Louis	Uncertain	
	Cook	Uncertain	
Morey, 1979, MGS Guidebook #12	Carlton	Uncertain	
	Pine	Uncertain	
Green, 1979, MGS Guidebook #11	St. Louis	Uncertain	
	Lake	Uncertain	
	Cook	Uncertain	

* See native copper occurrences for further possibilities.

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
AITKIN	44-22- 5	W	SW-NE	MGS		2019	MGS
AITKIN	44-23-25	W	SE-NW	COLE & MCDONALD		251	OTHER
AITKIN	44-23-25	W	SE-NW	COLE & MCDONALD		262	OTHER
AITKIN	44-23-26	W	SE-NW	COLE & MCDONALD		252	OTHER
AITKIN	44-23-26	W	SE-NW	COLE & MCDONALD		254	OTHER
AITKIN	44-23-26	W	SE-NW	COLE & MCDONALD		261	OTHER
AITKIN	45-27-15	W	SW-NE	WHITESIDE		1	OTHER
AITKIN	46-23- 2	W	SE-SE	MGS		2022	MGS
AITKIN	46-25-11	W	NW-NW	HANNA		G-4	USBM
AITKIN	46-25-11	W	NW-NW	HANNA		G-5	USBM
AITKIN	46-25-11	W	NW-NW	HANNA		G-6	USBM
AITKIN	46-25-11	W	SW-SW	HANNA		G-8	USBM
AITKIN	46-25-11	W	SW-SW	HANNA		G-9	USBM
AITKIN	46-25-14	W	SW-NW	USBM		12	USBM
AITKIN	46-25-14	W	NW-SW	USBM		11	USBM
AITKIN	46-25-15	W	SW-NE	USBM		3	USBM
AITKIN	46-25-15	W	SW-NE	USBM		8	USBM
AITKIN	46-25-15	W	SE-NE	USBM		10	USBM
AITKIN	46-25-15	W	SE-NE	USBM		9	USBM
AITKIN	46-25-15	W	NE-NW	USBM		1	USBM
AITKIN	46-25-15	W	SE-NW	USBM		2	USBM
AITKIN	46-25-15	W	SE-NW	USBM		4	USBM
AITKIN	46-25-15	W	SE-NW	USBM		5	USBM
AITKIN	46-25-15	W	SE-NW	USBM		6	USBM
AITKIN	46-25-15	W	SE-NW	USBM		7	USBM
AITKIN	46-25-16	W	SW-NE	HANNA	P8384	G-1	DNR
AITKIN	46-25-22	W	SW-SW	HANNA	P8386	85	DNR
AITKIN	46-25-27	W	NW-NW	HANNA		65	USBM
AITKIN	46-25-28	W	NE-NE	BUTLER BROS.		12	DNR
AITKIN	46-25-28	W	NE-NE	BUTLER BROS.		13	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		14	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		15	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		16	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		29	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		30	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		31	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		32	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		33	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		34	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		35	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		36	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		56	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		58	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		70	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		76	DNR
AITKIN	46-25-28	W	NE-NE	BUTLER BROS.		C.D.H. - 1	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		37	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		38	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		39	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		40	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		41	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		42	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		43	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		44	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		45	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		46	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		47	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		50	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		52	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		53	DNR
AITKIN	46-25-28	W	NE-NE	STATE OF MINN		54	DNR
AITKIN	46-25-28	W	NW-NE	STATE OF MINN		17	DNR
AITKIN	46-25-28	W	NW-NE	STATE OF MINN		18	DNR
AITKIN	46-25-28	W	NW-NE	STATE OF MINN		26	DNR
AITKIN	46-25-28	W	NW-NE	STATE OF MINN		27	DNR
AITKIN	46-25-28	W	NW-NE	STATE OF MINN		28	DNR
AITKIN	46-25-28	W	NW-NE	STATE OF MINN		48	DNR
AITKIN	46-25-28	W	NW-NE	STATE OF MINN		49	DNR
AITKIN	46-25-28	W	NW-NE	STATE OF MINN		51	DNR

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
AITKIN	46-25-28	W	NW-NE	STATE OF MINN		55	DNR
AITKIN	46-25-28	W	NW-NE	STATE OF MINN		57	DNR
AITKIN	46-25-28	W	NW-NE	STATE OF MINN		63	DNR
AITKIN	46-25-28	W	NE-NW	STATE OF MINN		19	DNR
AITKIN	46-25-28	W	NE-NW	STATE OF MINN		24	DNR
AITKIN	46-25-28	W	NE-NW	STATE OF MINN		25	DNR
AITKIN	46-25-28	W	NE-NW	STATE OF MINN		71	DNR
AITKIN	46-25-28	W	SW-NW	HANNA		73	USBM
AITKIN	46-25-28	W	SW-NW	HANNA		78	USBM
AITKIN	46-25-28	W	SW-NW	HANNA		79	USBM
AITKIN	46-25-28	W	SW-NW	HANNA		82	USBM
AITKIN	46-25-28	W	SE-NW	HANNA		81	USBM
AITKIN	46-25-28	W	SE-NW	STATE OF MINN		20	DNR
AITKIN	46-25-28	W	SE-NW	STATE OF MINN		22	DNR
AITKIN	46-25-28	W	SE-NW	STATE OF MINN		23	DNR
AITKIN	46-25-28	W	SE-SW	STATE OF MINN		60	DNR
AITKIN	46-25-28	W	SE-SW	STATE OF MINN		62	DNR
AITKIN	46-25-28	W	SE-SW	STATE OF MINN		64	DNR
AITKIN	46-25-28	W	SE-SW	STATE OF MINN		66	DNR
AITKIN	46-25-28	W	SE-SW	STATE OF MINN		68	DNR
AITKIN	46-25-28	W	NW-SE	O'CONNEL		21	USBM
AITKIN	46-25-28	W	NW-SE	HANNA		83	USBM
AITKIN	46-25-29	W	SE-NE	HANNA		86	USBM
AITKIN	46-25-29	W	NE-SE	HANNA		87	USBM
AITKIN	46-25-29	W	NW-SE	HANNA		84	USBM
AITKIN	46-25-36	W	NE-NE			1	OTHER
AITKIN	46-26-24	W	NE-NW	HANNA		N-1	OTHER
AITKIN	46-27-13	W	NW-SE	CROSBY		101	USBM
AITKIN	46-27-17	W	NW-SE	CROSBY		460	USBM
AITKIN	47-23-12	W	SW-NW	MGS		2023	MGS
AITKIN	47-24-6	W	NW-SE	CROSBY		589	USBM
AITKIN	47-24-6	W	NW-SE	CROSBY		594	USBM
AITKIN	47-24-6	W	NW-SE	CROSBY		598	USBM
AITKIN	47-24-6	W	NW-SE	CROSBY		603	USBM
AITKIN	47-24-6	W	NW-SE	CROSBY		605	USBM
AITKIN	47-24-6	W	NW-SE	CROSBY		609	USBM
AITKIN	47-24-6	W	NW-SE	CROSBY		610	USBM
AITKIN	47-24-6	W	NW-SE	CROSBY		611	USBM
AITKIN	47-24-6	W	NW-SE	CROSBY		612	USBM
AITKIN	47-24-6	W	NW-SE	CROSBY		614	USBM
AITKIN	47-24-6	W	NW-SE	CROSBY		615	USBM
AITKIN	47-24-6	W	NW-SE	CROSBY		620	USBM
AITKIN	47-25-1	W	NW-SE	ZENO IRON		3-Y	USBM
AITKIN	47-25-1	W	NW-SE	CROSBY		509	USBM
AITKIN	47-25-1	W	NW-SE	CROSBY		525	USBM
AITKIN	47-25-1	W	NW-SE	CROSBY		537	USBM
AITKIN	47-25-1	W	NW-SE	CROSBY		544	USBM
AITKIN	47-25-1	W	NW-SE	CROSBY		549	USBM
AITKIN	47-25-1	W	NW-SE	CROSBY		554	USBM
AITKIN	47-25-1	W	NW-SE	CROSBY		562	USBM
AITKIN	47-25-1	W	NW-SE	CROSBY		579	USBM
AITKIN	47-25-26	W	NW-SE	USBM		DL-3	USBM
AITKIN	47-25-26	W	NW-SE	USBM		DL-4	USBM
AITKIN	47-25-26	W	NW-SE	USBM		DL-5	USBM
AITKIN	47-25-34	W	SE-NE	MDNR		DL-1	OTHER
AITKIN	47-25-34	W	SE-NE	MDNR		DL-2	OTHER
AITKIN	47-25-34	W	SE-NE	MDNR		DL-3	OTHER
AITKIN	47-25-34	W	SE-NE	MDNR		DL-4	OTHER
AITKIN	47-25-34	W	NW-SE	USBM		DL-1	USBM
AITKIN	47-25-34	W	NW-SE	USBM		DL-2	USBM
AITKIN	47-26-2	W	NW-SE	HANNA		246	USBM
AITKIN	47-26-2	W	NW-SE	HANNA		276	USBM
AITKIN	47-26-2	W	NW-SE	HANNA		288	USBM
AITKIN	47-26-3	W	NW-NE	HANNA		258	USBM
AITKIN	47-26-3	W	NW-NE	HANNA		260	USBM
AITKIN	47-26-3	W	NW-NE	HANNA		260-A	USBM
AITKIN	47-26-3	W	NW-NE	HANNA		262	USBM
AITKIN	47-26-3	W	NW-NE	HANNA		S15	USBM
AITKIN	47-26-3	W	NW-NE	HANNA		S15-A	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
AITKIN	47-26-3	W	SW-NW	HANNA		168	USBM
AITKIN	47-26-3	W	SW-NW	HANNA		172	USBM
AITKIN	47-26-3	W	SW-NW	HANNA		182	USBM
AITKIN	47-26-3	W	SW-NW	HANNA		195	USBM
AITKIN	47-26-3	W	SW-NW	HANNA		S134	USBM
AITKIN	47-26-3	W	SW-NW	HANNA		S14	USBM
AITKIN	47-26-3	W	SW-NW	HANNA		S156	USBM
AITKIN	47-26-3	W	SW-NW	HANNA		S33	USBM
AITKIN	47-26-3	W	SW-NW	HANNA		S5	USBM
AITKIN	47-26-3	W	SW-NW	HANNA		S7	USBM
AITKIN	47-26-3	W	SW-NW	HANNA		S9	USBM
AITKIN	47-26-3	W	NW-SW	HANNA		158	USBM
AITKIN	47-26-3	W	NW-SW	HANNA		160	USBM
AITKIN	47-26-3	W	NW-SW	HANNA		163	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S24	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		186	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		186-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		192	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		192-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		203	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		203-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		206	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		206-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		210	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		210-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		215	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		215-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		220	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		223	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		227	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		231	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		234	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		234-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		255	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		265	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		265-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		266	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		270	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		270-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		273	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		281	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		281-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		295	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		295-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		37	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		40	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		40-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		50	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		53	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		53-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		56	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		56-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S12	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S12-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S16	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S17	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S177	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S18	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S21	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S22	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S22-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S23	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S24-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S241	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S241-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S242	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S242-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S245	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S25	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
AITKIN	47-26-3	W	NW-SE	HANNA		S250	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S250-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S252	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S253	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S256	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S256-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S26	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S269	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S27	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S27-A	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S32	USBM
AITKIN	47-26-3	W	NW-SE	ZENO IRON		1-U	USBM
AITKIN	47-26-3	W	NW-SE	CROSBY		1-Y	USBM
AITKIN	47-26-3	W	NW-SE	ZENO IRON		2-Y	USBM
AITKIN	47-26-3	W	NW-SE	HANNA		S24	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S319	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S271	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S275	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S285	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S291	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S293	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S299	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S309	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S313	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S315	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S321	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S322	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S323	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S324	USBM
AITKIN	47-26-4	W	NE-SW	HANNA		S328	USBM
AITKIN	47-26-4	W	NW-SW	HANNA		117	USBM
AITKIN	47-26-4	W	SW-SW	HANNA		S174	USBM
AITKIN	47-26-4	W	SW-SW	HANNA		S175	USBM
AITKIN	47-26-4	W	SW-SW	HANNA		S180	USBM
AITKIN	47-26-4	W	SW-SW	HANNA		S280	USBM
AITKIN	47-26-4	W	SW-SW	HANNA		S282	USBM
AITKIN	47-26-4	W	SW-SW	HANNA		S332	USBM
AITKIN	47-26-4	W	SW-SW	HANNA		S333	USBM
AITKIN	47-26-4	W	NE-SE	HANNA		S130	USBM
AITKIN	47-26-4	W	NE-SE	HANNA		S38	USBM
AITKIN	47-26-4	W	NE-SE	HANNA		S96	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		129	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S1	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S10	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S100	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S104	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S105	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S108	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S11	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S110	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S124	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S126	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S13	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S132	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S135	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S138	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S140	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S144	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S147	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S148	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S152	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S16	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S164	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S167	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S171	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S184	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S188	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S19	USBM
AITKIN	47-26-4	W	NW-SE	HANNA		S191	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
AITKIN	47-26- 4	W	NW-SE	HANNA		S2	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S20	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S29	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S3	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S30	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S314	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S316	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S317	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S318	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S320	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S325	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S326	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S327	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S39	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S4	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S41	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S42	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S45	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S47	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S49	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S51	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S57	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S6	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S79	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S8	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S91	USBM
AITKIN	47-26- 4	W	NW-SE	HANNA		S94	USBM
AITKIN	47-26- 9	W	NW-NE	HANNA		S239	USBM
AITKIN	47-26-17	W	NE-NW	HANNA		S225	USBM
AITKIN	47-26-17	W	NW-NW	HANNA		S208	USBM
AITKIN	47-26-17	W	NW-NW	HANNA		S216	USBM
AITKIN	47-26-18	W	SW-NE	HANNA		240	USBM
AITKIN	47-26-18	W	SE-NW	HANNA		247	USBM
AITKIN	47-26-18	W	NE-SW	HANNA		S257	USBM
AITKIN	48-22-15	W	SE-NW	MGS		2036	MGS
AITKIN	48-22-29	W	NW-SE	MGS		2037	MGS
AITKIN	48-22-30	W	NE-SW	MARTIN-TROST		H-1	DNR
AITKIN	48-25-30	W	NE-SE	HANNA		307	USBM
AITKIN	48-25-30	W	NE-SE	HANNA		310	USBM
AITKIN	48-25-30	W	NE-SE	HANNA		311	USBM
AITKIN	48-25-30	W	NW-SE	HANNA		304	USBM
AITKIN	48-25-30	W	NW-SE	HANNA		S300	USBM
AITKIN	48-25-30	W	NW-SE	HANNA		S330	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S236	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S238	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S243	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S244	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S248	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S251	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S254	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S259	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S261	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S264	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S268	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S272	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S274	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S277	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S279	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S284	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S287	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S289	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S294	USBM
AITKIN	48-25-31	W	NW-NW	HANNA		S296	USBM
AITKIN	48-25-31	W	SW-NW	HANNA		S222	USBM
AITKIN	48-25-31	W	SW-NW	HANNA		S228	USBM
AITKIN	48-25-31	W	SW-NW	HANNA		S232	USBM
AITKIN	48-25-31	W	SW-NW	HANNA		S233	USBM
AITKIN	48-26-35	W	SW-SW	HANNA		31	USBM
AITKIN	48-26-35	W	SW-SW	HANNA		36	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
AITKIN	48-26-35	W	SW-SW	HANNA		48	USBM
AITKIN	48-26-35	W	SW-SW	HANNA		48-A	USBM
AITKIN	48-26-35	W	SW-SW	HANNA		S28	USBM
AITKIN	48-26-35	W	SW-SW	HANNA		S34	USBM
AITKIN	48-26-35	W	SE-SW	HANNA		43	USBM
AITKIN	48-26-35	W	SE-SW	HANNA		43-A	USBM
AITKIN	48-26-35	W	SE-SW	HANNA		44	USBM
AITKIN	48-26-35	W	SE-SW	HANNA		44-A	USBM
AITKIN	48-26-35	W	SE-SW	HANNA		46	USBM
AITKIN	48-26-35	W	SE-SW	HANNA		46-A	USBM
AITKIN	48-26-35	W	NE-SE	HANNA		60	USBM
AITKIN	48-26-35	W	NE-SE	HANNA		60-A	USBM
AITKIN	48-26-35	W	NE-SE	HANNA		63	USBM
AITKIN	48-26-35	W	NE-SE	HANNA		63-A	USBM
AITKIN	48-26-35	W	NE-SE	HANNA		67	USBM
AITKIN	48-26-35	W	NE-SE	HANNA		67-A	USBM
AITKIN	48-26-35	W	NE-SE	HANNA		72	USBM
AITKIN	48-26-35	W	NE-SE	HANNA		72-A	USBM
AITKIN	48-26-35	W	NE-SE	HANNA		74	USBM
AITKIN	48-26-35	W	NE-SE	HANNA		S65	USBM
AITKIN	48-26-35	W	NE-SE	HANNA		S65-A	USBM
AITKIN	48-26-35	W	NW-SE	HANNA		52	USBM
AITKIN	48-26-35	W	NW-SE	HANNA		52-A	USBM
AITKIN	48-26-35	W	SW-SE	HANNA		292	USBM
AITKIN	48-26-35	W	SW-SE	HANNA		297	USBM
AITKIN	48-26-35	W	SE-SE	HANNA		292	USBM
AITKIN	48-26-35	W	SE-SE	HANNA		298	USBM
AITKIN	48-26-35	W	SE-SE	HANNA		301	USBM
AITKIN	48-26-35	W	SE-SE	HANNA		303	USBM
AITKIN	48-26-35	W	SE-SE	HANNA		305	USBM
AITKIN	48-26-35	W	SE-SE	HANNA		308	USBM
AITKIN	48-26-35	W	SE-SE	HANNA		55	USBM
AITKIN	48-26-35	W	SE-SE	HANNA		55-A	USBM
AITKIN	48-26-35	W	SE-SE	HANNA		61	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		106	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		111	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		113	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		115	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		118	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		121	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		127	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		128	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		131	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		133	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		155	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		166	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		173	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		179	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		183	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		187	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		193	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		201	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		204	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		207	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		211	USBM
AITKIN	48-26-36	W	SW-NE	HANNA		S213	USBM
AITKIN	48-26-36	W	SE-NE	HANNA		142	USBM
AITKIN	48-26-36	W	SE-NE	HANNA		149	USBM
AITKIN	48-26-36	W	SE-NE	HANNA		150	USBM
AITKIN	48-26-36	W	SE-NE	HANNA		151	USBM
AITKIN	48-26-36	W	SE-NE	HANNA		154	USBM
AITKIN	48-26-36	W	SE-NE	HANNA		154-A	USBM
AITKIN	48-26-36	W	SE-NE	HANNA		S146	USBM
AITKIN	48-26-36	W	SE-NW	HANNA		S81	USBM
AITKIN	48-26-36	W	SE-NW	HANNA		S84	USBM
AITKIN	48-26-36	W	SE-NW	HANNA		S85	USBM
AITKIN	48-26-36	W	SE-NW	HANNA		S86	USBM
AITKIN	48-26-36	W	SE-NW	HANNA		S89	USBM
AITKIN	48-26-36	W	NW-SW	HANNA		102	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
AITKIN	48-26-36	W	NW-SW	HANNA		62	USBM
AITKIN	48-26-36	W	NW-SW	HANNA		66	USBM
AITKIN	48-26-36	W	NW-SW	HANNA		71	USBM
AITKIN	48-26-36	W	NW-SW	HANNA		75	USBM
AITKIN	48-26-36	W	NW-SW	HANNA		78	USBM
AITKIN	48-27-23	W	NE-NE	USBM		6	USBM
AITKIN	48-27-23	W	NE-NE	USBM		7	USBM
AITKIN	48-27-23	W	SE-NW	USBM		5	USBM
AITKIN	48-27-23	W	NE-SW	USBM		1	USBM
AITKIN	48-27-23	W	NE-SW	USBM		2	USBM
AITKIN	48-27-23	W	NE-SW	USBM		3	USBM
AITKIN	48-27-23	W	NE-SW	USBM		4	USBM
AITKIN	48-27-23	W	NW-SE	CROSBY		10	USBM
AITKIN	48-27-23	W	NW-SE	OLSON & BERG		2	USBM
AITKIN	48-27-23	W	NW-SE	ZENO IRON		7	USBM
AITKIN	48-27-23	W	NW-SE	ZENO IRON		8	USBM
AITKIN	48-27-23	W	NW-SE	ZENO IRON		9	USBM
AITKIN	49-23-26	W	SE-NE	MGS		2021	MGS
AITKIN	49-26- 3	W	NW-SE	GREAT NORTHERN		24	USBM
AITKIN	49-26-21	W	NW-SE	GREAT NORTHERN		28	USBM
AITKIN	50-25- 6	W	NW-SE	GREAT NORTHERN		1	USBM
AITKIN	50-25- 7	W	NW-SE	GREAT NORTHERN		5	USBM
AITKIN	50-25- 8	W	NW-SE	GREAT NORTHERN		1	USBM
AITKIN	50-25- 8	W	NW-SE	GREAT NORTHERN		2	USBM
AITKIN	50-25-20	W	NW-SE	GREAT NORTHERN		11	USBM
AITKIN	50-26-15	W	NW-SE	GREAT NORTHERN		22	USBM
AITKIN	50-26-35	W	NW-SE	GREAT NORTHERN		16	USBM
AITKIN	50-27-23	W	NW-SE	GREAT NORTHERN		19	USBM
AITKIN	50-27-33	W	NW-SE	USBM		LP-1	USBM
AITKIN	50-27-33	W	NW-SE	USBM		LP-2	USBM
AITKIN	51-23-11	W	NW-SE	GREAT NORTHERN		12	USBM
AITKIN	51-23-23	W	NW-SE	GREAT NORTHERN		14	USBM
AITKIN	51-24- 2	W	NW-SE	GREAT NORTHERN		3	USBM
AITKIN	51-24- 2	W	NW-SE	GREAT NORTHERN		3A	USBM
AITKIN	51-24-11	W	NW-SE	GREAT NORTHERN		15	USBM
AITKIN	51-24-15	W	NW-SE	GREAT NORTHERN		6	USBM
AITKIN	51-24-23	W	NW-SE	GREAT NORTHERN		4	USBM
AITKIN	51-24-35	W	NW-SE	GREAT NORTHERN		8	USBM
AITKIN	51-26-35	W	NW-SE	GREAT NORTHERN		7	USBM
AITKIN	52-22-10	W	NW-SE	GREAT NORTHERN		23	USBM
AITKIN	52-23-13	W	NW-SE	GREAT NORTHERN		21	USBM
AITKIN	52-23-25	W	NW-SE	GREAT NORTHERN		13	USBM
ANOKA	30-24-22	W	NW-SE	MN HWY DEPT		T-1	USBM
ANOKA	31-22-24	W	NW-SE	MN HWY DEPT		T-2	USBM
ANOKA	32-22-36	W	NW-SE	MN HWY DEPT		T-1	USBM
ANOKA	32-22-36	W	NW-SE	MN HWY DEPT		T-2	USBM
BECKER	138-37- 6	W	NE-NW			1-4	OTHER
BECKER	138-37- 6	W	NE-NW			1-5	OTHER
BECKER	138-37- 6	W	NW-NW	HANNA		1-6	OTHER
BECKER	138-37- 6	W	NW-NW			1-1	OTHER
BECKER	138-37- 6	W	NE-SW			1-3	OTHER
BECKER	138-37-36	W	NE-SW	HANNA		4-1	OTHER
BECKER	138-37-36	W	NE-SW	UNK		4-2	OTHER
BECKER	139-37- 6	W	SE-SE	HANNA		1-2	OTHER
BECKER	139-37-36	W	SE-NW			6-1	OTHER
BECKER	139-37-36	W	SE-NW	UNK		6-2	OTHER
BECKER	139-37-36	W	SE-NW	UNK		6-3	OTHER
BECKER	139-38-36	W	SE-SE	UNK		1-2	OTHER
BELTRAMI	148-32-20	W	NW-SE	USBM		TR-1	USBM
BELTRAMI	150-31- 5	W	NW-NE	LEHMANN	CN-8244	SDE-1	DNR
BELTRAMI	150-31-10	W	SE-NE	EXXON	CN-7844	RL31	DNR
BELTRAMI	150-31-14	W	SW-SW	LEHMANN		TIT-3	DNR
BELTRAMI	150-31-14	W	SW-SW	LEHMANN		TIT-4	DNR
BELTRAMI	150-31-14	W	NE-SE	LEHMANN	CN-8046-N	VAN-2	DNR
BELTRAMI	150-31-14	W	NE-SE	LEHMANN	CN-8046-N	VAN-4	DNR
BELTRAMI	150-31-14	W	NW-SE	LEHMANN		VAN-1	DNR
BELTRAMI	150-31-14	W	SE-SE	LEHMANN	CN-8046-N	VAN-3	DNR
BELTRAMI	150-31-15	W	NE-NE	LEHMANN	CN-8247	PLO-1	DNR
BELTRAMI	150-31-15	W	NE-NE	LEHMANN	CN-8247	PLO-2	DNR

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
BELTRAMI	150-31-15	W	NW-SE	LEHMANN	CN-8046-N	IAP-1	DNR
BELTRAMI	150-31-15	W	SE-SE	LEHMANN		TIT-1	DNR
BELTRAMI	150-31-15	W	SE-SE	LEHMANN		TIT-2	DNR
BELTRAMI	150-31-23	W	NE-NW	LEHMANN		JAN-1	DNR
BELTRAMI	150-31-29	W	NW-NW			BID-3	DNR
BELTRAMI	150-31-29	W	SW-NW			RL-28-1	DNR
BELTRAMI	150-32-13	W	SE-NE			BID-2	DNR
BELTRAMI	151-30- 2	W	NW-SE	HENRY BOLTON		1	USBM
BELTRAMI	151-30- 3	W	NW-SE	HENRY BOLTON		2	USBM
BELTRAMI	151-30- 7	W	NE-NW			RL 42-1	DNR
BELTRAMI	151-30- 8	W	NW-NE			RL 43-1	DNR
BELTRAMI	151-31-10	W	NW-SE	LEHMANN		HAD-1	DNR
BELTRAMI	151-31-10	W	NW-SE	LEHMANN		HAD-2	DNR
BELTRAMI	151-31-10	W	NW-SE	LEHMANN		HAD-3	DNR
BELTRAMI	151-31-12	W	NE-SW	LEHMANN		COR-1	DNR
BELTRAMI	151-32-33	W	SW-SE	RIDGE	CN-7015	BID-1	DNR
BELTRAMI	151-32-36	W	NW-NW			RL-25	DNR
BELTRAMI	151-35-28	W	NW-SE	INDIAN AFFAIRS		1	USBM
BELTRAMI	152-30-21	W	SE-NW	LEHMANN	CN-8243	CON-1	DNR
BELTRAMI	152-30-30	W	NE-NE			RL-39	DNR
BELTRAMI	155-38- 1	W	NE-SE	RIDGE		FT-8	DNR
BELTRAMI	155-38- 1	W	NW-SE	RIDGE		FT-20	DNR
BELTRAMI	156-37-31	W	SW-NE	RIDGE		FT-9	DNR
BELTRAMI	157-36-24	W	NW-NE	RIDGE	CN-7881	FT-17	DNR
BELTRAMI	157-36-24	W	NW-NW	RIDGE	CN-7881	FT-15	DNR
BELTRAMI	157-36-24	W	NW-NW	RIDGE	CN-7881	FT-16	DNR
BELTRAMI	157-36-31	W	NW-SW	RIDGE	CN-7882	FT-6	DNR
BELTRAMI	157-36-36	W	SE-NE	RIDGE	CN-7883	FT-18	DNR
BELTRAMI	158-36- 7	W	NE-NE			FT-10	DNR
BELTRAMI	158-36- 7	W	SW-NE	RIDGE	CN-7884	FT-23	DNR
BELTRAMI	158-36- 7	W	SE-NE	RIDGE	CN-7884	FT-22	DNR
BELTRAMI	158-36- 7	W	SE-NE			FT-21	DNR
BELTRAMI	158-36- 7	W	NE-SE	RIDGE	CN-7884	FT-13	DNR
BELTRAMI	158-36- 7	W	NE-SE	RIDGE	CN-7884	FT-7	DNR
BELTRAMI	158-36- 7	W	NE-SE			FT-12	DNR
BELTRAMI	158-36-13	W	NW-SE			FT-14	DNR
BELTRAMI	158-36-23	W	SE-SW			FT-3	DNR
BELTRAMI	158-36-23	W	SW-SE			FT-2	DNR
BELTRAMI	158-36-23	W	SE-SE			FT-1	DNR
BELTRAMI	158-36-24	W	NW-SW			T25A-1	DNR
BELTRAMI	158-36-25	W	NE-NW			T25B-2	DNR
BELTRAMI	158-36-25	W	SE-NW	EXXON	CN-7867	T25B-1	DNR
BELTRAMI	158-36-26	W	SE-NW			FT-4	DNR
BELTRAMI	158-37-19	W	SE-SW	EXXON	CN-7870	T20-1	DNR
BELTRAMI	158-38-24	W	SE-SE	RIDGE	CN-7894	FT-19	DNR
BENTON	36-31-11	W	NW-SE	MN HWY DEPT		T-1	USBM
BENTON	36-31-11	W	NW-SE	MN HWY DEPT		T-2	USBM
BENTON	36-31-25	W	NW-SE	MN HWY DEPT		T-5	USBM
BENTON	37-28-26	W	NW-SW	URANGESELL/ST. JOE		LS-10	DNR
BENTON	37-28-34	W	NW-NW	URANGESELL/ST. JOE		LS-11	DNR
BENTON	38-28-23	W	NW-SE	MN HWY DEPT		T-1	USBM
BENTON	38-28-24	W	NW-SE	MN HWY DEPT		T-2	USBM
BIG STONE	121-44-36	W	SE-SE	U.S. STEEL		27007	DNR
BLUE EARTH	108-26- 5	W	NW-SE	MN HWY DEPT		T-1A	USBM
BLUE EARTH	108-26- 5	W	NW-SE	MN HWY DEPT		T-7	USBM
BLUE EARTH	108-27- 1	W	NW-SE	MN HWY DEPT		T-1	USBM
BLUE EARTH	108-27- 1	W	NW-SE	MN HWY DEPT		T-100	USBM
BLUE EARTH	108-27- 1	W	NW-SE	MN HWY DEPT		T-4	USBM
BLUE EARTH	108-27- 1	W	NW-SE	MN HWY DEPT		TR-1	USBM
BLUE EARTH	108-27- 1	W	NW-SE	MN HWY DEPT		TR-2	USBM
BLUE EARTH	108-27- 1	W	NW-SE	MN HWY DEPT		TR-3	USBM
BLUE EARTH	108-27- 1	W	NW-SE	MN HWY DEPT		TR-4	USBM
BLUE EARTH	108-27-13	W	NW-SE	MN HWY DEPT		T-16	USBM
BLUE EARTH	108-27-14	W	NW-SE	MN HWY DEPT		T-1	USBM
BLUE EARTH	108-27-14	W	NW-SE	MN HWY DEPT		T-2	USBM
BLUE EARTH	108-27-14	W	NW-SE	MN HWY DEPT		T-3	USBM
BLUE EARTH	108-27-14	W	NW-SE	MN HWY DEPT		T-4	USBM
BLUE EARTH	108-27-34	W	NW-SE	MN HWY DEPT		T-1	USBM
BLUE EARTH	108-27-34	W	NW-SE	MN HWY DEPT		T-2	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
BROWN	109-31-18	W	SE-SE	MARATHON		SQ-1	DNR
BROWN	109-33-35	W	NW-NW	MARATHON		SQ-2	DNR
BROWN	110-30-20	W	NW-SE	MN HWY DEPT		T-21	USBM
BROWN	110-30-20	W	NW-SE	MN HWY DEPT		T-22	USBM
CARLTON	46-18-3	W	NW-NW	URANGESSELLSCHAFT		LS-13	DNR
CARLTON	46-18-3	W	SW-SW	URANGESSELLSCHAFT		LS-12	DNR
CARLTON	46-19-7	W	NW-NW	MARTIN-TROST		MM-1	DNR
CARLTON	46-19-7	W	NW-SW	MARTIN-TROST		JA-1	DNR
CARLTON	46-19-17	W	NW-NE	MARTIN-TROST		AG-1	DNR
CARLTON	46-19-17	W	NW-NE	MARTIN-TROST		AG-2	DNR
CARLTON	46-19-17	W	NW-NE	MARTIN-TROST		AG-3	DNR
CARLTON	46-19-19	W	SE-NE	MARTIN-TROST		LO-1	DNR
CARLTON	46-19-19	W	SE-NW	MARTIN-TROST		PS-1	DNR
CARLTON	46-19-19	W	NE-SW	ENERGY RESERVES GR.		KR-6	DNR
CARLTON	46-19-19	W	NE-SE	MARTIN-TROST		AW-1	DNR
CARLTON	46-19-19	W	NE-SE			AW-2	DNR
CARLTON	46-19-19	W	SW-SE			PS-2	DNR
CARLTON	46-19-19	W	SW-SE	MARTIN-TROST		PS-3	DNR
CARLTON	46-19-23	W	SW-NE	ROCKY MT. ENERGY		ML-46C	DNR
CARLTON	46-20-3	W	SW-SW	MARTIN-TROST		CL-1	DNR
CARLTON	46-20-7	W	NW-SE	USBM		1	USBM
CARLTON	46-20-7	W	NW-SE	USBM		2	USBM
CARLTON	46-20-7	W	NW-SE	USBM		3	USBM
CARLTON	46-20-7	W	NW-SE	USBM		4	USBM
CARLTON	46-20-7	W	NW-SE	USBM		5	USBM
CARLTON	46-20-7	W	SW-SE			MG-5	DNR
CARLTON	46-20-8	W	SW-SW			MG-7	DNR
CARLTON	46-20-13	W	SE-SE	ENERGY RESERVES GR.		KR-5	DNR
CARLTON	46-20-17	W	NW-NW	ANACONDA		MG-6	DNR
CARLTON	46-20-21	W	NW-NW	MARTIN-TROST		WL-1	DNR
CARLTON	46-20-24	W	SW-SE	ENERGY RESERVES GR.		KRCH-2	DNR
CARLTON	46-20-25	W	SE-SW	ENERGY RESERVES GR.		KR-4	DNR
CARLTON	46-20-28	W	NE-NW			ML-48	DNR
CARLTON	46-20-33	W	NE-NE	ENERGY RESERVES GR.		KRCH-10	DNR
CARLTON	46-20-33	W	NE-NE	ENERGY RESERVES GR.		KRCH-11	DNR
CARLTON	46-20-33	W	NW-NE	ENERGY RESERVES GR.		KRCH-9	DNR
CARLTON	46-21-4	W	SW-NE	ENERGY RESERVES GR.		KRCH-7	DNR
CARLTON	46-21-4	W	SW-SE	ENERGY RESERVES GR.		KRCH-6	DNR
CARLTON	46-21-6	W	NE-NW	MARTIN-TROST		SL-1	DNR
CARLTON	46-21-9	W	NE-SE	ENERGY RESERVES GR. N.S		KR-3	DNR
CARLTON	46-21-22	W	SW-SW	ANACONDA		MG-2	DNR
CARLTON	46-21-22	W	SW-SW	ANACONDA		MG-4	DNR
CARLTON	46-21-22	W	SE-SW	ANACONDA		MG-1	DNR
CARLTON	46-21-28	W	NE-NW	ANACONDA		MG-3	DNR
CARLTON	47-17-28	W	NW-NW	MARTIN-TROST		WW-1	DNR
CARLTON	47-18-4	W	NW-NW	ROCKY MT. ENERGY		MLCH-11	DNR
CARLTON	47-18-4	W	SW-NW	ROCKY MT. ENERGY		MLCH-9	DNR
CARLTON	47-18-10	W	SE-SW	ROCKY MT. ENERGY		MLCH-14	DNR
CARLTON	47-18-11	W	NW-SE	MN HWY DEPT		T-2	USBM
CARLTON	47-18-11	W	NW-SE	MN HWY DEPT		T-2A	USBM
CARLTON	47-18-13	W	NE-SE	ROCKY MT. ENERGY		ML-47	DNR
CARLTON	47-18-15	W	SE-SE	MARTIN-TROST		GM-1	DNR
CARLTON	47-18-17	W	NE-NW	ROCKY MT. ENERGY		ML-24	DNR
CARLTON	47-18-17	W	SE-NW	ROCKY MT. ENERGY		ML-25	DNR
CARLTON	47-18-32	W	SE-NW	ENERGY RESERVES GR.		KR-1	DNR
CARLTON	47-19-7	W	NW-SW	MGS		2035	MGS
CARLTON	47-19-21	W	SE-NE	ROCKY MT. ENERGY		ML-6	DNR
CARLTON	47-19-21	W	SE-NE	ROCKY MT. ENERGY		ML-7	DNR
CARLTON	47-19-22	W	SE-NW	ROCKY MT. ENERGY		ML-9	DNR
CARLTON	47-19-27	W	NW-NW	ROCKY MT. ENERGY		ML-8	DNR
CARLTON	47-19-28	W	SE-NE	ROCKY MT. ENERGY		MLCH-5	DNR
CARLTON	47-19-28	W	SE-NE	ROCKY MT. ENERGY		MLCH-7	DNR
CARLTON	47-21-15	W	SE-NE	MGS		2025	MGS
CARLTON	48-16-5	W	NW-SE	MN HWY DEPT		T-5	USBM
CARLTON	48-16-5	W	NW-SE	MN HWY DEPT		T-6	USBM
CARLTON	48-17-32	W	NE-NE	ENERGY RESERVES GR.		KRCH-5	DNR
CARLTON	48-17-32	W	SE-SE	ENERGY RESERVES GR.		KRCH-4	DNR
CARLTON	48-18-32	W	SE-NE	ROCKY MT. ENERGY		ML-18	DNR
CARLTON	48-18-32	W	NE-NW	ROCKY MT. ENERGY		MLCH-1	DNR

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CARLTON	48-18-32	W	SE-NW	ROCKY MT. ENERGY		ML-1	DNR
CARLTON	48-18-32	W	SE-NW	ROCKY MT. ENERGY		ML-4	DNR
CARLTON	48-18-32	W	SE-NW			MLCH-3	DNR
CARLTON	48-18-32	W	SE-NW	ROCKY MT. ENERGY		ML-16	DNR
CARLTON	48-18-32	W	SE-NW	ROCKY MT. ENERGY		ML-17	DNR
CARLTON	48-18-32	W	SE-NW	ROCKY MT. ENERGY		ML-10	DNR
CARLTON	48-18-32	W	SE-NW	ROCKY MT. ENERGY		ML-12	DNR
CARLTON	48-18-32	W	SE-NW	ROCKY MT. ENERGY		ML-13	DNR
CARLTON	48-18-32	W	SE-NW	ROCKY MT. ENERGY		MLCH-3	DNR
CARLTON	48-18-32	W	SE-NW	ROCKY MT. ENERGY		MLCH-2	DNR
CARLTON	48-18-32	W	NE-SW	ROCKY MT. ENERGY		ML-3	DNR
CARLTON	48-18-32	W	NE-SW	ROCKY MT. ENERGY		ML-2	DNR
CARLTON	48-18-32	W	SE-SE	ROCKY MT. ENERGY		MLCH-12	DNR
CARLTON	48-18-33	W	SW-NW	ROCKY MT. ENERGY		ML-14	DNR
CARLTON	48-18-33	W	SW-NW	ROCKY MT. ENERGY		ML-15	DNR
CARLTON	48-18-33	W	SW-NW	ROCKY MT. ENERGY		ML-5	DNR
CARLTON	48-18-33	W	SW-NW	ROCKY MT. ENERGY		MLCH-4	DNR
CARLTON	48-18-33	W	NE-SW	ROCKY MT. ENERGY		ML-11	DNR
CARLTON	48-19-18	W	NE-SE	MGS		2026	MGS
CARLTON	48-20-20	W	NW-NW	MGS		2027	MGS
CARLTON	48-21-29	W	NE-NW	MGS		2024	MGS
CARLTON	49-16-19	W	NW-SE	MN HWY DEPT		SB-1	USBM
CARLTON	49-16-19	W	NW-SE	MN HWY DEPT		SB-2	USBM
CARLTON	49-16-19	W	NW-SE	MN HWY DEPT		SB-3	USBM
CARLTON	49-16-25	W	NW-SE	MN HWY DEPT		T-1	USBM
CARLTON	49-16-25	W	NW-SE	MN HWY DEPT		T-1A	USBM
CARLTON	49-16-25	W	NW-SE	MN HWY DEPT		T-2A	USBM
CARLTON	49-16-30	W	NW-SE	MN HWY DEPT		T-1A	USBM
CARLTON	49-16-30	W	NW-SE	MN HWY DEPT		T-3	USBM
CARLTON	49-17-25	W	NW-SE	MN HWY DEPT		T-1	USBM
CARLTON	49-17-25	W	NW-SE	MN HWY DEPT		T-2	USBM
CARLTON	49-17-25	W	NW-SE	MN HWY DEPT		T-3	USBM
CARLTON	49-17-25	W	NW-SE	MN HWY DEPT		T-4	USBM
CARLTON	49-17-25	W	NW-SE	MN HWY DEPT		T-4	USBM
CARLTON	49-17-25	W	NW-SE	MN HWY DEPT		T-4	USBM
CARVER	115-23- 1	W	NW-SE	MN HWY DEPT		T-29	USBM
CARVER	115-23- 1	W	NW-SE	MN HWY DEPT		T-31	USBM
CARVER	115-23- 3	W	NW-SE	MN HWY DEPT		T-3	USBM
CARVER	116-23-36	W	NW-SE	MN HWY DEPT		T-1	USBM
CASS	134-29-16	W	SW-NE	MGS		2043	MGS
CASS	134-30-11	W	SW-NE	MGS		1995	MGS
CASS	134-31-36	W	NW-NW	MGS		1996	MGS
CASS	135-30-10	W	NW-NW	MGS		1914	MGS
CASS	137-30-14	W	NW-SE	USBM		PR-1	USBM
CASS	137-30-14	W	NW-SE	USBM		PR-2	USBM
CASS	137-30-14	W	NW-SE	USBM		PR-3	USBM
CASS	137-30-22	W	NE-NE	MGS		1917	MGS
CASS	137-30-34	W	SE-SE	MGS		1915	MGS
CASS	139-26-27	W	NW-SE	USBM		28	USBM
CASS	139-26-27	W	NW-SE	USBM		32	USBM
CASS	139-26-33	W	NW-SE	USBM		26	USBM
CASS	139-26-33	W	NW-SE	USBM		27	USBM
CASS	139-26-34	W	NW-SE	USBM		29	USBM
CASS	139-27-20	W	NW-NW	MGS		1883	MGS
CASS	139-28- 2	W	NW-NE	MGS		1876	MGS
CASS	139-28-24	W	NE-SE	MGS		1884	MGS
CASS	139-28-26	W	NE-NE	MGS		1902	MGS
CASS	139-29- 1	W	NE-NW	MGS		1877	MGS
CASS	140-25-10	W	NW-SE	USBM		TL-1	USBM
CASS	140-25-10	W	NW-SE	USBM		TL-2	USBM
CASS	140-25-10	W	NW-SE	USBM		TL-3	USBM
CASS	140-25-23	W	NW-SE	USBM		TL-5	USBM
CASS	140-26-26	W	NW-SE	USBM		TL-4	USBM
CASS	140-27-14	W	NE-NE	MGS		1875	MGS
CASS	141-28-36	W	SE-SE	MGS		1874	MGS
CLAY	139-47- 5	W	NW-NE	USGS		56-15	USBM
CLAY	139-47- 5	W	NE-NW	USGS		56-12	USBM
CLAY	139-47- 5	W	NE-NW	USGS		56-13	USBM
CLAY	139-47- 5	W	NE-NW	USGS		56-2	USBM
CLAY	139-47- 5	W	NW-NW	USGS		56-14	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CLAY	139-47-17	W	SW-SW	USGS		56-4	USBM
CLAY	139-47-17	W	SW-SW	USGS		56-5	USBM
CLAY	139-47-17	W	SW-SE	USGS		56-1	USBM
CLAY	139-47-17	W	SW-SE	USGS		56-2	USBM
CLAY	139-47-17	W	SW-SE	USGS		56-6	USBM
CLAY	139-47-20	W	NE-NW	USGS		56-7	USBM
CLAY	139-47-20	W	SW-SE	USGS		56-8	USBM
CLAY	140-44-21	W	NE-NW	NDGS		RRVD-25A	NDGS
CLAY	140-47-32	W	NE-NW	USGS		56-17	USBM
CLAY	140-47-32	W	NE-NW	USGS		56-18	USBM
CLAY	140-47-32	W	NW-NW	USGS		56-16	USBM
CLAY	140-47-32	W	NW-NW	USGS		56-19	USBM
CLAY	142-44-29	W	SW-NE	EXXON		SL-1	DNR
COOK	63- 3-22	W	SE-NE	NJ ZINC		CC-1&2	USBM
COOK	63- 3-22	W	SE-NE	NJ ZINC		CC-3	USBM
COOK	63- 3-22	W	NE-SE	NEW JERSEY ZINC		G-1	OTHER
COOK	63- 3-23	W	NE-NE	NJ ZINC		G-5	USBM
COOK	63- 3-23	W	SE-NW	NJ ZINC		G-4	USBM
COOK	63- 3-23	W	NW-SW	NEW JERSEY ZINC		G-2	OTHER
COOK	63- 3-23	W	NW-SW	NJ ZINC		G-3	USBM
COOK	63- 3-23	W	NW-SW	NJ ZINC		G-6	USBM
COOK	63- 3-23	W	NE-SE	NJ ZINC		G-7	USBM
COOK	63- 4- 2	W	NW-SE			8	DNR
COOK	63- 4- 2	W	NW-SE			9	DNR
COOK	63- 4-32	W	NW-SE	IRRR		10	USBM
COOK	63- 4-32	W	NW-SE	IRRR		9	USBM
COOK	64- 2- 1	W	NW-SE	BEAR CREEK		R2-W	USBM
COOK	64- 3-17	E	NW-SE	MOORE		WS-1	OTHER
COOK	64- 3-17	E	NW-SE	MOORE		WS-2	OTHER
COOK	64- 3-17	E	NW-SE	MOORE		WS-3	OTHER
COOK	64- 3- 1	W	NE-NE			12	OTHER
COOK	64- 3- 1	W	NE-NE			13	OTHER
COOK	64- 3- 1	W	NE-NE			14	OTHER
COOK	64- 3- 1	W	NE-NE			15	OTHER
COOK	64- 3- 1	W	NW-SE	IRRR		1	USBM
COOK	64- 3- 1	W	NW-SE	IRRR		2	USBM
COOK	64- 3- 1	W	NW-SE	IRRR		3A	USBM
COOK	64- 3- 1	W	NW-SE	IRRR		7	USBM
COOK	64- 3- 1	W	NW-SE	IRRR		8	USBM
COOK	64- 3- 1	W	NW-SE	BEAR CREEK		LI-3W	USBM
COOK	64- 3- 1	W	NW-SE	BEAR CREEK		LI-5W	USBM
COOK	64- 3- 2	W	NW-SE	IRRR		4	USBM
COOK	64- 3- 2	W	NW-SE	IRRR		5	USBM
COOK	64- 3- 2	W	NW-SE	IRRR		6	USBM
COOK	64- 3- 2	W	NW-SE	BEAR CREEK		LI-1	USBM
COOK	64- 3- 2	W	NW-SE	BEAR CREEK		LI-2	USBM
COOK	65- 2-34	W	NW-SE	BEAR CREEK		ML-1	USBM
COOK	65- 3-25	W	NW-SE	BEAR CREEK		ELL-1	USBM
COOK	65- 3-31	W	NW-SE	BEAR CREEK		HC-1	USBM
COOK	65- 3-32	W	NW-SE	BEAR CREEK		LL-3W	USBM
COOK	65- 3-32	W	NW-SE	BEAR CREEK		LL-5W	USBM
COOK	65- 3-33	W	NW-SE	U. S. STEEL		10	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		11	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		12	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		12A	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		13	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		14	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		15	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		16	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		17	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		18	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		19	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		20	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		21	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		21	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		22	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		23	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		24	DNR
COOK	65- 3-33	W	NW-SE	U. S. STEEL		25	DNR

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
COOK	65- 3-33	W	NW-SE	U.S.STEEL		26	DNR
COOK	65- 3-33	W	NW-SE	U.S.STEEL		27	DNR
COOK	65- 3-33	W	NW-SE	U.S.STEEL		28	DNR
COOK	65- 3-33	W	NW-SE	U.S.STEEL		29	DNR
COOK	65- 3-33	W	NW-SE	U.S.STEEL		30	DNR
COOK	65- 3-33	W	NW-SE	U.S.STEEL		31	DNR
COOK	65- 3-33	W	NW-SE	U.S.STEEL		32	DNR
COOK	65- 3-33	W	NW-SE	BEAR CREEK		LL-4W	USBM
COOK	65- 3-33	W	NW-SE	BEAR CREEK		LL-6W	USBM
COOK	65- 3-34	W	NW-SE	U.S.STEEL		1	DNR
COOK	65- 3-34	W	NW-SE	U.S.STEEL		2	DNR
COOK	65- 3-34	W	NW-SE	U.S.STEEL		3	DNR
COOK	65- 3-34	W	NW-SE	U.S.STEEL		4	DNR
COOK	65- 3-34	W	NW-SE	U.S.STEEL		5	DNR
COOK	65- 3-34	W	NW-SE	U.S.STEEL		6	DNR
COOK	65- 3-34	W	NW-SE	U.S.STEEL		7	DNR
COOK	65- 3-34	W	NW-SE	U.S.STEEL		8	DNR
COOK	65- 3-34	W	NW-SE	U.S.STEEL		9	DNR
COOK	65- 3-34	W	NW-SE	BEAR CREEK		LL-1	USBM
COOK	65- 3-34	W	NW-SE	BEAR CREEK		LL-2	USBM
COOK	65- 3-36	W	SW-SW	CLIFFS-MOORE	CN-7205	GF-8	DNR
COOK	65- 3-36	W	NW-SE	BEAR CREEK		LI-4W	USBM
COOK	65- 4-27	W	NW-SE	BEAR CREEK		PM-1	USBM
COOK	65- 4-28	W	NW-SE	N AMERICAN IRON		1	USBM
COOK	65- 4-28	W	NW-SE	N AMERICAN IRON		11	USBM
COOK	65- 4-28	W	NW-SE	N AMERICAN IRON		12	USBM
COOK	65- 4-28	W	NW-SE	N AMERICAN IRON		13	USBM
COOK	65- 4-28	W	NW-SE	N AMERICAN IRON		14	USBM
COOK	65- 4-28	W	NW-SE	N AMERICAN IRON		15	USBM
COOK	65- 4-28	W	NW-SE	N AMERICAN IRON		16	USBM
COOK	65- 4-28	W	NW-SE	N AMERICAN IRON		17	USBM
COOK	65- 4-28	W	NW-SE	N AMERICAN IRON		2	USBM
COOK	65- 4-28	W	NW-SE	N AMERICAN IRON		3	USBM
COOK	65- 4-28	W	NW-SE	N AMERICAN IRON		5	USBM
COOK	65- 4-29	W	NW-SE	N AMERICAN IRON		21	USBM
COOK	65- 4-29	W	NW-SE	N AMERICAN IRON		23	USBM
COOK	65- 4-29	W	NW-SE	N AMERICAN IRON		25	USBM
COOK	65- 4-30	W	NW-SE	N AMERICAN IRON		37	USBM
COOK	65- 4-35	W	NW-SE	BEAR CREEK		CR-1	USBM
COTTONWOOD	105-37- 6	W	SW-SW	MARATHON		SO-11	DNR
COTTONWOOD	105-37-29	W	SE-SW	MARATHON		SO-12	DNR
COTTONWOOD	107-34- 5	W	NE-NE	MARATHON		SO-3A	DNR
COTTONWOOD	107-34- 7	W	SW-NE	MARATHON		SO-6	DNR
COTTONWOOD	107-34- 7	W	SW-NE	MARATHON		SO-6A	DNR
COTTONWOOD	107-35- 6	W	SE-NW	MARATHON		SO-3	DNR
CROW WING	45-30-11	W	NW-SE	CROSBY		682	USBM
CROW WING	45-30-11	W	NW-SE	CROSBY		686	USBM
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		101	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		102	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		103	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		104	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		105	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		106	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		107	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		108	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		109	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		110	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		3073	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		3192	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		3193	OTHER
CROW WING	45-30-32	W	NW-SE	U.S.STEEL		3253	OTHER
CROW WING	46-28- 6	W	NW-NE	CROSBY		1	USBM
CROW WING	46-28- 6	W	NW-NE	CROSBY		1-A	USBM
CROW WING	46-28- 6	W	NW-SE	CROSBY		11	USBM
CROW WING	46-28- 6	W	NW-SE	CROSBY		13	USBM
CROW WING	46-28- 6	W	NW-SE	CROSBY		138	USBM
CROW WING	46-28- 6	W	NW-SE	CROSBY		14	USBM
CROW WING	46-28- 6	W	NW-SE	CROSBY		15	USBM
CROW WING	46-28- 6	W	NW-SE	CROSBY		16	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	46-28- 6	W	NW-SE	CROSBY		17	USBM
CROW WING	46-28- 6	W	NW-SE	CROSBY		4	USBM
CROW WING	46-28- 6	W	NW-SE	CROSBY		5	USBM
CROW WING	46-28- 6	W	NW-SE	CROSBY		6	USBM
CROW WING	46-28- 6	W	NW-SE	CROSBY		7	USBM
CROW WING	46-28- 6	W	NW-SE	CROSBY		8	USBM
CROW WING	46-29- 1	W	NW-SE	MN HWY DEPT		T2	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		107	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		108	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		109	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		110	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		111	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		112	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		113	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		114	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		115	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		116	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		117	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		118	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		119	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		120	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		640	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		641	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		642	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		643	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		644	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		645	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		646	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		647	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		648	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		649	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		650	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		651	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		652	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		654	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		655	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		656	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		657	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		658	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		1	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		10	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		11	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		12	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		13	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		14	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		15	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		16	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		16-C	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		17	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		18	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		19	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		2	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		2-E	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		20	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		21	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		22	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		23	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		24	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		25	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		26	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		27	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		28	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		29	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		3	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		3-E	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		30	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD	N. S	31	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		32	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		33	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		34	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		35	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD	N.S	36	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		37	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD	N.S	38	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		39	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		4	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		4-E	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		40	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		41	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		42	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		43	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		44	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		45	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		46	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		47	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		48	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		49	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		5	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		5-E	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		50	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		51	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		52	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		53	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		54	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		55	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		56	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		57	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		58	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		59	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		6	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		6-E	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		60	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		7	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		7-E	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		70	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		71	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		72	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		73	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		8	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		80	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		81	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		82	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		84	USBM
CROW WING	46-29- 2	W	NW-SE	COLE & MCDONALD		9	USBM
CROW WING	46-29- 2	W	NW-SE	CROSBY		653	USBM
CROW WING	46-29- 2	W	NW-SE	COLE-MCDONALD		1-E	USBM
CROW WING	46-29- 2	W	SE-SE	CROSBY		121	USBM
CROW WING	46-29- 2	W	SE-SE	CROSBY		302	USBM
CROW WING	46-29- 3	W	NW-SE	CROSBY		730	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		1	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		10	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		11	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		12	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		13	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		14	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		2	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		3	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		4	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		6	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		7	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		8	USBM
CROW WING	46-29- 5	W	NW-SE	CROSBY		9	USBM
CROW WING	46-29- 6	W	NW-SE	CROSBY		423	USBM
CROW WING	46-29- 6	W	NW-SE	CROSBY		437	USBM
CROW WING	46-29- 6	W	NW-SE	CROSBY		440	USBM
CROW WING	46-29- 6	W	NW-SE	CROSBY		442	USBM
CROW WING	46-29- 6	W	NW-SE	CROSBY		443	USBM
CROW WING	46-29- 6	W	NW-SE	CROSBY		447	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	46-29- 6	W	NW-SE	CROSBY		452	USBM
CROW WING	46-29- 6	W	NW-SE	CROSBY		453	USBM
CROW WING	46-29- 6	W	NW-SE	CROSBY		461	USBM
CROW WING	46-29- 6	W	NW-SE	CROSBY		464	USBM
CROW WING	46-29- 7	W	NW-SE	CROSBY		401	USBM
CROW WING	46-29- 7	W	NW-SE	CROSBY		402	USBM
CROW WING	46-29- 7	W	NW-SE	CROSBY		403	USBM
CROW WING	46-29- 7	W	NW-SE	CROSBY		404	USBM
CROW WING	46-29- 7	W	NW-SE	CROSBY		405	USBM
CROW WING	46-29- 7	W	NW-SE	CROSBY		406	USBM
CROW WING	46-29- 7	W	NW-SE	CROSBY		407	USBM
CROW WING	46-29- 7	W	NW-SE	CROSBY		408	USBM
CROW WING	46-29- 9	W	NW-SE	CROSBY		304	USBM
CROW WING	46-29- 9	W	NW-SE	CROSBY		306	USBM
CROW WING	46-29- 9	W	NW-SE	CROSBY		307	USBM
CROW WING	46-29- 9	W	NW-SE	CROSBY		308	USBM
CROW WING	46-29- 9	W	NW-SE	CROSBY		309	USBM
CROW WING	46-29- 9	W	NW-SE	CROSBY		310	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		1	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		10	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		101	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		107	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		109	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		11	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		110	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		111	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		12	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		13	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		14	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		2	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		200	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		201	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		202	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		203	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		204	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		205	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		206	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		207	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		208	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		210	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		211	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		212	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		213	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		214	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		215	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		216	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		218	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		219	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		220	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		221	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		6	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		7	USBM
CROW WING	46-29- 9	W	NW-SE	COLE & MCDONALD		7A	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		103	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		104	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		119	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		125	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		129	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		132	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		146	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		147	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		151	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		153	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		154	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		155	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		156	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		157	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		158	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		159	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	46-29-10	W	NW-SE	CROSBY		161	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		170	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		172	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		173	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		175	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		177	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		205	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		211	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		217	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		218	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		222	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		226	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		232	USBM
CROW WING	46-29-10	W	NW-SE	CROSBY		233	USBM
CROW WING	46-29-10	W	NW-SE	COLE & MCDONALD		401	USBM
CROW WING	46-29-10	W	NW-SE	COLE & MCDONALD		402	USBM
CROW WING	46-29-10	W	NW-SE	COLE & MCDONALD		403	USBM
CROW WING	46-29-11	W	NW-NE	CROSBY		28A	USBM
CROW WING	46-29-11	W	NW-NE	CROSBY		29A	USBM
CROW WING	46-29-11	W	NW-NE	CROSBY		30A	USBM
CROW WING	46-29-11	W	NW-NE	CROSBY		31A	USBM
CROW WING	46-29-11	W	NW-NE	CROSBY		32A	USBM
CROW WING	46-29-11	W	NW-NE	CROSBY		33A	USBM
CROW WING	46-29-11	W	NW-NE	CROSBY		34A	USBM
CROW WING	46-29-11	W	NE-SW	CROSBY		485	USBM
CROW WING	46-29-11	W	NE-SW	CROSBY		516	USBM
CROW WING	46-29-11	W	SE-SW	CROSBY		122	USBM
CROW WING	46-29-11	W	SE-SW	CROSBY		127	USBM
CROW WING	46-29-11	W	SE-SW	CROSBY		128	USBM
CROW WING	46-29-11	W	SE-SW	CROSBY		131	USBM
CROW WING	46-29-11	W	SE-SW	CROSBY		135	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		1	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		10	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		11	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		13	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		138	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		16	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		17	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		2	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		24A	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		3	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		3A	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		4	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		446	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		448	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		450	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		458	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		459	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		465	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		466	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		468	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		476	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		477	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		480	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		482	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		483	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		491	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		495	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		496	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		5	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		500	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		507	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		514	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		552	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		553	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		554	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		555	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		6	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		7	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	46-29-11	W	NW-SE	CROSBY		8	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		9	USBM
CROW WING	46-29-11	W	NW-SE	CROSBY		CK2A	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		23	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		24	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		25	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		30	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		31	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		38	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		39	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		40	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		41	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		61	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		62	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		63	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		84	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		85	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		86	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		87	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		88	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		89	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		91	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		92	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		93	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		94	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		95	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		96	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		97	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		98	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD	N. S	A-8	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		C	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		D	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		K	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		L	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		M	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		N	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		T-1	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		T-2	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		T-3	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		T-4	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		T-5	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		T-6	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		U-1	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		U-2	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		U-2A	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		U-3	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		U-4	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		U-5	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		U-6	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		V-1	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		V-2	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		V-3	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		V-4	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		V-5	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD	N. S	V-6	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		W-1	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		W-2	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		W-3	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		W-4	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		W-5	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		W-6	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		X-3	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		X-4	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		X-5	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		X-6	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		Y-5	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		Y-6	USBM
CROW WING	46-29-11	W	NW-SE	COLE & MCDONALD		Z-6	USBM
CROW WING	46-29-11	W	SW-SE	CROSBY		107	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	46-29-11	W	SW-SE	CROSBY		114	USBM
CROW WING	46-29-11	W	SW-SE	CROSBY		117	USBM
CROW WING	46-29-15	W	SE-NE	CROSBY		1	USBM
CROW WING	46-29-15	W	SE-NE	CROSBY		2	USBM
CROW WING	46-29-15	W	SE-NE	CROSBY		3	USBM
CROW WING	46-29-16	W	NE-NE	CROSBY		112	USBM
CROW WING	46-29-16	W	NE-NE	CROSBY		115	USBM
CROW WING	46-29-16	W	NE-NE	CROSBY		120	USBM
CROW WING	46-29-16	W	NE-NE	CROSBY		123	USBM
CROW WING	46-29-16	W	NW-NE	CROSBY		133	USBM
CROW WING	46-29-16	W	NW-SW	CROSBY		136	USBM
CROW WING	46-29-16	W	NW-SW	CROSBY		137	USBM
CROW WING	46-29-16	W	NW-SW	CROSBY		139	USBM
CROW WING	46-29-16	W	NW-SW	CROSBY		140	USBM
CROW WING	46-29-16	W	NW-SW	CROSBY		141	USBM
CROW WING	46-29-16	W	NW-SW	CROSBY		143	USBM
CROW WING	46-29-16	W	SW-SW	CROSBY		111	USBM
CROW WING	46-29-16	W	SW-SW	CROSBY		113	USBM
CROW WING	46-29-16	W	SW-SW	CROSBY		116	USBM
CROW WING	46-29-16	W	SW-SW	CROSBY		118	USBM
CROW WING	46-29-16	W	SW-SW	CROSBY		121	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		100	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		101	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		102	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		105	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		106	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		108	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		109	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		124	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		126	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		130	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		155	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		156	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		159	USBM
CROW WING	46-29-16	W	NW-SE	CROSBY		164	USBM
CROW WING	46-29-17	W	NW-NE	CROSBY		7M	USBM
CROW WING	46-29-17	W	NE-NW	CROSBY		H-7	USBM
CROW WING	46-29-17	W	NW-SE	CROSBY		22M	USBM
CROW WING	46-29-17	W	NW-SE	CROSBY		24M	USBM
CROW WING	46-29-17	W	NW-SE	CROSBY		25M	USBM
CROW WING	46-29-17	W	NW-SE	CROSBY		26M	USBM
CROW WING	46-29-17	W	NW-SE	CROSBY		5M	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		248	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		253	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		258	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		264	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		270	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		272	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		277	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		282	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		283	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		293	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		312	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		313	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		314	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		315	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		316	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		317	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		318	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		319	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		395	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		398	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		400	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		403	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		412	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		415	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		662	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		664	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		667	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	46-29-18	W	NW-SE	CROSBY		670	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		675	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		687	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		690	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		724	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		725	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		726	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		727	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		729	USBM
CROW WING	46-29-18	W	NW-SE	CROSBY		730	USBM
CROW WING	46-30-13	W	NE-SE	CROSBY		13	USBM
CROW WING	46-30-13	W	NE-SE	CROSBY		2	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		1	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		10	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		102	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		103	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		104	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		105	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		106	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		107	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		108	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		109	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		110	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		111	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		112	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		113	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		114	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		115	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		116	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		117	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		118	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		12	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		14	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		4	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		8	USBM
CROW WING	46-30-13	W	NW-SE	CROSBY		9	USBM
CROW WING	46-30-26	W	NE-NW	CROSBY		454	USBM
CROW WING	46-30-26	W	NE-NW	CROSBY		462	USBM
CROW WING	46-30-26	W	NE-NW	CROSBY		463	USBM
CROW WING	46-30-26	W	NE-NW	CROSBY		469	USBM
CROW WING	46-30-26	W	NE-NW	CROSBY		473	USBM
CROW WING	46-30-26	W	NE-NW	CROSBY		474	USBM
CROW WING	46-30-26	W	NE-NW	CROSBY		475	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		479	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		487	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		488	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		490	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		493	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		494	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		501	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		502	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		506	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		515	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		518	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		528	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		531	USBM
CROW WING	46-30-26	W	SE-NW	CROSBY		534	USBM
CROW WING	46-30-26	W	NW-SE	CROSBY		524	USBM
CROW WING	46-30-26	W	NW-SE	CROSBY		530	USBM
CROW WING	46-30-26	W	NW-SE	CROSBY		539	USBM
CROW WING	46-30-26	W	NW-SE	CROSBY		541	USBM
CROW WING	46-30-26	W	NW-SE	CROSBY		545	USBM
CROW WING	46-30-26	W	NW-SE	CROSBY		546	USBM
CROW WING	46-30-26	W	NW-SE	CROSBY		555	USBM
CROW WING	46-30-26	W	SW-SE	CROSBY		556	USBM
CROW WING	46-30-26	W	SW-SE	CROSBY		565	USBM
CROW WING	46-30-26	W	SW-SE	CROSBY		566	USBM
CROW WING	46-30-26	W	SW-SE	CROSBY		572	USBM
CROW WING	46-30-26	W	SW-SE	CROSBY		573	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	46-30-34	W	NE-NW	SYRACUSE		S-4	OTHER
CROW WING	47-28-19	W	NW-SE	CROSBY		152	USBM
CROW WING	47-28-19	W	NW-SE	CROSBY		162	USBM
CROW WING	47-28-19	W	NW-SE	CROSBY		167	USBM
CROW WING	47-28-19	W	NW-SE	CROSBY		171	USBM
CROW WING	47-28-19	W	NW-SE	CROSBY		181	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1001	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1002	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1003	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1004	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1005	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1006	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1007	USBM
CRQW WING	47-28-29	W	NW-SE	CROSBY		1008	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1009	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1010	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1011	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1012	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1013	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1014	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1015	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1016	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1017	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1018	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1019	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1020	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1021	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1022	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1023	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1024	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1025	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1026	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1027	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1028	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1029	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1030	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1031	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1032	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1033	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		1034	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2001	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2002	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2003	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2004	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2005	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2006	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2007	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2008	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2009	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2010	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2011	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2012	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2013	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2014	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2015	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2016	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2017	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2018	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2019	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2020	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2021	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2022	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2023	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2024	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2025	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2026	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2027	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2028	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		2029	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	47-28-29	W	NW-SE	CROSBY		2030	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3001	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3002	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3003	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3004	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3005	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3006	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3007	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3008	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3009	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3010	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3011	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3012	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3013	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3014	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3015	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3016	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3017	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3018	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3019	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3020	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3021	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3022	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3023	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3024	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3025	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3026	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3027	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3028	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3029	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3030	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		3031	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		716	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		717	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		718	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		719	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		720	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		721	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		722	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		723	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		724	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		725	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		726	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		727	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		728	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		729	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		730	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		731	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		732	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		733	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		734	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		735	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		736	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		737	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		738	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		740	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		741	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		742	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		743	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		744	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		745	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		746	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		747	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		748	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		749	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		750	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		751	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		752	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		753	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	47-28-29	W	NW-SE	CROSBY		800	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		801	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		802	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		803	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		804	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		805	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		806	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		807	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		808	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		809	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		810	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		811	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		812	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		813	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		814	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		815	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		816	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		817	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		818	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		819	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		820	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		821	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		822	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		823	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		824	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		825	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		826	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		827	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		828	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		829	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		830	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		831	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		832	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		833	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		834	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		835	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		836	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		837	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		838	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		839	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		840	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		841	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		842	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		843	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		844	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		845	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		846	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		847	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		848	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		849	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		850	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		851	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		852	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		853	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		854	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		855	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		856	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		857	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		858	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		859	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		860	USBM
CROW WING	47-28-29	W	NW-SE	CROSBY		861	USBM
CROW WING	47-29-20	W	SE-SW	USBM		3	USBM
CROW WING	47-29-20	W	SE-SW	USBM		4	USBM
CROW WING	47-29-20	W	SE-SE	USBM		2	USBM
CROW WING	47-29-22	W	NW-NE	USBM		7	USBM
CROW WING	47-29-22	W	NW-NE	USBM		8	USBM
CROW WING	47-29-22	W	NW-SE	CROSBY		X-7	USBM
CROW WING	47-29-22	W	NW-SE	CROSBY		X-9	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	47-29-22	W	SW-SE	CROSBY		X-1	USBM
CROW WING	47-29-22	W	SW-SE	CROSBY		X-4	USBM
CROW WING	47-29-22	W	SW-SE	CROSBY		X-5	USBM
CROW WING	47-29-22	W	SE-SE	CROSBY		2201	USBM
CROW WING	47-29-22	W	SE-SE	CROSBY		2203	USBM
CROW WING	47-29-22	W	SE-SE	CROSBY		2206	USBM
CROW WING	47-29-23	W	NE-SE	HANNA		101	USBM
CROW WING	47-29-23	W	NE-SE	HANNA		102	USBM
CROW WING	47-29-23	W	NE-SE	HANNA		103	USBM
CROW WING	47-29-23	W	NE-SE	HANNA		104	USBM
CROW WING	47-29-23	W	NE-SE	HANNA		105	USBM
CROW WING	47-29-23	W	NE-SE	HANNA		106	USBM
CROW WING	47-29-23	W	NE-SE	HANNA		107	USBM
CROW WING	47-29-23	W	NE-SE	HANNA		108	USBM
CROW WING	47-29-23	W	NE-SE	HANNA		109	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		519-A	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		543	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		552	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		556	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		557	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		558	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		559	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		564	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		568	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		570	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		574	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		576	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		584	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		585	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		592	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		593	USBM
CROW WING	47-29-23	W	NW-SE	CROSBY		596	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		108-A	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		489-A	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		492-A	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		520	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		520-A	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		527	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		529	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		533	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		538	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		548	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		551	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		560	USBM
CROW WING	47-29-23	W	SW-SE	CROSBY		569	USBM
CROW WING	47-29-25	W	NW-NW	CROSBY		532	USBM
CROW WING	47-29-25	W	NW-NW	CROSBY		535	USBM
CROW WING	47-29-25	W	NW-NW	CROSBY		540	USBM
CROW WING	47-29-25	W	NW-NW	CROSBY		550	USBM
CROW WING	47-29-25	W	NW-NW	CROSBY		557	USBM
CROW WING	47-29-25	W	NW-NW	CROSBY		563	USBM
CROW WING	47-29-25	W	NW-NW	CROSBY		581	USBM
CROW WING	47-29-25	W	NW-SE	CROSBY		522	USBM
CROW WING	47-29-26	W	NW-SE	CROSBY		J1	USBM
CROW WING	47-29-26	W	SE-SE	CROSBY		1W	USBM
CROW WING	47-29-26	W	SE-SE	CROSBY		2W	USBM
CROW WING	47-29-26	W	SE-SE	CROSBY		3W	USBM
CROW WING	47-29-26	W	SE-SE	CROSBY		4W	USBM
CROW WING	47-29-26	W	SE-SE	CROSBY		5W	USBM
CROW WING	47-29-27	W	NW-NE	CROSBY		29	USBM
CROW WING	47-29-27	W	NW-NE	CROSBY		X-10	USBM
CROW WING	47-29-27	W	NW-NE	CROSBY		X-2	USBM
CROW WING	47-29-27	W	NW-NE	CROSBY		X-3	USBM
CROW WING	47-29-27	W	NE-NW	CROSBY		15	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		16	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		17	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		18	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		19	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		23	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	47-29-27	W	NW-SE	CROSBY		25	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		26	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		27	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		28	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		X-11	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		X-12	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		X-13	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		X-6	USBM
CROW WING	47-29-27	W	NW-SE	CROSBY		X-8	USBM
CROW WING	47-29-27	W	SW-SE	CROSBY		S-1	USBM
CROW WING	47-29-28	W	NW-SE	HANNA		1A	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-1	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-10	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-10A	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-11	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-12	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-13	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-14	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-15	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-16	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-17	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-18	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-19	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-2	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-20	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-21	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-22	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-23	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-24	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-25	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-26	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-27	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-28	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-29	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-3	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-4	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-5	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-6	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-7	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-8	USBM
CROW WING	47-29-28	W	NW-SE	CROSBY		Z-9	USBM
CROW WING	47-29-28	W	SE-SE	USBM		1A	USBM
CROW WING	47-29-29	W	NE-NE	USBM		6	USBM
CROW WING	47-29-29	W	NW-NW	USBM		5	USBM
CROW WING	47-29-30	W	SE-NE	USBM		1	USBM
CROW WING	47-29-32	W	NE-NE	CROSBY		V-1	USBM
CROW WING	47-29-32	W	NE-NE	CROSBY		V-2	USBM
CROW WING	47-29-32	W	NE-NE	CROSBY		V-3	USBM
CROW WING	47-29-32	W	NE-NE	CROSBY		V-4	USBM
CROW WING	47-29-32	W	SE-SW	CROSBY		318	USBM
CROW WING	47-29-32	W	SE-SW	CROSBY		319	USBM
CROW WING	47-29-32	W	SE-SW	CROSBY		399	USBM
CROW WING	47-29-32	W	SE-SW	CROSBY		404	USBM
CROW WING	47-29-32	W	SE-SW	CROSBY		405	USBM
CROW WING	47-29-34	W	NE-NE	CROSBY		U-1	USBM
CROW WING	47-29-34	W	NE-NE	CROSBY		U-2	USBM
CROW WING	47-29-34	W	NE-NE	CROSBY		U-3	USBM
CROW WING	47-29-34	W	NE-NE	CROSBY		U-4	USBM
CROW WING	47-29-34	W	NE-NE	CROSBY		U-5	USBM
CROW WING	47-29-34	W	SW-SE	CROSBY		R-1	USBM
CROW WING	47-29-34	W	SW-SE	CROSBY		R-2	USBM
CROW WING	47-29-35	W	NE-NE	CROSBY		286	USBM
CROW WING	47-29-35	W	NE-NW	CROSBY		699	USBM
CROW WING	47-29-35	W	NE-NW	CROSBY		700	USBM
CROW WING	47-29-35	W	NE-NW	CROSBY		702	USBM
CROW WING	47-29-35	W	NE-NW	CROSBY		703	USBM
CROW WING	47-29-35	W	NE-NW	CROSBY		706	USBM
CROW WING	47-29-35	W	NE-NW	CROSBY		707	USBM
CROW WING	47-29-35	W	NE-NW	CROSBY		708	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	47-29-35	W	NE-NW	CROSBY		709	USBM
CROW WING	134-28-22	W	NW-SE	USBM		302	USBM
CROW WING	134-28-22	W	NW-SE	USBM		303	USBM
CROW WING	134-28-22	W	NW-SE	USBM		304	USBM
CROW WING	134-28-22	W	NW-SE	USBM		305	USBM
CROW WING	134-28-22	W	NW-SE	USBM		306	USBM
CROW WING	134-28-22	W	NW-SE	USBM		701	USBM
CROW WING	134-28-23	W	NW-SE	USBM		111	USBM
CROW WING	134-28-23	W	NW-SE	USBM		112	USBM
CROW WING	134-28-23	W	NW-SE	USBM		113	USBM
CROW WING	134-28-32	W	NW-SE	USBM		114	USBM
CROW WING	134-28-32	W	NW-SE	USBM		115	USBM
CROW WING	134-28-32	W	NW-SE	USBM		307	USBM
CROW WING	134-28-32	W	NW-SE	USBM		308	USBM
CROW WING	134-28-32	W	NW-SE	USBM		309	USBM
CROW WING	134-28-32	W	NW-SE	USBM		310	USBM
CROW WING	136-25-28	W	NW-SE	USBM		RL-6	USBM
CROW WING	136-25-28	W	NW-SE	USBM		RL-7	USBM
CROW WING	136-25-28	W	NW-SE	USBM		RL-8	USBM
CROW WING	136-25-28	W	NW-SE	USBM		RL-9	USBM
CROW WING	136-26- 4	W	NW-SE	GREAT NORTHERN		101	USBM
CROW WING	136-26- 7	W	NW-SE	GREAT NORTHERN		102	USBM
CROW WING	136-26-19	W	NW-SE	GREAT NORTHERN		103	USBM
CROW WING	136-26-19	W	NW-SE	GREAT NORTHERN		104	USBM
CROW WING	136-26-26	W	NW-SE	GREAT NORTHERN		107	USBM
CROW WING	136-26-26	W	NW-SE	GREAT NORTHERN		108	USBM
CROW WING	136-26-30	W	NW-SE	GREAT NORTHERN		109	USBM
CROW WING	136-26-30	W	NW-SE	GREAT NORTHERN		110	USBM
CROW WING	136-26-35	W	NW-SE	GREAT NORTHERN		105	USBM
CROW WING	136-26-35	W	NW-SE	MOORE		MR-5	USBM
CROW WING	136-27-15	W	SE-NE	MGS		2042	MGS
CROW WING	136-27-24	W	NW-SE	GREAT NORTHERN		106	USBM
CROW WING	137-25-14	W	NW-SE	GREAT NORTHERN		29	USBM
CROW WING	137-25-16	W	SE-SE	MGS		2038	MGS
CROW WING	137-25-24	W	NW-SE	GREAT NORTHERN		30	USBM
CROW WING	137-25-28	W	NW-SE	USBM		RL-1	USBM
CROW WING	137-25-28	W	NW-SE	USBM		RL-2	USBM
CROW WING	137-25-28	W	NW-SE	USBM		RL-3	USBM
CROW WING	137-25-28	W	NW-SE	USBM		RL-4	USBM
CROW WING	137-25-28	W	NW-SE	USBM		RL-5	USBM
CROW WING	137-25-33	W	SE-NW	MGS		2039	MGS
CROW WING	137-25-36	W	NW-NW	UNK		18128	OTHER
CROW WING	137-25-36	W	SE-SW	UNK		18130	OTHER
CROW WING	138-25-12	W	NW-SE	GREAT NORTHERN		25	USBM
CROW WING	138-25-16	W	NW-NE	UNK		18126	OTHER
CROW WING	138-25-22	W	NW-SE	GREAT NORTHERN		20	USBM
CROW WING	138-25-22	W	NW-SE	GREAT NORTHERN		26	USBM
CROW WING	138-25-22	W	NW-SE	GREAT NORTHERN		9	USBM
CROW WING	138-25-26	W	NW-SE	GREAT NORTHERN		18	USBM
CROW WING	138-25-28	W	NW-SE	GREAT NORTHERN		17	USBM
CROW WING	138-25-32	W	NW-SE	GREAT NORTHERN		10	USBM
CROW WING	138-26- 3	W	NW-SE	USBM		17	USBM
CROW WING	138-26- 9	W	NW-SE	USBM		24	USBM
CROW WING	138-26- 9	W	NW-SE	USBM		25	USBM
CROW WING	138-26-15	W	NW-SE	USBM		19	USBM
CROW WING	138-26-18	W	NW-SE	USBM		33	USBM
CROW WING	138-26-20	W	NW-SE	USBM		20	USBM
CROW WING	138-26-20	W	NW-SE	USBM		201	USBM
CROW WING	138-26-20	W	NW-SE	USBM		202	USBM
CROW WING	138-26-20	W	NW-SE	USBM		21	USBM
CROW WING	138-26-20	W	NW-SE	USBM		22	USBM
CROW WING	138-26-21	W	NW-SE	USBM		16	USBM
CROW WING	138-26-21	W	NW-SE	USBM		23	USBM
CROW WING	138-26-21	W	NW-SE	USBM		31	USBM
CROW WING	138-26-23	W	NW-SE	USBM		52	USBM
CROW WING	138-26-23	W	NW-SE	USBM		60	USBM
CROW WING	138-26-23	W	NW-SE	USBM		63	USBM
CROW WING	138-26-23	W	NW-SE	USBM		66	USBM
CROW WING	138-26-23	W	NW-SE	USBM		69	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
CROW WING	138-26-23	W	NW-SE	USBM		76	USBM
CROW WING	138-26-23	W	NW-SE	USBM		78	USBM
CROW WING	138-26-24	W	NW-SE	USBM		49	USBM
CROW WING	138-26-24	W	NW-SE	USBM		67	USBM
CROW WING	138-26-24	W	NW-SE	USBM		68	USBM
CROW WING	138-26-24	W	NW-SE	USBM		72	USBM
CROW WING	138-26-24	W	NW-SE	USBM		73	USBM
CROW WING	138-26-24	W	NW-SE	USBM		74	USBM
CROW WING	138-26-24	W	NW-SE	USBM		75	USBM
CROW WING	138-26-24	W	NW-SE	USBM		77	USBM
CROW WING	138-26-25	W	NW-SE	USBM		54	USBM
CROW WING	138-26-25	W	NW-SE	USBM		58	USBM
CROW WING	138-26-26	W	NW-SE	USBM		44	USBM
CROW WING	138-26-26	W	NW-SE	USBM		55	USBM
CROW WING	138-27-13	W	NW-SE	USBM		34	USBM
CROW WING	138-27-29	W	SW-NE	MGS		1905	MGS
CROW WING	138-27-35	W	NW-SE	USBM		GL-1	USBM
CROW WING	138-27-35	W	NW-SE	USBM		GL-2	USBM
CROW WING	138-27-35	W	NW-SE	USBM		GL-3	USBM
CROW WING	138-27-35	W	NW-SE	USBM		GL-4	USBM
CROW WING	138-28-12	W	SE-NE	MGS		1904	MGS
CROW WING	138-28-23	W	NW-SE	USBM		45	USBM
CROW WING	138-28-23	W	NW-SE	USBM		46	USBM
CROW WING	138-28-23	W	NW-SE	USBM		47	USBM
DAKOTA	27-23-4	W	NW-SE	MN HWY DEPT		T-1	USBM
DAKOTA	27-24-13	W	NW-SE	MN HWY DEPT		T-14	USBM
DAKOTA	28-22-16	W	NW-SE	MN HWY DEPT		T-2	USBM
DAKOTA	28-22-21	W	NW-SE	MN HWY DEPT		T-1	USBM
DAKOTA	28-22-21	W	NW-SE	MN HWY DEPT		T-2	USBM
DAKOTA	28-22-28	W	NW-SE	MN HWY DEPT	N.S	T-1	USBM
DAKOTA	28-23-23	W	NW-SE	MN HWY DEPT		T-1	USBM
DAKOTA	28-23-23	W	NW-SE	MN HWY DEPT		T-2	USBM
DAKOTA	28-23-23	W	NW-SE	MN HWY DEPT		T-2	USBM
DAKOTA	28-23-23	W	NW-SE	MN HWY DEPT		T-3	USBM
DAKOTA	28-23-23	W	NW-SE	MN HWY DEPT		T-4	USBM
DAKOTA	28-23-23	W	NW-SE	MN HWY DEPT		T-4	USBM
DAKOTA	28-23-23	W	NW-SE	MN HWY DEPT		T-5	USBM
DAKOTA	28-23-23	W	NW-SE	MN HWY DEPT		TH-6	USBM
DAKOTA	28-23-27	W	NW-SE	MN HWY DEPT		T-1	USBM
DAKOTA	28-23-27	W	NW-SE	MN HWY DEPT		T-103	USBM
DAKOTA	28-23-27	W	NW-SE	MN HWY DEPT		T-105P	USBM
DAKOTA	28-23-27	W	NW-SE	MN HWY DEPT		T-106P	USBM
DAKOTA	28-23-27	W	NW-SE	MN HWY DEPT		T-108P	USBM
DAKOTA	28-23-27	W	NW-SE	MN HWY DEPT		T-2	USBM
DAKOTA	28-23-27	W	NW-SE	MN HWY DEPT		T-3	USBM
DAKOTA	28-23-27	W	NW-SE	MN HWY DEPT		T-52	USBM
DAKOTA	28-23-27	W	NW-SE	MN HWY DEPT		T100P	USBM
DAKOTA	28-23-28	W	NW-SE	MN HWY DEPT		T-1	USBM
DAKOTA	28-23-28	W	NW-SE	MN HWY DEPT		T-109P	USBM
DAKOTA	28-23-28	W	NW-SE	MN HWY DEPT		T-110P	USBM
DAKOTA	28-23-28	W	NW-SE	MN HWY DEPT		T-2	USBM
DAKOTA	28-23-28	W	NW-SE	MN HWY DEPT		T-3	USBM
DAKOTA	28-23-33	W	NW-SE	MN HWY DEPT		T-2	USBM
DAKOTA	28-23-34	W	NW-SE	MN HWY DEPT		T-2	USBM
DAKOTA	28-23-34	W	NW-SE	MN HWY DEPT		T-50	USBM
DAKOTA	28-23-35	W	NW-SE	MN HWY DEPT		T-1	USBM
DAKOTA	28-23-35	W	NW-SE	MN HWY DEPT		T-3	USBM
DAKOTA	112-18-12	W	NW-SE	MN HWY DEPT		T-1	USBM
DAKOTA	112-18-12	W	NW-SE	MN HWY DEPT		T-1	USBM
DAKOTA	112-18-12	W	NW-SE	MN HWY DEPT		T-2	USBM
DAKOTA	112-18-12	W	NW-SE	MN HWY DEPT		T-2	USBM
DAKOTA	112-18-12	W	NW-SE	MN HWY DEPT		T-3	USBM
DAKOTA	112-18-12	W	NW-SE	MN HWY DEPT		T-4	USBM
DAKOTA	112-18-12	W	NW-SE	MN HWY DEPT		T-5	USBM
DAKOTA	112-18-12	W	NW-SE	MN HWY DEPT		T-6	USBM
DAKOTA	113-18-4	W	NE-NE	N NATURAL GAS		H65-1	USBM
DAKOTA	113-18-8	W	NE-NE	N NATURAL GAS		H65-3	USBM
DAKOTA	113-18-9	W	NW-SE	MN HWY DEPT		T-6	USBM
DAKOTA	113-18-9	W	NW-SE	MN HWY DEPT		T-7	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
DAKOTA	113-18-16	W	NW-SE	MN HWY DEPT		T-8	USBM
DAKOTA	114-18- 8	W	SW-SW	N NATURAL GAS		V66-2	USBM
DAKOTA	114-18-17	W	SE-SE	N NATURAL GAS		V66-1	USBM
DAKOTA	114-18-19	W	SE-SE	N NATURAL GAS		V66-3	USBM
DAKOTA	114-18-21	W	SE-SW	N NATURAL GAS		V66-4	USBM
DAKOTA	115-17-18	W	NW-SE	MN HWY DEPT		THA-4	USBM
DAKOTA	115-17-23	W	NW-SE	MN HWY DEPT		THB-1	USBM
DAKOTA	115-17-26	W	NW-SE	MN HWY DEPT		THB-2	USBM
DAKOTA	115-17-26	W	NW-SE	MN HWY DEPT		THB-4	USBM
DAKOTA	115-17-26	W	NW-SE	MN HWY DEPT		THB-7	USBM
DAKOTA	115-17-34	W	NW-SE	MN HWY DEPT		T-1	USBM
DAKOTA	115-17-34	W	NW-SE	MN HWY DEPT		T-2	USBM
DAKOTA	115-20-19	W	NW-SE	MN HWY DEPT		T-2	USBM
DODGE	107-16-32	W	NW-SE	MN HWY DEPT		T-1	USBM
DODGE	107-16-32	W	NW-SE	MN HWY DEPT		T-2	USBM
DODGE	107-16-32	W	NW-SE	MN HWY DEPT		T-3	USBM
DODGE	107-16-32	W	NW-SE	MN HWY DEPT		T-4	USBM
DODGE	107-17-13	W	NW-SE	MN HWY DEPT		T-1	USBM
DODGE	107-17-13	W	NW-SE	MN HWY DEPT		T-2	USBM
DOUGLAS	129-36-22	W	NW-NE	MGS		1913	MGS
FARIBAULT	102-24- 2	W	NW-SE	MN HWY DEPT		T-2	USBM
FARIBAULT	102-24- 9	W	NW-SE	MN HWY DEPT		T-1	USBM
FARIBAULT	102-25-10	W	NW-SE	MN HWY DEPT		T-3	USBM
FARIBAULT	102-26-12	W	NW-SE	MN HWY DEPT		T-2	USBM
FARIBAULT	102-27- 5	W	NW-SE	MN HWY DEPT		T-1	USBM
FARIBAULT	102-27-10	W	NW-SE	MN HWY DEPT		T-2	USBM
FARIBAULT	102-28- 3	W	NW-SE	MN HWY DEPT		T-1	USBM
FILLMORE	102-10- 6	W	NW-SE	MN HWY DEPT		T-1	USBM
FILLMORE	103- 9- 3	W	NW-SE	MN HWY DEPT		T-1	USBM
FILLMORE	103- 9- 7	W	NW-SE	MN HWY DEPT		T-1	USBM
FILLMORE	103- 9- 7	W	NW-SE	MN HWY DEPT		T-2	USBM
FILLMORE	103- 9- 7	W	NW-SE	MN HWY DEPT		T-4	USBM
FILLMORE	103- 9-16	W	NW-SE	MN HWY DEPT		T-1	USBM
FILLMORE	103- 9-16	W	NW-SE	MN HWY DEPT		T-2	USBM
FILLMORE	104- 9-25	W	NW-SW	NJ ZINC		B-1	USBM
FREEBORN	101-21- 4	W	NW-SE	MN HWY DEPT		T-1	USBM
FREEBORN	101-21-21	W	NW-SE	MN HWY DEPT		T-11	USBM
FREEBORN	101-21-21	W	NW-SE	MN HWY DEPT		T-12	USBM
FREEBORN	101-21-21	W	NW-SE	MN HWY DEPT		T-2	USBM
FREEBORN	101-21-33	W	NW-SE	MN HWY DEPT		T-2	USBM
FREEBORN	102-21- 2	W	NW-SE	MN HWY DEPT		T-1	USBM
FREEBORN	102-21-11	W	NW-SE	MN HWY DEPT		T-1	USBM
FREEBORN	102-21-11	W	NW-SE	MN HWY DEPT		T-1A	USBM
FREEBORN	102-21-16	W	SW-SE	USGS		CW#4	USBM
FREEBORN	102-21-21	W	SW-NE	USGS		TH	USBM
FREEBORN	102-21-23	W	NW-SE	MN HWY DEPT		T-1	USBM
FREEBORN	102-21-23	W	NW-SE	MN HWY DEPT		T-4	USBM
FREEBORN	103-19- 7	W	SE-SW	N NATURAL GAS		H-1	USBM
FREEBORN	103-19- 7	W	SE-SW	N NATURAL GAS		H-1A	USBM
GOODHUE	112-17-18	W	NW-SE	MN HWY DEPT		T-1	USBM
GOODHUE	112-17-18	W	NW-SE	MN HWY DEPT		T-1A	USBM
GOODHUE	112-17-18	W	NW-SE	MN HWY DEPT		T-2	USBM
GOODHUE	112-17-18	W	NW-SE	MN HWY DEPT		T-2A	USBM
GOODHUE	112-17-18	W	NW-SE	MN HWY DEPT		T-3	USBM
GOODHUE	112-17-18	W	NW-SE	MN HWY DEPT		T-4	USBM
GOODHUE	112-18-21	W	NW-SE	MN HWY DEPT		T-1	USBM
GOODHUE	113-15-19	W	NW-SE	MN HWY DEPT		T-1	USBM
ITASCA	54-24-18	W	NW-SE	USGS		18-L	USBM
ITASCA	54-25- 4	W	NW-SE	USGS		4-B	USBM
ITASCA	54-25-13	W	NW-SE	USGS		13-Q	USBM
ITASCA	54-25-24	W	NW-SE	USGS		24-G	USBM
ITASCA	54-25-24	W	NW-SE	USGS		24-R	USBM
ITASCA	54-25-25	W	NW-SE	USGS		25-B	USBM
ITASCA	54-25-25	W	NW-SE	USGS		25-E	USBM
ITASCA	54-25-26	W	NW-SE	USGS		26-F	USBM
ITASCA	54-25-27	W	NW-SE	USGS		27-P	USBM
ITASCA	54-25-34	W	NW-SE	USGS		34-A	USBM
ITASCA	54-26- 4	W	NW-SE	USGS		4-D	USBM
ITASCA	54-26-23	W	NW-SE	USGS		23-Q	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ITASCA	54-26-25	W	NW-SE	USGS		25-C	USBM
ITASCA	54-26-25	W	NW-SE	USGS		25-C-A	USBM
ITASCA	54-26-25	W	NW-SE	USGS		25-D	USBM
ITASCA	54-26-25	W	NW-SE	USGS		25-Q	USBM
ITASCA	54-26-26	W	NW-SE	USGS		26-B	USBM
ITASCA	55-22-4	W	NW-SE	USGS		4-D	USBM
ITASCA	55-22-5	W	NW-SE	USGS		5-G	USBM
ITASCA	55-22-6	W	NW-SE	USGS		6-M	USBM
ITASCA	55-23-1	W	NW-SE	USGS		1-R	USBM
ITASCA	55-23-6	W	NW-SE	USGS		6-E	USBM
ITASCA	55-24-1	W	NW-SE	USGS		1-A	USBM
ITASCA	55-24-14	W	NW-SE	USGS		14-Q	USBM
ITASCA	55-24-21	W	NW-SE	USGS		21-L	USBM
ITASCA	55-24-22	W	NW-SE	USGS		22-J	USBM
ITASCA	55-24-22	W	NW-SE	USGS		22-L	USBM
ITASCA	55-24-22	W	NW-SE	USGS		22-M	USBM
ITASCA	55-24-23	W	NW-SE	USGS		23-E	USBM
ITASCA	55-24-28	W	NW-SE	USGS		28-J	USBM
ITASCA	55-24-33	W	NW-SE	USGS		33G	USBM
ITASCA	55-24-36	W	SE-NE	MGS		8	USBM
ITASCA	55-25-16	W	NW-SE	USGS		16-J	USBM
ITASCA	55-25-16	W	NW-SE	USGS		16-Q	USBM
ITASCA	55-25-21	W	NW-SE	USGS		21-G	USBM
ITASCA	55-25-28	W	NW-SE	USGS		28-A	USBM
ITASCA	55-25-28	W	NW-SE	USGS		28-J	USBM
ITASCA	55-25-33	W	NW-SE	USGS		33-G	USBM
ITASCA	55-25-33	W	NW-SE	USGS		33-J	USBM
ITASCA	55-25-33	W	NW-SE	USGS		33-R	USBM
ITASCA	55-26-13	W	NW-SE	USGS		13-K	USBM
ITASCA	55-26-14	W	NW-SE	USGS		14-J	USBM
ITASCA	55-26-14	W	NW-SE	USGS		14-Q	USBM
ITASCA	55-26-22	W	NW-SE	USGS		22-G	USBM
ITASCA	55-26-23	W	NW-SE	USGS		23-F	USBM
ITASCA	55-26-27	W	NW-SE	USGS		27-C	USBM
ITASCA	55-26-28	W	NW-SE	USGS		28-R	USBM
ITASCA	55-26-33	W	NW-SE	USGS		33-B	USBM
ITASCA	55-26-33	W	NW-SE	USGS		33-F	USBM
ITASCA	56-22-18	W	NW-SE	USGS		18-M	USBM
ITASCA	56-22-18	W	NW-SE	USGS		18-M-A	USBM
ITASCA	56-22-19	W	NW-SE	USGS		19-J	USBM
ITASCA	56-22-19	W	NW-SE	USGS		19-J-A	USBM
ITASCA	56-22-29	W	NW-SE	USGS		29-C	USBM
ITASCA	56-22-29	W	NW-SE	USGS		29-D	USBM
ITASCA	56-22-29	W	NW-SE	USGS		29-G	USBM
ITASCA	56-23-2	W	NW-SE	USBM		1	USBM
ITASCA	56-23-13	W	NW-SE	USGS		13-J	USBM
ITASCA	56-23-14	W	NW-SE	USGS		14-N	USBM
ITASCA	56-23-14	W	NW-SE	USGS		14-N-A	USBM
ITASCA	56-23-14	W	NW-SE	USGS		14-P	USBM
ITASCA	56-23-19	W	SW-NE	USGS		UNK	USBM
ITASCA	56-24-36	W	NW-SE	USGS		36-H	USBM
ITASCA	56-24-36	W	NW-SE	USGS		36-J	USBM
ITASCA	56-24-36	W	NW-SE	USGS		36-R	USBM
ITASCA	57-22-25	W	NW-SE	MN HWY DEPT		T-2	USBM
ITASCA	57-22-36	W	NE-SE	MGS		7	USBM
ITASCA	59-26-14	W	NW-SE	MOORE		BF-H-1	OTHER
ITASCA	60-22-7	W	SE-SE	LEHMANN	CN-8284	CAL-1	DNR
ITASCA	60-22-18	W	NE-NE	LEHMANN	CN-8285	CAL-2	DNR
ITASCA	60-22-18	W	NE-NE	LEHMANN	CN-8285	CAL-3	DNR
ITASCA	60-22-18	W	NW-SW	LEHMANN	CN-8285	GAN-1	DNR
ITASCA	60-22-19	W	NW-NE	INCO	CN-7700	40925	DNR
ITASCA	60-23-16	W	NE-NW	LEHMANN	CN-8287	KAT-1	DNR
ITASCA	60-23-16	W	NE-NW	LEHMANN	CN-8287	KAT-2	DNR
ITASCA	60-23-25	W	NW-SW	LEHMANN	CN-8288	SOC-1	DNR
ITASCA	60-23-34	W	SW-NW	MOORE	CN-7811	BL-D-1	DNR
ITASCA	60-23-34	W	SW-NW	MOORE	CN-7811	BL-D-2	DNR
ITASCA	60-23-35	W	NE-SW	LEHMANN	CN-8390	GUA-1	DNR
ITASCA	60-23-35	W	NE-SW	LEHMANN	CN-8290	KAI-1	DNR
ITASCA	60-23-35	W	NE-SW	LEHMANN	CN-8390	KAI-2	DNR

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ITASCA	60-25-29	W	SE-NE	HUMBLE	CN-7645	CN-16	DNR
ITASCA	61-22-21	W	SW-SE	LEHMANN	CN-8270	SNT-1	DNR
ITASCA	61-22-29	W	SW-SW	LEHMANN	CN-8271	HER-1	DNR
ITASCA	61-22-29	W	SE-SW	LEHMANN	CN-8271	HER-3	DNR
ITASCA	61-22-32	W	NE-NW	LEHMANN	CN-8272	HER-2	DNR
ITASCA	61-23-4	W	SE-NW	MOORE	CN-7615	C-B-1	DNR
ITASCA	61-23-17	W	NE-NE	HANNA	CN-7539	C-K-2	DNR
ITASCA	61-24-6	W	NE-SW	U. S. STEEL	CN-7824	26516	DNR
ITASCA	61-24-11	W	SW-SE	HANNA	CN-7763	T-13	DNR
ITASCA	61-25-10	W	NE-NE	U. S. STEEL	CN-7825	26511	DNR
ITASCA	61-25-10	W	SE-NE	U. S. STEEL	CN-7825	26509	DNR
ITASCA	61-25-10	W	SE-NE	U. S. STEEL	CN-7825	26510	DNR
ITASCA	61-25-10	W	SE-SW	U. S. STEEL		26512	DNR
ITASCA	61-25-10	W	SE-SW	U. S. STEEL		26513	DNR
ITASCA	61-25-12	W	NE-NW	U. S. STEEL	CN-7827	26502	DNR
ITASCA	61-25-12	W	NE-NW	U. S. STEEL	CN-7827	26503	DNR
ITASCA	61-25-12	W	NW-NW	U. S. STEEL	CN-7827	26506	DNR
ITASCA	61-25-12	W	NW-SW	U. S. STEEL	CN-7827	26508	DNR
ITASCA	61-25-12	W	NW-SW	U. S. STEEL	CN-7827	26507	DNR
ITASCA	61-25-16	W	SW-NE	U. S. STEEL	CN-7828	26514	DNR
ITASCA	61-25-16	W	NE-SE	U. S. STEEL	CN-7828	26515	DNR
ITASCA	62-22-7	W	SW-SE	HUMBLE	CN-7476	COOK 8-1	DNR
ITASCA	62-22-10	W	NE-SW	HUMBLE	CN-7479	MDB-1-1	DNR
ITASCA	62-22-29	W	NE-SE	MOORE	CN-7611	CE-6	DNR
ITASCA	62-24-17	W	SE-SW	HANNA	CN-7770	T-7	DNR
ITASCA	62-24-30	W	SW-NE	INCO		40927	DNR
ITASCA	150-26-9	W	NW-SE	USBM		ML-5	USBM
ITASCA	150-26-9	W	NW-SE	USBM		ML-6	USBM
ITASCA	150-26-15	W	NW-SE	USBM		ML-7	USBM
ITASCA	150-26-17	W	NW-SE	USBM		ML-3	USBM
ITASCA	150-26-17	W	NW-SE	USBM		ML-4	USBM
ITASCA	150-26-17	W	NW-SE	USBM		ML-8	USBM
ITASCA	150-26-20	W	NW-SE	USBM		ML-10	USBM
ITASCA	150-27-10	W	NW-SE	USBM		ML-2	USBM
ITASCA	150-27-15	W	NW-SE	USBM		ML-1	USBM
ITASCA	150-27-15	W	NW-SE	USBM		ML-9	USBM
JACKSON	102-36-11	W	SE-SE	MARATHON		SQ-5	DNR
JACKSON	102-36-31	W	NE-NW	MARATHON		SQ-14	DNR
JACKSON	104-35-4	W	SE-SE	MARATHON		SQ-10	DNR
JACKSON	104-36-8	W	SE-SW	MARATHON		SQ-4	DNR
KANABEC	40-23-21	W	NW-NW	ROCKY MTN. ENERGY		MO-3	DNR
KANABEC	40-23-22	W	SW-SW	ROCKY MTN. ENERGY		MO-2	DNR
KANABEC	40-23-26	W	NW-NW	ROCKY MTN. ENERGY		MO-1	DNR
KANDIYOHI	122-34-2	W	NW-NW	MGS		2020	MGS
KITTSO	159-45-22	W	SW-SW	USGS		E-10	USBM
KITTSO	159-45-23	W	SE-SE	USGS		E-7	USBM
KITTSO	159-46-4	W	SW-NE	USGS		D-17	USBM
KITTSO	159-46-5	W	NE-NE	USGS		D-30	USBM
KITTSO	159-46-5	W	NW-NE	USGS		D-15	USBM
KITTSO	159-46-5	W	NW-NE	USGS		D-19	USBM
KITTSO	159-46-5	W	NW-NW	USGS		BH-17	USBM
KITTSO	159-46-6	W	NW-NW	USGS		D-18	USBM
KITTSO	159-46-6	W	SE-SE	USGS		UNK	USBM
KITTSO	159-46-9	W	NW-NW	USGS		UNK	USBM
KITTSO	159-46-22	W	SW-SW	USGS		E-11	USBM
KITTSO	159-46-24	W	SE-SE	USGS		E-9	USBM
KITTSO	159-46-30	W	NW-NE	USGS		E-8	USBM
KITTSO	159-47-24	W	SW-SW	USGS		E-13A	USBM
KITTSO	159-47-27	W	NE-NE	USGS		E-2	USBM
KITTSO	159-48-2	W	NE-NW	USGS		R-2	USBM
KITTSO	159-48-2	W	NE-NW	USGS		R-3	USBM
KITTSO	159-48-2	W	NW-NW	USGS		R-1	USBM
KITTSO	159-48-2	W	SW-SE	USGS		L-3	USBM
KITTSO	159-48-11	W	SE-SE	USGS		AU-1	USBM
KITTSO	159-48-11	W	SE-SE	USGS		AU-2	USBM
KITTSO	159-48-11	W	SE-SE	USGS		AU-3	USBM
KITTSO	159-48-13	W	SW-SE	USGS		CL-1	USBM
KITTSO	159-48-21	W	SW-SW	USGS		E-1	USBM
KITTSO	159-48-25	W	SE-SE	USGS		E-13	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
KITTSO	160-45-25	W	SW-SE	USGS		D-8	USBM
KITTSO	160-45-28	W	NE-SW	USGS		D-3	USBM
KITTSO	160-46- 2	W	NE-NW	USGS		C-10	USBM
KITTSO	160-46- 4	W	SE-NE	USGS		BH-15	USBM
KITTSO	160-46- 4	W	SW-SW	USGS		C-19	USBM
KITTSO	160-46- 4	W	SE-SW	USGS		C-21	USBM
KITTSO	160-46- 4	W	SE-SE	USGS		C-31	USBM
KITTSO	160-46- 5	W	NE-NW	USGS		C-18	USBM
KITTSO	160-46- 5	W	NW-SW	USGS		BH-5	USBM
KITTSO	160-46- 5	W	SW-SW	USGS		C-24	USBM
KITTSO	160-46- 5	W	SE-SW	USGS		C-22	USBM
KITTSO	160-46- 5	W	NE-SE	USGS		BH-2	USBM
KITTSO	160-46- 5	W	SE-SE	USGS		C-20	USBM
KITTSO	160-46- 6	W	NW-NE	USGS		BH-23	USBM
KITTSO	160-46- 6	W	NW-SW	USGS		BH-14	USBM
KITTSO	160-46- 7	W	SW-NE	USGS		BH-29	USBM
KITTSO	160-46- 8	W	SW-SW	USGS		C-27	USBM
KITTSO	160-46- 8	W	NW-SE	USGS		BH-22	USBM
KITTSO	160-46- 9	W	SW-SW	USGS		C-28	USBM
KITTSO	160-46- 9	W	SE-SW	USGS		BH-21	USBM
KITTSO	160-46- 9	W	SE-SW	USGS		BH-24	USBM
KITTSO	160-46-15	W	SW-SW	USGS		D-23	USBM
KITTSO	160-46-16	W	NE-NE	USGS		C-26	USBM
KITTSO	160-46-16	W	SE-NE	USGS		C-25	USBM
KITTSO	160-46-17	W	NE-NW	USGS		BH-20	USBM
KITTSO	160-46-17	W	SW-NW	USGS		BH-18	USBM
KITTSO	160-46-17	W	NE-SE	USGS		BH-6	USBM
KITTSO	160-46-17	W	NE-SE	USGS		BH-7	USBM
KITTSO	160-46-17	W	SW-SE	USGS		BH-8	USBM
KITTSO	160-46-20	W	NW-NE	USGS		BH-28	USBM
KITTSO	160-46-20	W	NW-NE	USGS		BH-3	USBM
KITTSO	160-46-20	W	SE-NE	USGS		BH-11	USBM
KITTSO	160-46-20	W	NW-NW	USGS		D-24	USBM
KITTSO	160-46-20	W	SW-SW	USGS		D-13	USBM
KITTSO	160-46-20	W	NE-SE	USGS		BH-12	USBM
KITTSO	160-46-20	W	SW-SE	USGS		D-12	USBM
KITTSO	160-46-21	W	NE-NW	USGS		BH-9	USBM
KITTSO	160-46-21	W	SW-SW	USGS		D-14	USBM
KITTSO	160-46-21	W	NE-SE	USGS		D-21	USBM
KITTSO	160-46-25	W	NW-NW	USGS		D-4	USBM
KITTSO	160-46-30	W	SE-NE	USGS		BH-16	USBM
KITTSO	160-46-30	W	NW-NW	USGS		D-20	USBM
KITTSO	160-46-32	W	NE-NE	USGS		D-26	USBM
KITTSO	160-46-32	W	NW-NE	USGS		D-29	USBM
KITTSO	160-46-32	W	NW-NW	USGS		D-25	USBM
KITTSO	160-46-32	W	SE-NW	USGS		BH-19	USBM
KITTSO	160-46-32	W	SE-SW	USGS		BH-30	USBM
KITTSO	160-46-33	W	NE-NE	USGS		D-27	USBM
KITTSO	160-46-33	W	NW-NE	USGS		D-28	USBM
KITTSO	160-47-12	W	SW-NE	USGS		C-32	USBM
KITTSO	160-47-24	W	SW-SE	USGS		BH-25	USBM
KITTSO	160-47-32	W	NW-NE	USGS		D-2A	USBM
KITTSO	160-47-32	W	NE-NW	USGS		D-2	USBM
KITTSO	160-47-34	W	NE-NE	USGS		D-7	USBM
KITTSO	160-47-34	W	NE-NE	USGS		D-7A	USBM
KITTSO	160-48-27	W	NE-SW	USGS		D-10	USBM
KITTSO	160-48-27	W	NW-SW	USGS		D-11	USBM
KITTSO	160-48-28	W	SW-SE	USGS		D-9	USBM
KITTSO	160-48-30	W	SW-SW	USGS		D-1	USBM
KITTSO	160-48-34	W	NE-NE	USGS		AN-1	USBM
KITTSO	160-48-34	W	NE-NE	USGS		AN-2	USBM
KITTSO	160-48-34	W	NE-NE	USGS		C-4	USBM
KITTSO	161-45-31	W	SE-SE	USGS		C-11	USBM
KITTSO	161-45-33	W	SE-SE	USGS		C-5	USBM
KITTSO	161-46- 6	W	NW-NW	USGS		1	USBM
KITTSO	161-46-30	W	SW-SW	USGS		BR-1	USBM
KITTSO	161-46-32	W	NE-NE	USGS		UNK	USBM
KITTSO	161-46-32	W	SW-NW	USGS		C-29	USBM
KITTSO	161-46-32	W	SW-SE	USGS		C-17	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
KITTSO	161-46-32	W	SE-SE	USGS		C-16	USBM
KITTSO	161-46-33	W	NE-SW	USGS		C-30	USBM
KITTSO	161-46-33	W	SW-SW	USGS		C-15	USBM
KITTSO	161-46-33	W	SW-SE	USGS		BH-4	USBM
KITTSO	161-46-33	W	SW-SE	USGS		C-13	USBM
KITTSO	161-46-33	W	SW-SE	USGS		C-14	USBM
KITTSO	161-46-33	W	SE-SE	USGS		C-12	USBM
KITTSO	161-46-34	W	SW-SE	USGS		BH-1	USBM
KITTSO	161-47-26	W	SW-SE	USGS		C-1	USBM
KITTSO	161-47-33	W	NW-NW	USGS		C-2	USBM
KITTSO	161-48-36	W	NW-NW	USGS		C-3	USBM
KITTSO	161-49-13	W	NW-SE	MGS		888	USBM
KITTSO	161-49-15	W	SW-NE	USGS		HA-1	USBM
KITTSO	162-45-4	W	SW-NE	USGS		A-9	USBM
KITTSO	162-45-12	W	SE-SE	USGS		A-10	USBM
KITTSO	162-46-23	W	SW-SE	USGS		B-3	USBM
KITTSO	162-46-29	W	NE-NW	USGS		B-4	USBM
KITTSO	162-47-18	W	SW-SW	USGS		B-8	USBM
KITTSO	162-47-20	W	NE-NE	USGS		B-12	USBM
KITTSO	162-47-22	W	SE-SW	USGS		B-9	USBM
KITTSO	162-47-23	W	SE-SE	USGS		B-13	USBM
KITTSO	162-48-13	W	SW-SW	USGS		LA-1	USBM
KITTSO	162-48-14	W	NW-SE	USGS		B-11	USBM
KITTSO	162-48-16	W	SE-SE	USGS		B-1	USBM
KITTSO	162-48-18	W	SW-SW	USGS		B-2	USBM
KITTSO	162-49-15	W	SE-SE	USGS		B-5	USBM
KITTSO	163-46-20	W	SE-SE	USGS		A-11	USBM
KITTSO	163-46-20	W	SE-SE	USGS		A-11A	USBM
KITTSO	163-46-26	W	NW-NW	USGS		A-4	USBM
KITTSO	163-46-30	W	NE-NW	USGS		A-3	USBM
KITTSO	163-47-28	W	SW-NE	USGS		A-2	USBM
KITTSO	163-48-15	W	NE-NW	USGS		A-8	USBM
KITTSO	163-48-17	W	SE-SE	USGS		A-7B	USBM
KITTSO	163-48-18	W	SW-SE	USGS		A-7A	USBM
KITTSO	163-48-24	W	NE-NE	USGS		A-1	USBM
KITTSO	163-49-16	W	SE-SW	USGS		A-6	USBM
KITTSO	163-50-23	W	SW-SE	USGS		A-5	USBM
KOOCHIC	63-25-27	W	SE-NW			FL-32-1	DNR
KOOCHIC	63-25-35	W	NW-SE	BEAR CREEK	CN-7794	FL-30-1	DNR
KOOCHIC	68-22-3	W	NW-SE	MN HWY DEPT		T-1	USBM
KOOCHIC	71-22-33	W	NW-SE	MN HWY DEPT		T-1	USBM
KOOCHIC	71-22-33	W	NW-SE	MN HWY DEPT		T-2	USBM
KOOCHIC	71-23-30	W	NW-SE	MN HWY DEPT		T-2	USBM
KOOCHIC	71-23-30	W	NW-SE	MN HWY DEPT		T-1	USBM
KOOCHIC	151-28-21	W	SW-NW			G-2	DNR
KOOCHIC	151-28-22	W	SE-SW	UNK		GP-132	OTHER
KOOCHIC	152-27-22	W	NE-NE			MIZ A-1	DNR
KOOCHIC	157-29-32	W	NE-SE	AMOCO	CN-7939	A-4-1	DNR
KOOCHIC	157-29-33	W	NW-SW	AMOCO	CN-7940	A-4-2	DNR
KOOCHIC	158-27-3	W	NW-NW	MOORE	8407-F	KC-1	DNR
KOOCHIC	158-27-3	W	NW-SW	HUMBLE	CN-7305	R-4-2	DNR
KOOCHIC	158-27-4	W	NE-NE	MOORE	8408-F	KC-3	DNR
KOOCHIC	158-27-4	W	SE-NE			R-4-1	DNR
KOOCHIC	158-27-4	W	NW-NW	HUMBLE	CN-7306	R-4-3	DNR
KOOCHIC	158-28-5	W	SE-SW			A-9-1	DNR
KOOCHIC	158-28-7	W	SW-SW			A-8-1	DNR
KOOCHIC	158-28-8	W	NW-NW	AMOCO		A-9-2	DNR
KOOCHIC	158-29-1	W	NW-SW	AMOCO	CN-7941	A-10-1	DNR
KOOCHIC	158-29-18	W	SW-SE	AMOCO	CN-7946	A-6-2	DNR
KOOCHIC	158-29-19	W	NW-NE	AMOCO	CN-7947	A-6-1	DNR
KOOCHIC	158-29-35	W	NW-NW	AMOCO	CN-7950	A-1-1	DNR
KOOCHIC	159-25-10	W	NW-NE			IH-13	DNR
KOOCHIC	159-25-16	W	SW-NW			IH-10	DNR
KOOCHIC	159-25-16	W	SW-NW			IH-11	DNR
KOOCHIC	159-25-16	W	SW-NW			IH-12	DNR
KOOCHIC	159-26-2	W	NE-NE	MDNR		M-1	DNR
KOOCHIC	159-26-7	W	NE-NE			RR-80-2	DNR
KOOCHIC	159-27-15	W	NW-SW			R-2-1	DNR
KOOCHIC	159-27-16	W	NE-SE			R-2-1A	DNR

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
KOOCHICHING	159-27-16	W	SE-SE			NCB-2	DNR
KOOCHICHING	159-27-16	W	SE-SE			S-43-1	DNR
KOOCHICHING	159-27-16	W	SE-SE			S-43-2	DNR
KOOCHICHING	159-27-16	W	SE-SE	SUPERIOR OIL		NCB-1	DNR
KOOCHICHING	159-27-16	W	SE-SE	TEXASGULF		S-43-3	DNR
KOOCHICHING	159-27-20	W	NE-SE	TEXASGULF	CN-7268	R.R.6-1	DNR
KOOCHICHING	159-27-20	W	SW-SE			R.R.6-2	DNR
KOOCHICHING	159-27-21	W	NW-NE	HUMBLE	CN-7322	R-2-3	DNR
KOOCHICHING	159-27-21	W	NW-NE			R-2-2	DNR
KOOCHICHING	159-27-21	W	SW-SW	HUMBLE	CN-7322	R-3-2	DNR
KOOCHICHING	159-27-25	W	SE-NW	HUMBLE	CN-7325	R-1-1	DNR
KOOCHICHING	159-27-29	W	NW-NW			R-3-1	DNR
KOOCHICHING	159-27-30	W	NW-NW	HUMBLE	CN-7329	R-3-4	DNR
KOOCHICHING	159-27-30	W	NW-NW			R-3-3	DNR
KOOCHICHING	159-27-34	W	SE-SE	MOORE	8396-F	KC-4	DNR
KOOCHICHING	159-27-35	W	SW-NW	MOORE	8397-F	KC-2	DNR
KOOCHICHING	159-28-10	W	SW-NE			R.R.12-1	DNR
KOOCHICHING	159-28-10	W	SE-NW	TEXASGULF	CN-7272	R.R.12-2	DNR
KOOCHICHING	159-28-26	W	NE-SW			R-5-1	DNR
KOOCHICHING	159-28-26	W	NE-SW			R-5-2	DNR
KOOCHICHING	160-29-18	W	NW-SE	MN HWY DEPT		T-1	USBM
KOOCHICHING	160-29-18	W	NW-SE	MN HWY DEPT		T-2	USBM
LAC QUI PARLE	120-46-20	W	NE-NE	MGS		2041	MGS
LAC QUI PARLE	120-46-21	W	SE-NE	MGS		2040	MGS
LAKE	52-11-2	W	NW-SE	MN HWY DEPT		T-15	USBM
LAKE	52-11-2	W	NW-SE	MN HWY DEPT		T-16	USBM
LAKE	52-11-2	W	NW-SE	MN HWY DEPT		T-17	USBM
LAKE	52-11-2	W	NW-SE	MN HWY DEPT		T-18	USBM
LAKE	52-11-2	W	NW-SE	MN HWY DEPT		T-19	USBM
LAKE	53-10-1	W	NW-SE	MN HWY DEPT		T-1	USBM
LAKE	53-10-1	W	NW-SE	MN HWY DEPT		T-6	USBM
LAKE	53-10-1	W	NW-SE	MN HWY DEPT		T-6A	USBM
LAKE	53-10-12	W	NW-SE	MN HWY DEPT		T-1A	USBM
LAKE	53-10-12	W	NW-SE	MN HWY DEPT		T-2	USBM
LAKE	53-10-12	W	NW-SE	MN HWY DEPT		T-3	USBM
LAKE	56-7-15	W	NW-SE	MN HWY DEPT		T-1	OTHER
LAKE	56-7-15	W	NW-SE	MN HWY DEPT		T-2	OTHER
LAKE	56-7-15	W	NW-SE	MN HWY DEPT		T-7	USBM
LAKE	61-11-2	W	NW-NW	NEWMONT		NM-3	DNR
LAKE	61-11-3	W	NW-SE	DUVAL	CN-7230	8	DNR
LAKE	61-11-4	W	NW-SE	DUVAL	CN-7231	1	DNR
LAKE	61-11-4	W	NW-SE	DUVAL	CN-7231	5	DNR
LAKE	61-11-4	W	NW-SE	DUVAL	CN-7231	6	DNR
LAKE	61-11-4	W	NW-SE	DUVAL	CN-7231	18	DNR
LAKE	61-11-4	W	NW-SE	DUVAL	CN-7231	19	DNR
LAKE	61-11-4	W	NW-SE	DUVAL	CN-7231	20	DNR
LAKE	61-11-5	W	NE-NE	INCO		34871	DNR
LAKE	61-11-5	W	NW-NE	INCO		BH-32718	USBM
LAKE	61-11-5	W	SW-NE	INCO		BH-32730	USBM
LAKE	61-11-5	W	NW-SW	INCO		BH-32727	USBM
LAKE	61-11-5	W	NW-SW	INCO		BH-32727A	USBM
LAKE	61-11-5	W	SW-SE	DUVAL	CN-7232	2	DNR
LAKE	61-11-8	W	SE-NE	DUVAL	CN-7233	13	DNR
LAKE	61-11-10	W	NW-NW	NEWMONT		ELY-4	DNR
LAKE	61-11-10	W	NW-NW	NEWMONT		PD ELY-4	DNR
LAKE	61-11-10	W	NW-SE	NEWMONT		NM-6	DNR
LAKE	61-11-11	W	NW-NW	NEWMONT		NM-5	DNR
LAKE	61-11-17	W	SE-NE	DUVAL		17	DNR
LAKE	61-11-20	W	SW-NW	DUVAL		14	DNR
LAKE	61-11-31	W	NE-NW	DUVAL		16	DNR
LAKE	61-11-31	W	SW-NW	DUVAL		12	DNR
LAKE	62-10-19	W	NW-SW	INCO		11518	USBM
LAKE	62-10-30	W	NW-NW	NEWMONT		NM-2	DNR
LAKE	62-10-30	W	NW-SE	BEAR CREEK		MV2-1W	USBM
LAKE	62-10-30	W	SE-SE	NEWMONT		NM-1	DNR
LAKE	62-11-24	W	SE-SE	INCO		11516	USBM
LAKE	62-11-25	W	NE-NE	INCO		34872	DNR
LAKE	62-11-25	W	SW-NE	INCO		34870	DNR
LAKE	62-11-25	W	SW-NE	INCO		34870-A	DNR

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
LAKE	62-11-25	W	NW-NW	INCO		BH-32740	USBM
LAKE	62-11-26	W	NW-NE	BEAR CREEK		AD-3	USBM
LAKE	62-11-26	W	NW-NE	BEAR CREEK		AD-4	USBM
LAKE	62-11-26	W	SE-NE	INCO		11519	USBM
LAKE	62-11-26	W	NE-NW	USBM		3	USBM
LAKE	62-11-26	W	NE-NW	BEAR CREEK		AD-5	USBM
LAKE	62-11-26	W	NE-NW	BEAR CREEK		AD-6	USBM
LAKE	62-11-26	W	SE-NW	USBM		1	USBM
LAKE	62-11-26	W	SE-NW	USBM		2	USBM
LAKE	62-11-26	W	SE-NW	BEAR CREEK		AD-1	USBM
LAKE	62-11-26	W	SE-NW	BEAR CREEK		AD-2	USBM
LAKE	62-11-34	W	NW-SE	DUVAL	CN-7235	3	DNR
LAKE	62-11-34	W	NW-SE	DUVAL	CN-7235	4	DNR
LAKE	62-11-34	W	NW-SE	DUVAL	CN-7236	7	DNR
LAKE	63- 9-12	W	NE-SW	AMAX-MOORE	CN-7258	S-3	DNR
LAKE	63- 9-14	W	NW-NE	AMAX-MOORE	CN-7260	S-1	DNR
LAKE	63- 9-14	W	SW-NE	AMAX		S-4	DNR
LAKE	63- 9-15	W	NE-NE	AMAX		S-2	DNR
LAKE	63-11-30	W	SW-NW	JONES & LAUGHLIN		5408	USBM
LAKE	63-11-30	W	SW-NW	JONES & LAUGHLIN		5615	USBM
LAKE	63-11-30	W	SE-NW	JONES & LAUGHLIN		5406	USBM
LAKE	63-11-30	W	SE-NW	JONES & LAUGHLIN		5407	USBM
LAKE	63-11-30	W	NW-SE	JONES & LAUGHLIN		5401	USBM
LAKE	63-11-30	W	NW-SE	JONES & LAUGHLIN		5402	USBM
LAKE	63-11-30	W	NW-SE	JONES & LAUGHLIN		5403	USBM
LAKE	63-11-30	W	NW-SE	JONES & LAUGHLIN		5404	USBM
LAKE	63-11-30	W	NW-SE	JONES & LAUGHLIN		5405	USBM
LAKE	63-11-30	W	NW-SE	JONES & LAUGHLIN		5409	USBM
LAKE	63-11-30	W	NW-SE	JONES & LAUGHLIN		5410	USBM
LAKE	63-11-30	W	NW-SE	JONES & LAUGHLIN		5411	USBM
LAKE OF THE WOODS	157-33- 8	W	NW-NE	INCO	CN-7734	40918	DNR
LAKE OF THE WOODS	157-33-34	W	NW-SW	INCO	CN-7736	40917	DNR
LAKE OF THE WOODS	157-34- 5	W	SW-NE	EXXON	CN-7679	B31-3	DNR
LAKE OF THE WOODS	157-34- 5	W	SW-NE	EXXON	CN-7679	B31-4	DNR
LAKE OF THE WOODS	157-34- 5	W	SW-NE			B31-5	DNR
LAKE OF THE WOODS	157-34- 5	W	NE-NW	EXXON	CN-7679	B31-2	DNR
LAKE OF THE WOODS	157-34- 5	W	SE-NW			B31-1	DNR
LAKE OF THE WOODS	157-34-14	W	SE-NE			40926	DNR
LAKE OF THE WOODS	157-34-21	W	SE-SE	EXXON		B35-1	DNR
LAKE OF THE WOODS	158-33- 2	W	NW-NW			B21-3	DNR
LAKE OF THE WOODS	158-33- 3	W	NE-NW			B21-2	DNR
LAKE OF THE WOODS	158-33- 6	W	SE-SE			MSD-1	DNR
LAKE OF THE WOODS	158-33-19	W	SE-SE			B24-4	DNR
LAKE OF THE WOODS	158-33-30	W	NE-NE	EXXON		B24-3	DNR
LAKE OF THE WOODS	158-33-30	W	NE-NE			B24-1	DNR
LAKE OF THE WOODS	158-33-30	W	NE-NE			B24-2	DNR
LAKE OF THE WOODS	158-33-32	W	NW-NW			MED-1	DNR
LAKE OF THE WOODS	158-33-32	W	NW-SW	EXXON		B58-1	DNR
LAKE OF THE WOODS	158-34-11	W	SE-SW	AMSELCO		MQD-1	DNR
LAKE OF THE WOODS	158-34-11	W	SE-SW			MQD-2	DNR
LAKE OF THE WOODS	158-34-11	W	SW-SE			B-0-1	DNR
LAKE OF THE WOODS	158-34-12	W	NE-SE			MDD-1	DNR
LAKE OF THE WOODS	158-34-17	W	NW-NW			B54-1	DNR
LAKE OF THE WOODS	158-34-25	W	SW-NE			MMD-1	DNR
LAKE OF THE WOODS	158-34-25	W	SE-SE			B5-1	DNR
LAKE OF THE WOODS	159-32-12	W	SW-SE	RIDGE	CN-7831	BD-1	DNR
LAKE OF THE WOODS	159-32-14	W	NE-SW			BD-3	DNR
LAKE OF THE WOODS	159-32-15	W	SE-SW			BD-2	DNR
LAKE OF THE WOODS	159-32-27	W	SE-NW	MOORE	CN-7816	B-8-2	DNR
LAKE OF THE WOODS	159-33-25	W	SE-SE			40919	DNR
LAKE OF THE WOODS	159-33-29	W	SE-SW			40920	DNR
LAKE OF THE WOODS	159-33-34	W	SE-SE			B21-1	DNR
LAKE OF THE WOODS	159-36-15	W	NW-NW	HOUSTON O&M	CN-8126	YWQ-1	DNR
LAKE OF THE WOODS	160-30- 9	W	SW-SW	HUMBLE	CN-7835-N	B-57	DNR
LAKE OF THE WOODS	160-30- 9	W	SW-SW			B-57-1	DNR
LAKE OF THE WOODS	160-30-16	W	NE-NW			B-3-3	DNR
LAKE OF THE WOODS	160-30-17	W	NE-NE	AMOCO	CN-7956	B-3-1	DNR
LAKE OF THE WOODS	160-30-17	W	NE-NE			B-3-2	DNR
LAKE OF THE WOODS	160-30-23	W	NW-NW			B-7-1	DNR

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
LAKE OF THE WOODS	160-30-23	W	NW-NW			B-7-2	DNR
LAKE OF THE WOODS	160-30-23	W	NW-NW			B-7-3	DNR
LAKE OF THE WOODS	160-30-31	W	SE-NE	TEXASGULF	CN-7276	R.R. 16-1	DNR
LINCOLN	110-44-33	W	NW-SE	USGS		2	USBM
LINCOLN	112-46-7	W	SE-SW	NJ. ZINC		E-1A	USBM
LYON	109-41-4	W	NW-NE	USGS		K-1	USBM
LYON	109-41-7	W	SE-SW	USGS		K-4	USBM
LYON	109-41-9	W	NW-NW	USGS		K-3	USBM
LYON	109-42-8	W	SW-SW	USGS		UNK	USBM
LYON	109-42-17	W	NE-NE	USGS		UNK	USBM
LYON	109-42-17	W	NE-NE	USGS		UNK-1	USBM
LYON	109-42-24	W	SE-SE	USGS		K-2	USBM
LYON	109-43-16	W	SW-NW	USGS		F-3	USBM
LYON	109-43-17	W	SW-SE	USGS		F-1	USBM
LYON	109-43-21	W	NW-NE	USGS		F-2	USBM
LYON	110-40-8	W	SW-SW	USGS		UNK	USBM
LYON	110-42-26	W	NE-SW	USGS		K-6	USBM
LYON	110-43-13	W	NE-NE	USGS		K-5	USBM
LYON	110-43-28	W	NE-NE	USGS		UNK	USBM
LYON	110-43-28	W	SW-NE	USGS		UNK	USBM
LYON	110-43-30	W	SW-NW	USGS		UNK	USBM
LYON	111-40-6	W	NW-NW	USGS		W-14	USBM
LYON	111-41-2	W	SW-NE	USGS		W-10	USBM
LYON	111-41-2	W	SW-NW	USGS		W-9	USBM
LYON	111-41-3	W	NE-SW	USGS		UNK	USBM
LYON	111-41-6	W	NW-NW	USGS		R-5	USBM
LYON	111-41-7	W	SW-SW	USGS		UNK	USBM
LYON	111-41-7	W	SE-SW	USGS		OBS-2	USBM
LYON	111-41-7	W	SE-SW	USGS		OBS-3	USBM
LYON	111-41-7	W	NW-SE	USGS		OBS-1	USBM
LYON	111-41-8	W	SW-NW	USGS		P-3	USBM
LYON	111-41-8	W	NE-SW	USGS		UNK	USBM
LYON	111-41-8	W	NW-SW	USGS		P-2	USBM
LYON	111-41-8	W	SE-SW	USGS		P-1	USBM
LYON	111-41-8	W	NW-SE	USGS		P-4	USBM
LYON	111-41-8	W	SE-SE	USGS		T-1	USBM
LYON	111-41-9	W	SW-SE	USGS		T-3	USBM
LYON	111-41-10	W	SE-NE	USGS		W-7	USBM
LYON	111-41-10	W	SW-SW	USGS		T-5	USBM
LYON	111-41-12	W	SW-SE	USGS		Z-8	USBM
LYON	111-41-16	W	SW-NE	USGS		W-6	USBM
LYON	111-41-16	W	SW-SE	USGS		W-5	USBM
LYON	111-41-17	W	NE-NW	USGS		P-6	USBM
LYON	111-41-17	W	SE-SW	USGS		UNK	USBM
LYON	111-41-18	W	NE-NE	USGS		P-5	USBM
LYON	111-41-18	W	SE-SE	USGS		P-7	USBM
LYON	111-41-20	W	SW-SE	USGS		W-1	USBM
LYON	111-41-21	W	NE-NW	USGS		W-4	USBM
LYON	111-41-21	W	SW-NW	USGS		W-3	USBM
LYON	111-41-23	W	NW-NE	USGS		Z-5	USBM
LYON	111-41-27	W	NW-NE	USGS		Z-2	USBM
LYON	111-41-27	W	SE-SW	USGS		Z-1	USBM
LYON	111-42-1	W	NE-SW	USGS		R-4	USBM
LYON	111-42-1	W	SW-SW	USGS		R-3	USBM
LYON	111-42-10	W	SE-SE	USGS		R-1	USBM
LYON	111-42-11	W	NE-NW	USGS		R-2	USBM
LYON	111-42-24	W	SE-SE	USGS		UNK	USBM
LYON	111-42-24	W	SE-SE	USGS		UNK-1	USBM
LYON	111-43-26	W	NW-SE	USGS		UNK	USBM
LYON	111-43-26	W	NW-SE	USGS		UNK-1	USBM
LYON	112-40-15	W	NW-SE	USGS		UNK	USBM
LYON	112-40-30	W	SW-SE	USGS		W-13	USBM
LYON	112-40-31	W	SW-NW	USGS		W-12	USBM
LYON	112-41-2	W	NE-NW	USGS		G-4	USBM
LYON	112-41-2	W	SW-NW	USGS		G-3	USBM
LYON	112-41-2	W	SE-NW	USGS		G-2	USBM
LYON	112-41-24	W	NW-NE	USGS		X-6	USBM
LYON	112-41-26	W	NE-NW	USGS		UNK	USBM
LYON	112-41-26	W	NE-NW	USGS		X-4	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
LYON	112-41-29	W	SE-NE	USGS		R-10	USBM
LYON	112-41-31	W	SE-NE	USGS		R-8	USBM
LYON	112-41-31	W	NE-SW	USGS		R-7	USBM
LYON	112-41-32	W	NW-SE	MN HWY DEPT		T-2	USBM
LYON	112-41-33	W	NW-SE	MN HWY DEPT		T-1	USBM
LYON	112-41-34	W	SW-SW	USGS		X-1	USBM
LYON	112-41-36	W	SW-SE	USGS		W-11	USBM
LYON	112-42- 6	W	NE-NE	USGS		UNK	USBM
LYON	112-42- 8	W	SW-NE	USGS		UNK	USBM
LYON	112-42-24	W	NW-SW	USGS		V-6	USBM
LYON	112-42-27	W	NE-NE	USGS		V-4	USBM
LYON	112-42-34	W	NW-NE	USGS		V-1	USBM
LYON	112-42-34	W	NW-NE	USGS		V-2	USBM
LYON	112-43-24	W	SE-SE	USGS		UNK	USBM
LYON	113-40- 9	W	NW-SE	USGS		A-1	USBM
LYON	113-40- 9	W	NW-SE	USGS		CD-3	USBM
LYON	113-40- 9	W	SW-SE	USGS		CD-2	USBM
LYON	113-41-10	W	SE-SE	USGS		UNK	USBM
LYON	113-41-13	W	SW-NW	USGS		UNK	USBM
LYON	113-41-13	W	SW-SW	USGS		UNK-1	USBM
LYON	113-41-14	W	SE-SE	USGS		UNK	USBM
LYON	113-41-19	W	SW-NE	USGS		UNK	USBM
LYON	113-41-35	W	SE-SE	USGS		G-1	USBM
LYON	113-42- 7	W	NW-NW	USGS		H-1	USBM
LYON	113-43-25	W	SE-NW	USGS		M-4	USBM
LYON	113-43-25	W	NW-SW	USGS		M-6	USBM
LYON	113-43-26	W	NW-SE	USGS		M-10	USBM
LYON	113-43-26	W	NW-SE	USGS		M-5	USBM
LYON	113-43-26	W	SE-SE	USGS		M-7	USBM
LYON	113-43-35	W	SE-SE	USGS		M-1	USBM
LYON	113-43-36	W	NE-NE	USGS		M-3	USBM
LYON	113-43-36	W	NW-NW	USGS		M-2	USBM
MARSHALL	154-45- 4	W	NW-NW	USGS		J-5B	USBM
MARSHALL	154-46- 2	W	NW-NW	USGS		J-3	USBM
MARSHALL	155-39- 1	W	SE-SW	LEHMANN		STAR-3	DNR
MARSHALL	155-39- 4	W	NW-NW	LEHMANN		STAR-2	DNR
MARSHALL	155-41- 5	W	NE-NW	LEHMANN		STAR-1	DNR
MARSHALL	155-43-33	W	NE-NW	USGS		UNK	USBM
MARSHALL	155-43-33	W	NW-NW	USGS		J-2	USBM
MARSHALL	155-44-20	W	NE-SE	USGS		J-6A	USBM
MARSHALL	155-45- 2	W	SW-SW	USGS		H-4	USBM
MARSHALL	155-45- 2	W	SW-SW	USGS		H-4A	USBM
MARSHALL	155-45-33	W	NW-SE	USGS		UNK	USBM
MARSHALL	155-46- 2	W	SW-SE	USGS		H-6	USBM
MARSHALL	155-46- 2	W	SW-SE	USGS		H-6A	USBM
MARSHALL	155-46-31	W	SE-SW	USGS		J-4	USBM
MARSHALL	155-47- 1	W	SW-NE	USGS		M-13	USBM
MARSHALL	155-47- 1	W	NE-NW	USGS		M-17	USBM
MARSHALL	155-47- 1	W	NE-NW	USGS		M-18	USBM
MARSHALL	155-47- 1	W	NW-NW	USGS		M-19	USBM
MARSHALL	155-47- 1	W	SW-NW	USGS		M-16	USBM
MARSHALL	155-47- 1	W	SE-NW	USGS		M-14	USBM
MARSHALL	155-47- 1	W	SE-NW	USGS		M-15	USBM
MARSHALL	155-47- 1	W	NE-SW	USGS		M-25	USBM
MARSHALL	155-47- 1	W	SW-SW	USGS		M-22	USBM
MARSHALL	155-47- 1	W	SW-SW	USGS		M-23	USBM
MARSHALL	155-47- 2	W	NE-SW	USGS		M-1	USBM
MARSHALL	155-47- 2	W	NE-SE	USGS		M-20	USBM
MARSHALL	155-47- 2	W	SE-SE	USGS		M-21	USBM
MARSHALL	155-47- 6	W	SW-SW	USGS		H-1	USBM
MARSHALL	155-47-10	W	SE-SE	USGS		M-8	USBM
MARSHALL	155-47-11	W	NE-NE	USGS		H-2	USBM
MARSHALL	155-47-11	W	NE-NE	USGS		M-35	USBM
MARSHALL	155-47-11	W	NE-NE	USGS		M-50	USBM
MARSHALL	155-47-11	W	NE-NE	USGS		M-51	USBM
MARSHALL	155-47-11	W	NE-NE	USGS		M-52	USBM
MARSHALL	155-47-11	W	NE-NE	USGS		M-6	USBM
MARSHALL	155-47-11	W	NW-NE	USGS		M-39	USBM
MARSHALL	155-47-11	W	SW-NE	USGS		M-36	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
MARSHALL	155-47-11	W	SE-NE	USGS		M-37	USBM
MARSHALL	155-47-11	W	SE-NW	USGS		M-40	USBM
MARSHALL	155-47-11	W	SE-NW	USGS		M-41	USBM
MARSHALL	155-47-11	W	SE-NW	USGS		M-42	USBM
MARSHALL	155-47-11	W	NE-SW	USGS		M-24	USBM
MARSHALL	155-47-11	W	NE-SW	USGS		M-5	USBM
MARSHALL	155-47-11	W	SW-SW	USGS		M-7	USBM
MARSHALL	155-47-11	W	SE-SW	USGS		M-11	USBM
MARSHALL	155-47-11	W	SE-SW	USGS		M-26	USBM
MARSHALL	155-47-11	W	SW-SE	USGS		M-9	USBM
MARSHALL	155-47-12	W	NW-NE	USGS		M-2	USBM
MARSHALL	155-47-12	W	NE-NW	USGS		M-3	USBM
MARSHALL	155-47-12	W	NE-NW	USGS		M-4	USBM
MARSHALL	155-47-12	W	NW-NW	USGS		M-49	USBM
MARSHALL	155-47-12	W	NW-NW	USGS		M-53	USBM
MARSHALL	155-47-12	W	SW-NW	USGS		M-12	USBM
MARSHALL	155-47-12	W	SW-NW	USGS		M-38	USBM
MARSHALL	155-47-12	W	SW-SW	USGS		M-10	USBM
MARSHALL	155-47-14	W	SW-NE	USGS		M-29	USBM
MARSHALL	155-47-14	W	SW-NW	USGS		M-43	USBM
MARSHALL	155-47-14	W	SE-NW	USGS		M-27	USBM
MARSHALL	155-47-14	W	SE-NW	USGS		M-28	USBM
MARSHALL	155-47-14	W	NE-SE	USGS		M-30	USBM
MARSHALL	155-47-15	W	NE-SE	USGS		M-44	USBM
MARSHALL	155-47-15	W	SW-SE	USGS		M-47	USBM
MARSHALL	155-47-15	W	SW-SE	USGS		M-48	USBM
MARSHALL	155-47-15	W	SE-SE	USGS		M-45	USBM
MARSHALL	155-47-15	W	SE-SE	USGS		M-46	USBM
MARSHALL	155-47-23	W	NW-NE	USGS		M-31	USBM
MARSHALL	155-47-23	W	NE-NW	USGS		M-32	USBM
MARSHALL	155-47-23	W	NE-NW	USGS		M-33	USBM
MARSHALL	155-47-23	W	NW-NW	USGS		M-34	USBM
MARSHALL	155-47-30	W	NE-NE	USGS		UNK	USBM
MARSHALL	155-47-34	W	SE-SW	USGS		J-6	USBM
MARSHALL	155-49-36	W	SW-SW	USGS		J-1	USBM
MARSHALL	156-42-31	W	SE-NE	EXXON		GS-1	DNR
MARSHALL	156-43- 4	W	SW-SE	USGS		G-5	USBM
MARSHALL	156-43-11	W	SE-NE	USGS		G-6	USBM
MARSHALL	156-43-28	W	SW-SW	USGS		H-3	USBM
MARSHALL	156-44- 1	W	SE-SE	USGS		G-7	USBM
MARSHALL	156-44-10	W	NW-NW	USGS		G-8A	USBM
MARSHALL	156-44-32	W	SW-NE	USGS		H-5	USBM
MARSHALL	156-45- 1	W	SE-SE	USGS		G-4	USBM
MARSHALL	156-45- 4	W	SE-SW	USGS		G-3	USBM
MARSHALL	156-45-11	W	NE-NW	USGS		G-9A	USBM
MARSHALL	156-46- 1	W	SW-SE	USGS		G-11	USBM
MARSHALL	156-46- 2	W	SE-SW	USGS		G-8	USBM
MARSHALL	156-46-17	W	NE-NE	USGS		G-10	USBM
MARSHALL	156-47- 8	W	SE-SW	USGS		G-1	USBM
MARSHALL	156-47-13	W	NW-NW	USGS		G-9	USBM
MARSHALL	156-47-15	W	NE-NW	USGS		G-12	USBM
MARSHALL	156-48-15	W	NE-NE	USGS		G-2	USBM
MARSHALL	157-39- 2	W	NW-SW	TEXAS GULF	CN-8417	MR-2-84	DNR
MARSHALL	157-39- 2	W	SW-SW	TEXAS GULF	CN-8417	MR-1-84	DNR
MARSHALL	157-39- 3	W	NE-SW	EXXON	CN-7965	G-1	DNR
MARSHALL	157-43- 3	W	SW-SW	USGS		F-3	USBM
MARSHALL	157-43- 5	W	SW-SW	USGS		F-10	USBM
MARSHALL	157-44- 7	W	SW-NE	USGS		F-4	USBM
MARSHALL	157-44- 9	W	NE-NW	USGS		F-9	USBM
MARSHALL	157-44-11	W	NE-NW	USGS		F-7	USBM
MARSHALL	157-45- 1	W	SW-SW	USGS		F-12	USBM
MARSHALL	157-45- 4	W	NE-NE	USGS		F-11	USBM
MARSHALL	157-45- 4	W	SE-SE	USGS		F-5	USBM
MARSHALL	157-45- 7	W	NE-NE	USGS		F-11	USBM
MARSHALL	157-46- 2	W	NW-NW	USGS		F-6	USBM
MARSHALL	157-46- 2	W	NE-SE	USGS		F-8	USBM
MARSHALL	157-46- 2	W	NE-SE	USGS		F-8-A	USBM
MARSHALL	157-48- 4	W	SW-NW	USGS		F-1	USBM
MARSHALL	158-40-15	W	NW-SE			M-1	DNR

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
MARSHALL	158-46-31	W	SW-NE	USGS		F-11A	USBM
MARSHALL	158-47-23	W	NW-SW	NDGS		RRVD-30	NDGS
MARSHALL	158-47-32	W	SE-NW	USGS		F-2	USBM
MARSHALL	158-50-20	W	NW-SE	MGS		887	USBM
MARTIN	104-32- 1	W	SE-SW	MARATHON		SQ-9	DNR
MEEKER	118-31-10	W	NW-SE	TEXASGULF WESTERN		BKV-81-1	DNR
MEEKER	119-29-29	W	NW-SE	TEXASGULF WESTERN		NB-81-1	DNR
MEEKER	119-32-15	W	SW-SE	TEXASGULF WESTERN		LL-81-1	DNR
MEEKER	121-30- 6	W	SE-SW	USGS		W-8	USBM
MEEKER	121-31- 1	W	SE-SE	USGS		W-10	USBM
MEEKER	121-31- 1	W	SE-SE	USGS		W-11	USBM
MEEKER	121-31- 1	W	SE-SE	USGS		W-7	USBM
MEEKER	121-31-12	W	NE-NE	USGS		W-9	USBM
MILLE LACS	37-27-26	W	NW-SE	MN HWY DEPT		T-1	USBM
MORRISON	40-28-36	W	SE-SW	MDNR		R-1	DNR
MORRISON	40-32-17	W	NW-SE	MN HWY DEPT		T-2	USBM
MORRISON	40-32-20	W	NW-SE	MN HWY DEPT		T-1	USBM
MORRISON	40-32-27	W	NW-SE	MN HWY DEPT		T-1	USBM
MORRISON	41-32-26	W	NW-SE	MN HWY DEPT		T-1	USBM
MORRISON	41-32-26	W	NW-SE	MN HWY DEPT		T-3	USBM
MORRISON	41-32-27	W	NW-SE	MN HWY DEPT		T-2	USBM
MORRISON	41-32-27	W	NW-SE	MN HWY DEPT		T-3	USBM
MORRISON	41-32-27	W	NW-SE	MN HWY DEPT		T-4	USBM
MORRISON	42-29- 2	W	SE-SE	MGS		2004	MGS
MORRISON	42-29- 3	W	SW-SE	MGS		2003	MGS
MORRISON	42-30- 1	W	NE-NE	MGS		2002	MGS
MORRISON	42-30-21	W	NW-SE	HENRY BOLTON		1	USBM
MORRISON	42-30-21	W	NW-SE	HENRY BOLTON		2	USBM
MORRISON	127-29- 5	W	NW-NW	IRRRRC		1	DNR
MORRISON	127-29- 5	W	NW-NW	IRRRRC		2	DNR
MORRISON	127-29- 5	W	NW-NW	IRRRRC		3	DNR
MORRISON	127-29- 5	W	NW-NW	IRRRRC		4	DNR
MORRISON	127-30- 8	W	SW-SW	MGS		2007	MGS
MORRISON	127-31-29	W	SE-NE	MGS		2008	MGS
MORRISON	128-30-15	W	SE-SE	MGS		2005	MGS
MORRISON	129-29- 7	W	NW-SE	MN HWY DEPT		T-1	USBM
MORRISON	129-29- 7	W	NW-SE	MN HWY DEPT		T-2	USBM
MORRISON	129-29- 8	W	NW-SE	MN HWY DEPT		T-1	USBM
MORRISON	130-30- 6	W	NW-SE	USBM		104	USBM
MORRISON	130-30- 6	W	NW-SE	USBM		105	USBM
MORRISON	130-30- 6	W	NW-SE	USBM		107	USBM
MORRISON	130-30- 6	W	NW-SE	USBM		108	USBM
MORRISON	130-30- 6	W	NW-SE	USBM		109	USBM
MORRISON	130-30- 6	W	NW-SE	USBM		110	USBM
MORRISON	130-30- 6	W	NW-SE	USBM		111	USBM
MORRISON	130-30- 6	W	NW-SE	USBM		112	USBM
MORRISON	130-30- 6	W	NW-SE	USBM		113	USBM
MORRISON	130-30- 6	W	NW-SE	USBM		117	USBM
MORRISON	130-30- 6	W	NW-SE	USBM		118	USBM
MORRISON	130-31-21	W	NW-SW	MGS		2001	MGS
MORRISON	131-30-16	W	NW-SE	USBM		704	USBM
MORRISON	131-30-16	W	NW-SE	USBM		706	USBM
MORRISON	131-30-16	W	NW-SE	USBM		707	USBM
MORRISON	131-30-16	W	NW-SE	USBM		709	USBM
MORRISON	131-30-16	W	NW-SE	USBM		721	USBM
MORRISON	131-30-16	W	NW-SE	USBM		723	USBM
MORRISON	131-30-16	W	NW-SE	USBM		731	USBM
MORRISON	131-30-16	W	NW-SE	USBM		732	USBM
MORRISON	131-30-31	W	NW-SE	USBM		101	USBM
MORRISON	131-30-31	W	NW-SE	USBM		102	USBM
MORRISON	131-30-31	W	NW-SE	USBM		103	USBM
MORRISON	131-30-31	W	NW-SE	USBM		114	USBM
MORRISON	131-30-31	W	NW-SE	USBM		115	USBM
MORRISON	131-30-31	W	NW-SE	USBM		116	USBM
MORRISON	131-30-31	W	NW-SE	USBM		201	USBM
MORRISON	131-30-31	W	NW-SE	USBM		202	USBM
MORRISON	131-30-31	W	NW-SE	USBM		203	USBM
MORRISON	131-30-31	W	NW-SE	USBM		204	USBM
MORRISON	131-30-31	W	NW-SE	USBM		205	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
MORRISON	131-30-31	W	NW-SE	USBM		206	USBM
MORRISON	131-30-31	W	NW-SE	USBM		207	USBM
MORRISON	131-30-31	W	NW-SE	USBM		208	USBM
MORRISON	131-30-31	W	NW-SE	USBM		209	USBM
MORRISON	131-30-31	W	NW-SE	USBM		210	USBM
MORRISON	131-30-31	W	NW-SE	USBM		211	USBM
MORRISON	131-30-31	W	NW-SE	USBM		212	USBM
MORRISON	131-31-17	W	NW-SE	UNK		721	DNR
MORRISON	131-31-17	W	NW-SE	USBM		722	USBM
MORRISON	131-31-23	W	SE-NW	UNK		401	OTHER
MORRISON	131-31-23	W	SE-NW	UNK		402	OTHER
MORRISON	131-31-23	W	SE-NW	UNK		403	OTHER
MORRISON	131-31-23	W	SE-NW	UNK		407	OTHER
MORRISON	131-31-23	W	NW-SE	UNK		404	OTHER
MORRISON	131-31-26	W	SE-NW	UNK		405	OTHER
MORRISON	131-31-26	W	SE-NW	UNK		406	OTHER
MORRISON	132-30- 7	W	NW-SE	USBM		716	USBM
MORRISON	132-30- 7	W	NW-SE	USBM		717	USBM
MORRISON	132-30-11	W	NW-SE	USBM		712	USBM
MORRISON	132-30-14	W	NW-SE	USBM		715	USBM
MORRISON	132-30-18	W	NW-SE	USBM		711	USBM
MORRISON	132-30-18	W	NW-SE	USBM		713	USBM
MORRISON	132-30-18	W	NW-SE	USBM		714	USBM
MORRISON	132-30-36	W	NW-SE	USBM		701	USBM
MORRISON	132-30-36	W	NW-SE	USBM		702	USBM
MORRISON	132-30-36	W	NW-SE	USBM		703	USBM
MORRISON	132-30-36	W	NW-SE	USBM		705	USBM
MORRISON	132-30-36	W	NW-SE	USBM		708	USBM
MORRISON	132-30-36	W	NW-SE	USBM		710	USBM
MORRISON	132-30-36	W	NW-SE	USBM		UNK	USBM
MORRISON	132-31- 6	W	NW-NW	MGS		1911	MGS
MORRISON	132-31-21	W	SE-SE	MGS		1998	MGS
MORRISON	133-30-29	W	NW-NE	MGS		1997	MGS
MOWER	102-18-27	W	NW-SE	MN HWY DEPT		T-1	USBM
MOWER	102-18-27	W	NW-SE	MN HWY DEPT		T-2	USBM
MOWER	102-18-27	W	NW-SE	MN HWY DEPT		T-3	USBM
MOWER	102-18-27	W	NW-SE	MN HWY DEPT		T-4	USBM
MOWER	103-14-11	W	NW-SE	MN HWY DEPT		T-1	USBM
MOWER	103-14-11	W	NW-SE	MN HWY DEPT		T-2	USBM
MOWER	103-14-23	W	NW-SE	MN HWY DEPT		T-1	USBM
MOWER	103-14-23	W	NW-SE	MN HWY DEPT		T-2	USBM
MOWER	103-17-29	W	NW-SE	MN HWY DEPT		T-1	USBM
MOWER	103-17-29	W	NW-SE	MN HWY DEPT		T-3	USBM
MOWER	103-18-33	W	NW-SE	MN HWY DEPT		T-1	USBM
MOWER	103-18-33	W	NW-SE	MN HWY DEPT		T-3	USBM
MURRAY	105-43-34	W	SW-SE	MARATHON		SQ-7	DNR
NICOLLET	110-30-21	W	NW-SE	MN HWY DEPT		T-20	USBM
NICOLLET	110-30-21	W	NW-SE	MN HWY DEPT		T-23	USBM
NOBLES	101-39-11	W	SW-SW	EXXON		RL-1	DNR
NOBLES	101-39-20	W	SW-SE	EXXON		RL-2	DNR
NOBLES	101-40- 2	W	NW-SE	USGS		W-13	USBM
NOBLES	101-40-10	W	NW-SW	USGS		W-11	USBM
NOBLES	101-40-27	W	SW-SE	USGS		W-24	USBM
NOBLES	101-40-27	W	SE-SE	USGS		W-22A	USBM
NOBLES	101-40-27	W	SE-SE	USGS		W-22B	USBM
NOBLES	101-40-27	W	SE-SE	USGS		W-23	USBM
NOBLES	101-40-27	W	SE-SE	USGS		W-25	USBM
NOBLES	101-40-31	W	SE-NW	USGS		B-1	USBM
NOBLES	101-40-31	W	SE-NW	USGS		B-3	USBM
NOBLES	101-40-33	W	NW-NW	USGS		W-12	USBM
NOBLES	101-41- 9	W	NE-NE	USGS		W-5	USBM
NOBLES	102-39-14	W	NW-NE	USGS		W-21	USBM
NOBLES	102-39-27	W	SW-SW	USGS		W-16	USBM
NOBLES	102-39-28	W	NW-NE	USGS		W-15	USBM
NOBLES	102-39-28	W	SE-SW	USGS		W-14	USBM
NOBLES	102-39-32	W	NE-NW	USGS		W-26	USBM
NOBLES	102-40- 7	W	SW-NW	USGS		W56-7	USBM
NOBLES	102-40- 7	W	NE-SW	USGS		W56-8	USBM
NOBLES	102-40- 7	W	NW-SW	USGS		W56-4	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
NOBLES	102-40- 7	W	SW-SW	USGS		W56-5	USBM
NOBLES	102-40-15	W	NW-NW	USGS		W56-10	USBM
NOBLES	102-40-15	W	NW-NW	USGS		W56-9	USBM
NOBLES	102-40-15	W	SW-SE	USGS		E-1	USBM
NOBLES	102-40-15	W	SW-SE	USGS		E-2	USBM
NOBLES	102-40-16	W	NE-NE	USGS		W56-11	USBM
NOBLES	102-40-22	W	SE-NW	USGS		W-9	USBM
NOBLES	102-40-23	W	NW-SW	USGS		W-10	USBM
NOBLES	102-40-24	W	NE-SE	USGS		W-27	USBM
NOBLES	102-40-24	W	SW-SE	USGS		W-7	USBM
NOBLES	102-40-25	W	NW-NW	USGS		W57-4	USBM
NOBLES	102-40-25	W	NW-NW	USGS		W57-5	USBM
NOBLES	102-40-26	W	NE-NE	USGS		W56-1	USBM
NOBLES	102-40-26	W	NW-NE	USGS		W57-6	USBM
NOBLES	102-40-26	W	SW-NE	USGS		W57-2	USBM
NOBLES	102-40-26	W	NW-NW	USGS		W57-3	USBM
NOBLES	102-40-27	W	SW-SW	USGS		P-1	USBM
NOBLES	102-40-27	W	SW-SW	USGS		W56-2	USBM
NOBLES	102-40-27	W	SW-SW	USGS		W56-3	USBM
NOBLES	102-40-27	W	SW-SW	USGS		W56-6	USBM
NOBLES	102-40-34	W	NE-NW	USGS		W57-9	USBM
NOBLES	102-40-34	W	NW-NW	USGS		W57-7	USBM
NOBLES	102-40-34	W	SE-NW	USGS		W57-8	USBM
NOBLES	102-41-10	W	SE-SE	USGS		W-2	USBM
NOBLES	102-41-17	W	NW-SE	USGS		WF-21	USBM
NOBLES	102-41-17	W	NW-SE	USGS		WF-22	USBM
NOBLES	102-41-17	W	NW-SE	USGS		WF-24	USBM
NOBLES	102-41-17	W	NW-SE	USGS		WF-4	USBM
NOBLES	102-41-22	W	NE-NE	USGS		W-1	USBM
NOBLES	102-41-34	W	SW-SW	USGS		W-8	USBM
NOBLES	103-41- 4	W	NE-NE	USGS		W-19	USBM
NOBLES	103-41- 4	W	SW-SW	USGS		W-17	USBM
NOBLES	104-40-35	W	NW-NE	USGS		W-20	USBM
NORMAN	143-44-34	W	SW-NE			HL-1	DNR
NORMAN	143-45- 5	W	NW-NW	EXXON		W-1	DNR
NORMAN	143-45-20	W	NW-NE			RK-1	DNR
NORMAN	143-46-12	W	NE-SE	EXXON		W-1	DNR
NORMAN	144-44- 9	W	SE-NE	EXXON		E-1	DNR
NORMAN	144-44- 9	W	SE-NE	EXXON		E-2	DNR
NORMAN	144-46- 1	W	SW-SW	EXXON		K-1	DNR
NORMAN	145-43- 7	W	NW-SW	EXXON		GD-1	DNR
NORMAN	145-44-15	W	SW-NE			ST-2	DNR
NORMAN	145-44-15	W	NE-SE	EXXON		ST-3	DNR
NORMAN	145-44-15	W	NW-SE			ST-1	DNR
NORMAN	145-45- 8	W	NE-SE	EXXON		GM-1	DNR
NORMAN	145-45-14	W	SE-NW	EXXON		FL-1	DNR
NORMAN	145-47-15	W	NW-SW	NDGS		RRVD-26	NDGS
NORMAN	146-44-36	W	SE-SE			GA-1	DNR
OLMSTED	105-13- 3	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	105-13- 3	W	NW-SE	MN HWY DEPT		T-3	USBM
OLMSTED	105-13- 5	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	105-13- 5	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	105-13- 7	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	105-13- 7	W	NW-SE	MN HWY DEPT		T-3	USBM
OLMSTED	105-14-12	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	105-14-22	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	105-14-22	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	105-14-31	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	105-14-32	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	106-11-28	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	106-11-28	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	106-11-29	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	106-11-30	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	106-12-27	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	106-12-27	W	NW-SE	MN HWY DEPT		T-1A	USBM
OLMSTED	106-12-27	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	106-12-27	W	NW-SE	MN HWY DEPT		T-2A	USBM
OLMSTED	106-12-27	W	NW-SE	MN HWY DEPT		T-3	USBM
OLMSTED	106-12-27	W	NW-SE	MN HWY DEPT		T-3A	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
OLMSTED	106-12-29	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	106-12-29	W	NW-SE	MN HWY DEPT		T-1A	USBM
OLMSTED	106-12-29	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	106-12-30	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	106-13-19	W	NW-SE	MN HWY DEPT		T-3	USBM
OLMSTED	106-13-19	W	NW-SE	MN HWY DEPT		T-3A	USBM
OLMSTED	106-13-20	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	106-13-26	W	NW-SE	MN HWY DEPT	N.W.	T-2	USBM
OLMSTED	106-13-26	W	NW-SE	MN HWY DEPT		T-3	USBM
OLMSTED	106-13-26	W	NW-SE	MN HWY DEPT		T-4	USBM
OLMSTED	106-13-26	W	NW-SE	MN HWY DEPT		T-6	USBM
OLMSTED	106-13-27	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	106-13-27	W	NW-SE	MN HWY DEPT		T-1A	USBM
OLMSTED	106-13-28	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	106-13-28	W	NW-SE	MN HWY DEPT		T-3	USBM
OLMSTED	106-13-34	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	106-14- 2	W	NW-SE	MN HWY DEPT		T-7	USBM
OLMSTED	106-14- 3	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	106-14-10	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	106-14-10	W	NW-SE	MN HWY DEPT		T-1A	USBM
OLMSTED	106-14-10	W	NW-SE	MN HWY DEPT		T-1B	USBM
OLMSTED	106-14-10	W	NW-SE	MN HWY DEPT		T-1C	USBM
OLMSTED	106-14-10	W	NW-SE	MN HWY DEPT		T-1D	USBM
OLMSTED	106-14-10	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	106-14-10	W	NW-SE	MN HWY DEPT		T-3	USBM
OLMSTED	106-14-10	W	NW-SE	MN HWY DEPT		T-3A	USBM
OLMSTED	106-14-10	W	NW-SE	MN HWY DEPT		T-3B	USBM
OLMSTED	106-14-10	W	NW-SE	MN HWY DEPT		T-4	USBM
OLMSTED	106-14-11	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	106-14-11	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	106-14-11	W	NW-SE	MN HWY DEPT		T-2A	USBM
OLMSTED	106-14-14	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	106-14-14	W	NW-SE	MN HWY DEPT		T-1A	USBM
OLMSTED	106-14-14	W	NW-SE	MN HWY DEPT		T-4	USBM
OLMSTED	106-14-14	W	NW-SE	MN HWY DEPT		T-5	USBM
OLMSTED	106-14-14	W	NW-SE	MN HWY DEPT		T-6	USBM
OLMSTED	106-14-15	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	106-14-19	W	NW-SE	MN HWY DEPT		T-5	USBM
OLMSTED	106-14-24	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	107-11-33	W	NW-SE	MN HWY DEPT		T-2	USBM
OLMSTED	107-11-34	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	107-14-16	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	107-14-16	W	NW-SE	MN HWY DEPT		T-11	USBM
OLMSTED	107-14-16	W	NW-SE	MN HWY DEPT		T-12	USBM
OLMSTED	107-14-16	W	NW-SE	MN HWY DEPT		T-14	USBM
OLMSTED	107-14-16	W	NW-SE	MN HWY DEPT		T-16	USBM
OLMSTED	107-14-16	W	NW-SE	MN HWY DEPT		T-17	USBM
OLMSTED	107-14-16	W	NW-SE	MN HWY DEPT		T-4	USBM
OLMSTED	107-14-16	W	NW-SE	MN HWY DEPT		T-7	USBM
OLMSTED	107-14-16	W	NW-SE	MN HWY DEPT		T-8	USBM
OLMSTED	108-14-11	W	NW-SE	MN HWY DEPT		T-1	USBM
OLMSTED	108-14-11	W	NW-SE	MN HWY DEPT		T-2	USBM
OTTER TAIL	132-37-34	W	SW-SE	MGS		1646	MGS
OTTER TAIL	132-37-34	W	SW-SE	MGS		1647	MGS
OTTER TAIL	133-36- 1	W	NW-NW	MGS		1642	MGS
OTTER TAIL	134-44-21	W	SE-SW	NDGS		RRVD-24	NDGS
OTTER TAIL	135-37- 1	W	NE-SE	HANNA		7-1	OTHER
OTTER TAIL	136-40- 7	W	SW-SW	HANNA		2-1	OTHER
OTTER TAIL	136-41-34	W	NW-SE	USBM		MC-1	USBM
OTTER TAIL	137-39-22	W	SE-SE			3-1	OTHER
OTTER TAIL	137-39-22	W	SE-SE	HANNA		3-2	OTHER
OTTER TAIL	137-39-22	W	SE-SE	HANNA		3-3	OTHER
OTTER TAIL	137-39-22	W	SE-SE	HANNA		3-4	OTHER
PINE	43-20-11	W	NW-SE	MN HWY DEPT		T-1	USBM
PINE	43-20-11	W	NW-SE	MN HWY DEPT		T-2	USBM
PINE	43-20-11	W	NW-SE	MN HWY DEPT		T-3	USBM
PINE	43-20-11	W	NW-SE	MN HWY DEPT		T-4	USBM
PINE	44-21- 1	W	SE-SW	MARTIN-TROST		PR-1	DNR
PINE	44-21-10	W	NE-SW	MARTIN-TROST		RS-1	DNR

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
PINE	44-21-10	W	SW-SW	MARTIN-TROST		RS-2	DNR
PINE	45-17-20	W	NW-SE	MN HWY DEPT		T-5	USBM
PINE	45-17-20	W	NW-SE	MN HWY DEPT		T-6	USBM
PINE	45-19-11	W	NW-NW	ROCKY MT. ENERGY		MLCH-13	DNR
PINE	45-20-3	W	NW-NW	ENERGY RESERVES		KR-2	DNR
PINE	45-20-4	W	SW-SE	ENERGY RESERVES		KRCH-8	DNR
PINE	45-20-7	W	SE-NE	ROCKY MT. ENERGY		MLCH-8	DNR
PINE	45-20-8	W	NW-NW	ROCKY MT. ENERGY		ML-27	DNR
PINE	45-20-10	W	NW-NW	MARTIN-TROST		JW-1	DNR
PINE	45-20-19	W	SW-SW	MARTIN-TROST		DRP-1	DNR
PINE	45-20-19	W	SW-SW	MARTIN-TROST		DRP-2	DNR
PINE	45-20-20	W	SW-SW	ROCKY MT. ENERGY		ML-42C	DNR
PINE	45-20-20	W	SE-SE	ROCKY MT. ENERGY		ML-22	DNR
PINE	45-20-28	W	NW-NW	ROCKY MT. ENERGY		ML-55CA	DNR
PINE	45-20-29	W	NE-NE	ROCKY MT. ENERGY		ML-44C	DNR
PINE	45-20-29	W	NE-NE	ROCKY MT. ENERGY		ML-50C	DNR
PINE	45-20-29	W	NE-NE	ROCKY MT. ENERGY		ML-51C	DNR
PINE	45-20-29	W	NE-NE	ROCKY MT. ENERGY		ML-54C	DNR
PINE	45-20-29	W	NE-NE	ROCKY MT. ENERGY		MLCH-10	DNR
PINE	45-20-29	W	NE-NE			ML-56C	DNR
PINE	45-20-29	W	NE-NE			ML-45C	DNR
PINE	45-20-29	W	NE-NE			ML-49C	DNR
PINE	45-20-29	W	NE-NE			ML-53C	DNR
PINE	45-20-29	W	NE-NE			MLCH-6	DNR
PINE	45-20-29	W	NE-NE			ML-43C	DNR
PINE	45-20-29	W	SE-NE	ROCKY MT. ENERGY		ML-52C	DNR
PINE	45-20-29	W	NW-NW	ROCKY MT. ENERGY		ML-19	DNR
PINE	45-20-29	W	SW-NW	ROCKY MT. ENERGY		ML-20	DNR
PINE	45-20-29	W	NW-SW	ROCKY MT. ENERGY		ML-21	DNR
PINE	45-20-29	W	NW-SE			ML-23	DNR
PINE	45-21-1	W	NE-NW	ENERGY RESERVES		KRCH-1	DNR
PINE	45-21-9	W	NE-NW	MARTIN-TROST		D-1	DNR
PINE	45-21-9	W	SE-NW			D-2	DNR
PINE	45-21-11	W	SE-SE	ROCKY MT. ENERGY		ML-26	DNR
POLK	148-45-19	W	NW-SE			P4-B	DNR
POLK	149-43-26	W	NW-SE	SOLAR GAS		L2	USBM
POLK	149-43-26	W	NW-SE	SOLAR GAS		L3	USBM
POLK	149-43-26	W	NW-SE	SOLAR GAS		L4	USBM
POLK	152-49-11	W	SW-SE	NDGS		RRVD-27	NDGS
POPE	123-40-32	W	SE-SW	U.S. STEEL		27008	DNR
POPE	124-39-21	W	SW-SW	U.S. STEEL		27009	DNR
RED LAKE	150-44-10	W	SW-SW	NDGS		RRVD-28	NDGS
REDWOOD	109-38-35	W	NW-NE	USGS		UNK	USBM
REDWOOD	109-39-14	W	SW-SE	USGS		UNK1	USBM
REDWOOD	112-35-6	W	SW-NW	USGS		RF-25	USBM
REDWOOD	112-35-19	W	SE-SE	USGS		RF-33	USBM
REDWOOD	112-36-1	W	SW-NW	USGS		RF-14	USBM
REDWOOD	112-36-1	W	SW-SW	USGS		RF-11	USBM
REDWOOD	112-36-1	W	SW-SW	USGS		RF-12	USBM
REDWOOD	112-36-1	W	SE-SW	USGS		BUCKLEY	USBM
REDWOOD	112-36-2	W	SW-SE	USGS		RF-13	USBM
REDWOOD	112-36-2	W	SE-SE	USGS		RF-10	USBM
REDWOOD	112-36-11	W	NE-NE	USGS		RF-15	USBM
REDWOOD	112-36-11	W	NE-NE	USGS		RF-20	USBM
REDWOOD	112-36-11	W	NW-SW	USGS		RF-5	USBM
REDWOOD	112-36-12	W	NW-NE	USGS		RF-19	USBM
REDWOOD	112-36-12	W	SE-NE	USGS		RF-21	USBM
REDWOOD	112-36-12	W	NE-NW	USGS		RF-16	USBM
REDWOOD	112-36-12	W	NW-NW	USGS		1	USBM
REDWOOD	112-36-12	W	NW-NW	USGS		2	USBM
REDWOOD	112-36-12	W	NW-NW	USGS		RF-24	USBM
REDWOOD	112-36-12	W	SW-NW	USGS		RF-23	USBM
REDWOOD	112-36-12	W	SE-NW	USGS		RF-18	USBM
REDWOOD	112-36-12	W	NW-SW	USGS		RF-17	USBM
REDWOOD	112-36-12	W	NE-SE	USGS		RF-22	USBM
REDWOOD	112-36-13	W	NW-SE	USGS		RF-2	USBM
REDWOOD	112-36-13	W	SW-SE	USGS		RF-36	USBM
REDWOOD	112-36-14	W	NE-NE	USGS		RF-1	USBM
REDWOOD	112-36-14	W	NW-NE	USGS		RF-38	USBM
REDWOOD	112-36-14	W	NW-NE	USGS		RF-40	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
REDWOOD	112-36-14	W	NW-NE	USGS		RF-41	USBM
REDWOOD	112-36-18	W	NW-NE	USGS		RF-34	USBM
REDWOOD	112-36-18	W	NW-SW	USGS		RF-3	USBM
REDWOOD	112-36-22	W	SE-SE	USGS		RF-32	USBM
REDWOOD	112-36-23	W	SW-SW	USGS		RF-29	USBM
REDWOOD	112-36-24	W	NW-SE	USGS		RF-27	USBM
REDWOOD	112-36-24	W	SE-SE	USGS		RF-30	USBM
REDWOOD	112-36-25	W	SE-NW	USGS		RF-26	USBM
REDWOOD	112-36-25	W	SE-SW	USGS		RF-35	USBM
REDWOOD	112-36-36	W	NW-NE	USGS		RF-31	USBM
RICE	109-21- 1	W	NW-SE	MN HWY DEPT		T-1	USBM
RICE	109-21- 1	W	NW-SE	MN HWY DEPT		T-2	USBM
RICE	110-21-24	W	NW-SE	MN HWY DEPT		T-1	USBM
RICE	110-21-24	W	NW-SE	MN HWY DEPT		T-2	USBM
RICE	110-21-24	W	NW-SE	MN HWY DEPT		T-3	USBM
RICE	110-21-26	W	NW-SE	MN HWY DEPT		T-1	USBM
RICE	110-21-26	W	NW-SE	MN HWY DEPT		T-2	USBM
RICE	110-21-35	W	NW-SE	MN HWY DEPT		T-1	USBM
RICE	110-21-35	W	NW-SE	MN HWY DEPT		T-1A	USBM
RICE	110-21-35	W	NW-SE	MN HWY DEPT		T-2	USBM
RICE	110-21-35	W	NW-SE	MN HWY DEPT		T-2A	USBM
RICE	110-21-35	W	NW-SE	MN HWY DEPT		T-3	USBM
RICE	110-21-35	W	NW-SE	MN HWY DEPT		T-3A	USBM
RICE	111-20- 1	W	NW-SE	MN HWY DEPT		T-1	USBM
RICE	111-20- 1	W	NW-SE	MN HWY DEPT		T-2	USBM
RICE	112-20-36	W	NW-SE	MN HWY DEPT		T-1	USBM
RICE	112-20-36	W	NW-SE	MN HWY DEPT		T-2	USBM
RICE	112-20-36	W	NW-SE	MN HWY DEPT		T-3	USBM
RICE	112-21-14	W	NW-NW	N NATURAL GAS		L65-2	USBM
RICE	112-21-14	W	SW-SW	N NATURAL GAS		L65-1	USBM
ROSEAU	159-41-36	W	SW-NE	TEXAS GULF	CN-8431	W1-84	DNR
ROSEAU	159-43-25	W	NE-NE	USGS		E-3	USBM
ROSEAU	159-43-29	W	NW-NW	USGS		E-5	USBM
ROSEAU	159-44-20	W	NE-SW	USGS		E-6	USBM
ROSEAU	159-44-23	W	NW-SE	USGS		E-4	USBM
ROSEAU	159-44-23	W	NW-SE	USGS		E-4A	USBM
ROSEAU	160-42-32	W	NW-NE	NDGS		RRVD-29	NDGS
ROSEAU	160-43- 1	W	NW-NW	USGS		C-9	USBM
ROSEAU	160-43-33	W	SW-SE	USGS		D-5	USBM
ROSEAU	160-44-34	W	NW-NW	USGS		D-6	USBM
ROSEAU	161-36- 6	W	NW-SE			W3-1	DNR
ROSEAU	161-37- 9	W	NW-NW	EXXON		HC-1	DNR
ROSEAU	161-37-12	W	SE-NE			W1-1	DNR
ROSEAU	161-43-33	W	NE-NW	USGS		C-8	USBM
ROSEAU	161-44-30	W	SW-SW	USGS		G-6	USBM
ROSEAU	161-44-34	W	NE-NW	USGS		C-7	USBM
ROSEAU	162-36-10	W	NW-SW			W9-1	DNR
ROSEAU	162-36-18	W	SW-SW	EXXON		W13-1	DNR
ROSEAU	162-36-27	W	SW-SE	HOUSTON O&M		YGWA-1	DNR
ROSEAU	162-36-27	W	SW-SE	HOUSTON O&M		YGWA-2	DNR
ROSEAU	162-36-27	W	SW-SE	HOUSTON O&M		YWA-3	DNR
ROSEAU	162-36-27	W	SW-SE	HOUSTON O&M		YWA-4	DNR
ROSEAU	162-36-31	W	NW-NE	EXXON		BD-1	DNR
ROSEAU	162-36-31	W	NW-NE	EXXON		BD-2	DNR
ROSEAU	162-36-35	W	SE-NW	EXXON		W8-1	DNR
ROSEAU	162-37-14	W	SW-SW	EXXON	CN-8104	D-1	DNR
ROSEAU	162-37-27	W	NW-SW	EXXON		WB-1	DNR
ROSEAU	162-37-36	W	NE-NW	EXXON		SP-2	DNR
ROSEAU	162-37-36	W	NW-NW	EXXON		SP-1A	DNR
ROSEAU	162-43-28	W	SW-SW	USGS		B-6	USBM
ROSEAU	162-43-36	W	NW-NW	USGS		B-7	USBM
ROSEAU	162-44-15	W	SE-SE	USGS		B-10	USBM
ROSEAU	162-44-33	W	NE-SE	HOUSTON O&M		YGH-1	DNR
ROSEAU	162-44-35	W	NW-SW	HOUSTON O&M	CN-8227	YGH-2	DNR
ROSEAU	163-40-36	W	SE-SW	EXXON		J-1	DNR
ST. LOUIS	49-14- 4	W	NW-SE	MN HWY DEPT		T-121	USBM
ST. LOUIS	49-14- 4	W	NW-SE	MN HWY DEPT		T-123	USBM
ST. LOUIS	49-14- 4	W	NW-SE	MN HWY DEPT		T-124	USBM
ST. LOUIS	49-14- 4	W	NW-SE	MN HWY DEPT		T-3	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-346	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-347	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-354	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-356	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-357	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-360	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-366	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-394	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-395	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-396	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-397	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-398	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-399	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-400	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-479A	USBM
ST. LOUIS	49-14-4	W	NW-SE	MN HWY DEPT		T-479C	USBM
ST. LOUIS	49-15-12	W	NW-SE	MN HWY DEPT		T-1A	USBM
ST. LOUIS	49-15-12	W	NW-SE	MN HWY DEPT		T-2	USBM
ST. LOUIS	49-15-12	W	NW-SE	MN HWY DEPT		T-2A	USBM
ST. LOUIS	49-15-12	W	NW-SE	MN HWY DEPT		T-3	USBM
ST. LOUIS	49-15-14	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	49-15-14	W	NW-SE	MN HWY DEPT		T-2	USBM
ST. LOUIS	49-15-14	W	NW-SE	MN HWY DEPT		T-2A	USBM
ST. LOUIS	49-15-14	W	NW-SE	MN HWY DEPT		T-3	USBM
ST. LOUIS	49-15-14	W	NW-SE	MN HWY DEPT		T-6	USBM
ST. LOUIS	49-15-14	W	NW-SE	MN HWY DEPT		T-8	USBM
ST. LOUIS	49-15-14	W	NW-SE	MN HWY DEPT		T-9	USBM
ST. LOUIS	49-15-14	W	NW-SE	MN HWY DEPT		T1-F	USBM
ST. LOUIS	49-15-14	W	NW-SE	MN HWY DEPT		T1-H	USBM
ST. LOUIS	49-15-15	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	49-15-15	W	NW-SE	MN HWY DEPT		T-1A	USBM
ST. LOUIS	49-15-15	W	NW-SE	MN HWY DEPT		T-2	USBM
ST. LOUIS	49-15-16	W	NW-SE	MN HWY DEPT		T-2A	USBM
ST. LOUIS	49-15-16	W	NW-SE	MN HWY DEPT		T-4	USBM
ST. LOUIS	49-15-16	W	NW-SE	MN HWY DEPT		T-5	USBM
ST. LOUIS	49-15-20	W	NW-SE	MN HWY DEPT		T-2A	USBM
ST. LOUIS	49-15-20	W	NW-SE	MN HWY DEPT		T-4	USBM
ST. LOUIS	49-15-30	W	NW-SE	MN HWY DEPT		T-2A	USBM
ST. LOUIS	50-13-4	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	50-13-4	W	NW-SE	MN HWY DEPT		T-10	USBM
ST. LOUIS	50-13-4	W	NW-SE	MN HWY DEPT		T-13	USBM
ST. LOUIS	50-13-4	W	NW-SE	MN HWY DEPT		T-18	USBM
ST. LOUIS	50-13-4	W	NW-SE	MN HWY DEPT		T-2	USBM
ST. LOUIS	50-13-4	W	NW-SE	MN HWY DEPT		T-21	USBM
ST. LOUIS	50-13-4	W	NW-SE	MN HWY DEPT		T-24	USBM
ST. LOUIS	50-13-4	W	NW-SE	MN HWY DEPT		T-3	USBM
ST. LOUIS	50-13-4	W	NW-SE	MN HWY DEPT		T-4	USBM
ST. LOUIS	50-13-4	W	NW-SE	MN HWY DEPT		T-5	USBM
ST. LOUIS	50-13-4	W	NW-SE	MN HWY DEPT		T-6	USBM
ST. LOUIS	50-14-1	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	50-14-1	W	NW-SE	MN HWY DEPT		T-2	USBM
ST. LOUIS	50-14-4	W	NW-SE	MN HWY DEPT		T-478	USBM
ST. LOUIS	50-14-4	W	NW-SE	MN HWY DEPT		T-479	USBM
ST. LOUIS	50-14-8	W	NW-SE	MN HWY DEPT		T-3	USBM
ST. LOUIS	50-14-13	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	50-14-13	W	NW-SE	MN HWY DEPT		T-1A	USBM
ST. LOUIS	50-14-13	W	NW-SE	MN HWY DEPT		T-2	USBM
ST. LOUIS	50-14-13	W	NW-SE	MN HWY DEPT		T-4	USBM
ST. LOUIS	50-14-18	W	NW-SE	MN HWY DEPT		T-3	USBM
ST. LOUIS	50-14-23	W	NW-SE	MN HWY DEPT		T-660	USBM
ST. LOUIS	50-14-23	W	NW-SE	MN HWY DEPT		T-662	USBM
ST. LOUIS	50-14-23	W	NW-SE	MN HWY DEPT		T-663	USBM
ST. LOUIS	50-14-23	W	NW-SE	MN HWY DEPT		T-678	USBM
ST. LOUIS	50-14-26	W	NW-SE	MN HWY DEPT		T-642	USBM
ST. LOUIS	50-14-26	W	NW-SE	MN HWY DEPT		T-646	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		LT-103	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		LT-104	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-10	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-125	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-127	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-128	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-1A	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-1A	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-2	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-2A	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-3	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-4A	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-527	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-534	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-535	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-537	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-538	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-545	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-546	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-547	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-548	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-549	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-554	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-556	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-556A	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-557	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-559	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-563	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-564	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-565	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-566	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-567	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-568	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-569	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-570	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-571	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-572	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-576	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-577	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-578	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-590	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-591	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-598	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-602	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-603	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-605	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-606	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-607	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-610	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-610A	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-610B	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-612	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-613	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-614	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-615	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-620	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-626	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-629	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-635	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-636	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-637	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-638	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-639	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-640	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-641	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-6A	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-8	USBM
ST. LOUIS	50-14-27	W	NW-SE	MN HWY DEPT		T-9	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-12	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-122	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-16	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-18	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-21	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-25	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-27	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-28	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-3	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-300	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-300A	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-302	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-304A	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-323	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-324	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-325	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-327	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-328	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-329	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-330	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-331	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-332	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-512A	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-512C	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-518	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-520C	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-592	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-593	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-594	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-804	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		T-805	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		TP-13A	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		TP-16A	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		TP-16B	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		TP-27B	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		TP-29A	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		TP-2A	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		TP-32B	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		TP-33A	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		TP-40A	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		TP-40B	USBM
ST. LOUIS	50-14-33	W	NW-SE	MN HWY DEPT		TP-8B	USBM
ST. LOUIS	50-14-34	W	NW-SE	MN HWY DEPT		LT-101	USBM
ST. LOUIS	50-14-34	W	NW-SE	MN HWY DEPT		T-516	USBM
ST. LOUIS	50-14-34	W	NW-SE	MN HWY DEPT		T-517	USBM
ST. LOUIS	50-14-34	W	NW-SE	MN HWY DEPT		T-521	USBM
ST. LOUIS	50-14-34	W	NW-SE	MN HWY DEPT		T-523	USBM
ST. LOUIS	50-14-34	W	NW-SE	MN HWY DEPT		T-524	USBM
ST. LOUIS	50-14-34	W	NW-SE	MN HWY DEPT		T-530	USBM
ST. LOUIS	50-14-34	W	NW-SE	MN HWY DEPT		T-531	USBM
ST. LOUIS	50-14-34	W	NW-SE	MN HWY DEPT		T-540	USBM
ST. LOUIS	50-14-34	W	NW-SE	MN HWY DEPT		T-542	USBM
ST. LOUIS	50-15-12	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	51-13-25	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	51-13-33	W	NW-SE	MN HWY DEPT		T-2	USBM
ST. LOUIS	51-14-33	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	51-17-16	W	SE-SE	MGS		2028	MGS
ST. LOUIS	51-17-28	W	NE-SE	EXXON		GL-1	OTHER
ST. LOUIS	52-12-26	W	SW-SE			3	OTHER
ST. LOUIS	52-15-22	W	NW-SW	M.P. & L.		MPL-1	DNR
ST. LOUIS	53-14-7	W	NW-NE			IV-9	DNR
ST. LOUIS	53-14-7	W	SW-NE			IV-7	DNR
ST. LOUIS	53-14-7	W	SE-NE			IV-6	DNR
ST. LOUIS	53-14-7	W	SE-NE			IV-8	DNR
ST. LOUIS	53-14-8	W	SW-NW			IV-1	DNR
ST. LOUIS	53-15-24	W	NW-NW	PHELPS-DODGE	CN-7085	VII-3A	DNR
ST. LOUIS	53-15-25	W	NW-SE			V-2	DNR
ST. LOUIS	53-15-36	W	SW-NE	PHELPS-DODGE	CN-7087	V-3	DNR
ST. LOUIS	53-15-36	W	NE-NW	PHELPS-DODGE	CN-7087	V-1	DNR
ST. LOUIS	53-15-36	W	NW-SE			UNK	OTHER
ST. LOUIS	53-19-10	W	NE-NE	U.S. STEEL		27003	DNR
ST. LOUIS	53-19-32	W	NW-SE	MGS		2034	MGS

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	53-19-32	W	SE-SE	U.S. STEEL		27002	DNR
ST. LOUIS	53-19-33	W	NE-NW	U.S. STEEL		27001	DNR
ST. LOUIS	54-14-9	W	SE-SE			I-6	DNR
ST. LOUIS	54-14-10	W	SW-NW			I-1A	DNR
ST. LOUIS	54-14-10	W	SE-NW			I-5A	DNR
ST. LOUIS	54-14-14	W	SE-SW	PHELPS-DODGE		VIII-4A	DNR
ST. LOUIS	54-14-16	W	NE-NE			I-7	DNR
ST. LOUIS	54-14-16	W	SW-NE			I-12	DNR
ST. LOUIS	54-14-16	W	SE-NE			I-9	DNR
ST. LOUIS	54-14-16	W	SE-NW			I-3	DNR
ST. LOUIS	54-14-16	W	NE-SW			I-10	DNR
ST. LOUIS	54-14-16	W	NE-SW			I-2	DNR
ST. LOUIS	54-14-16	W	SE-SW			I-8	DNR
ST. LOUIS	54-14-16	W	NW-SE			I-13	DNR
ST. LOUIS	54-14-16	W	NW-SE			I-4	DNR
ST. LOUIS	54-14-23	W	NE-NW			VIII-2	DNR
ST. LOUIS	54-18-18	W	NE-NW	MGS		2029	MGS
ST. LOUIS	55-14-9	W	NW-SE			CV-2	DNR
ST. LOUIS	55-14-29	W	NW-SW			CV-1	DNR
ST. LOUIS	55-18-6	W	NW-NW	MGS		2032	MGS
ST. LOUIS	55-20-14	W	SW-SW	MGS		2030	MGS
ST. LOUIS	56-13-31	W	NW-NE	PHELPS-DODGE		HL-2	DNR
ST. LOUIS	56-13-31	W	NW-NW	PHELPS-DODGE		HL-1A	DNR
ST. LOUIS	56-14-28	W	SE-NE	MDNR		CN-7	OTHER
ST. LOUIS	56-18-14	W	NW-SE	USGS		14-G	USBM
ST. LOUIS	56-18-15	W	NE-NW	USGS		A4	USBM
ST. LOUIS	56-18-15	W	NE-NW	USGS		A4-A	USBM
ST. LOUIS	56-18-31	W	NE-SW	MGS		2031	MGS
ST. LOUIS	56-20-5	W	NW-SE	USGS		5-B	USBM
ST. LOUIS	56-20-5	W	NW-SE	USGS		5-B-A	USBM
ST. LOUIS	56-20-5	W	NW-SE	USGS		5-R	USBM
ST. LOUIS	56-20-6	W	NW-SE	USGS		6-B	USBM
ST. LOUIS	56-20-6	W	NW-SE	USGS		6-D	USBM
ST. LOUIS	56-20-6	W	NW-SE	USGS		6-F	USBM
ST. LOUIS	56-20-6	W	NW-SE	USGS		6-F-A	USBM
ST. LOUIS	56-21-1	W	NW-SE	USGS		1-A	USBM
ST. LOUIS	56-21-1	W	NW-SE	USGS		1-D	USBM
ST. LOUIS	56-21-1	W	NW-SE	USGS		1-D-1	USBM
ST. LOUIS	56-21-3	W	NW-SE	USGS		3-A	USBM
ST. LOUIS	56-21-3	W	NW-SE	USGS		3-A-A	USBM
ST. LOUIS	56-21-3	W	NW-SE	USGS		3-B	USBM
ST. LOUIS	56-21-3	W	NW-SE	USGS		3-B-A	USBM
ST. LOUIS	56-21-12	W	NW-SE	USGS		12-0	USBM
ST. LOUIS	57-14-16	W	NE-NE			II-3	DNR
ST. LOUIS	57-14-16	W	SE-NE			II-1	DNR
ST. LOUIS	57-14-16	W	SE-NE			II-4	DNR
ST. LOUIS	57-14-16	W	SE-SW			II-2	DNR
ST. LOUIS	57-14-16	W	NE-SE			II-6	DNR
ST. LOUIS	57-14-16	W	NW-SE			II-5	DNR
ST. LOUIS	57-14-28	W	NE-NE	BEAR CREEK		CN-8	USBM
ST. LOUIS	57-14-28	W	SW-NE	BEAR CREEK		CN-2	USBM
ST. LOUIS	57-14-28	W	SE-NE	BEAR CREEK		CN-7	USBM
ST. LOUIS	57-14-28	W	NE-SE	BEAR CREEK		CN-1	USBM
ST. LOUIS	57-14-28	W	NE-SE	BEAR CREEK		CN-4	USBM
ST. LOUIS	57-14-28	W	NW-SE	BEAR CREEK		CN-3	USBM
ST. LOUIS	57-14-28	W	SW-SE	BEAR CREEK		CN-5	USBM
ST. LOUIS	57-14-28	W	SW-SE	BEAR CREEK		CN-6	USBM
ST. LOUIS	57-14-28	W	SE-SE	BEAR CREEK		CN-9	USBM
ST. LOUIS	57-14-34	W	SE-SW			BC-80-1	DNR
ST. LOUIS	57-15-1	W	NW-SE	USGS		1-C	USBM
ST. LOUIS	57-15-6	W	NW-SE	USGS		6-E	USBM
ST. LOUIS	57-15-17	W	NW-SE	USGS		17-A	USBM
ST. LOUIS	57-15-17	W	NW-SE	USGS		17-C	USBM
ST. LOUIS	57-15-17	W	NW-SE	USGS		17-D	USBM
ST. LOUIS	57-16-1	W	NW-SE	USGS		1-C	USBM
ST. LOUIS	57-16-1	W	NW-SE	USGS		1-D	USBM
ST. LOUIS	57-16-1	W	NW-SE	USGS		1-M	USBM
ST. LOUIS	57-16-2	W	NW-SE	USGS		2-A	USBM
ST. LOUIS	57-16-2	W	NW-SE	USGS		2-A-A	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	57-16- 2	W	NW-SE	USGS		2-C	USBM
ST. LOUIS	57-16- 2	W	NW-SE	USGS		2-N	USBM
ST. LOUIS	57-16- 2	W	NW-SE	USGS		2-N-A	USBM
ST. LOUIS	57-16- 2	W	NW-SE	USGS		2-P	USBM
ST. LOUIS	57-16- 3	W	NW-SE	USGS		3-C	USBM
ST. LOUIS	57-16- 3	W	NW-SE	USGS		3-Q	USBM
ST. LOUIS	57-16- 3	W	NW-SE	USGS		3-R	USBM
ST. LOUIS	57-16- 4	W	NW-SE	USGS		4-E	USBM
ST. LOUIS	57-16- 4	W	NW-SE	USGS		4-L	USBM
ST. LOUIS	57-16- 4	W	NW-SE	USGS		4-Q	USBM
ST. LOUIS	57-16- 5	W	NW-SE	USGS		5-A	USBM
ST. LOUIS	57-16- 6	W	NW-SE	USGS		6-B	USBM
ST. LOUIS	57-16- 6	W	NW-SE	USGS		6-C	USBM
ST. LOUIS	57-16- 6	W	NW-SE	USGS		6-D	USBM
ST. LOUIS	57-16- 7	W	NW-SE	USGS		7-D	USBM
ST. LOUIS	57-16- 8	W	NW-SE	USGS		8-A	USBM
ST. LOUIS	57-16- 9	W	NW-SE	USGS		9-N	USBM
ST. LOUIS	57-16- 9	W	NW-SE	USGS		9-Q	USBM
ST. LOUIS	57-16- 9	W	NW-SE	USGS		9-R	USBM
ST. LOUIS	57-16-10	W	NW-SE	USGS		10-D	USBM
ST. LOUIS	57-16-11	W	NW-SE	USGS		11-E	USBM
ST. LOUIS	57-16-11	W	NW-SE	USGS		11-H	USBM
ST. LOUIS	57-16-12	W	NW-SE	USGS		12-N	USBM
ST. LOUIS	57-16-13	W	NW-SE	USGS		13-C	USBM
ST. LOUIS	57-16-13	W	NW-SE	USGS		13-G	USBM
ST. LOUIS	57-16-15	W	NW-SE	USGS		15-B	USBM
ST. LOUIS	57-16-15	W	NW-SE	USGS		15-D	USBM
ST. LOUIS	57-16-16	W	NW-SE	USGS		16-B	USBM
ST. LOUIS	57-16-16	W	NW-SE	USGS		16-B-A	USBM
ST. LOUIS	57-16-16	W	NW-SE	USGS		16-N	USBM
ST. LOUIS	57-16-17	W	NW-SE	USGS		17-C	USBM
ST. LOUIS	57-16-17	W	NW-SE	USGS		17-H	USBM
ST. LOUIS	57-16-17	W	NW-SE	USGS		17-J	USBM
ST. LOUIS	57-16-18	W	NW-SE	USGS		18-D	USBM
ST. LOUIS	57-16-18	W	NW-SE	USGS		18-M	USBM
ST. LOUIS	57-16-19	W	NW-SE	USGS		19-E	USBM
ST. LOUIS	57-16-21	W	NW-SE	USGS		21-E	USBM
ST. LOUIS	57-16-21	W	NW-SE	USGS		21-M	USBM
ST. LOUIS	57-17- 1	W	NE-NW	USGS		1-C	USBM
ST. LOUIS	57-17- 3	W	NW-SE	USGS		3-E	USBM
ST. LOUIS	57-17- 3	W	NW-SE	USGS		3-Q	USBM
ST. LOUIS	57-17- 4	W	NW-SE	USGS		4-J	USBM
ST. LOUIS	57-17- 4	W	NW-SE	USGS		4-R	USBM
ST. LOUIS	57-17- 8	W	NW-SE	USGS		8-D	USBM
ST. LOUIS	57-17- 8	W	NW-SE	USGS		8-R	USBM
ST. LOUIS	57-17- 8	W	NW-SE	USGS		8-R-A	USBM
ST. LOUIS	57-17- 9	W	NW-SE	USGS		9-H	USBM
ST. LOUIS	57-17- 9	W	NW-SE	USGS		9-K	USBM
ST. LOUIS	57-17-11	W	NW-SE	USGS		11-D	USBM
ST. LOUIS	57-17-11	W	NW-SE	USGS		11-M	USBM
ST. LOUIS	57-17-15	W	NE-NE	USGS		15-A	USBM
ST. LOUIS	57-17-16	W	NE-NE	USGS		16-A	USBM
ST. LOUIS	57-17-16	W	NW-NE	USGS		16-B	USBM
ST. LOUIS	57-17-16	W	NW-SE			3	
ST. LOUIS	57-17-16	W	NW-SE	USGS		16-E	USBM
ST. LOUIS	57-17-16	W	NW-SE	USGS		16-F	USBM
ST. LOUIS	57-17-16	W	NW-SE	USGS		16-N	USBM
ST. LOUIS	57-17-16	W	NW-SE	USGS		16-P	USBM
ST. LOUIS	57-17-17	W	NE-NW	USGS		17-C	USBM
ST. LOUIS	57-17-19	W	SW-SW	USGS		19-N	USBM
ST. LOUIS	57-17-20	W	NE-NE	USGS		20-A	USBM
ST. LOUIS	57-17-20	W	NW-SE	USGS		20-K	USBM
ST. LOUIS	57-17-21	W	SE-SW	USGS		21-P	USBM
ST. LOUIS	57-17-22	W	SW-SW	USGS		22-N	USBM
ST. LOUIS	57-17-22	W	SW-SE	USGS		22-Q	USBM
ST. LOUIS	57-17-23	W	SW-SW	USGS		23-N	USBM
ST. LOUIS	57-17-23	W	NW-SE	USGS		23-Q	USBM
ST. LOUIS	57-17-27	W	NW-NE	USGS		27-B	USBM
ST. LOUIS	57-17-29	W	SE-NE	USGS		29-H	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	57-17-29	W	SE-NW	USGS		29-F	USBM
ST. LOUIS	57-17-30	W	SE-NE	USGS		30-H	USBM
ST. LOUIS	57-17-30	W	NW-NW	USGS		30-D	USBM
ST. LOUIS	57-17-30	W	SE-NW	USGS		30-F	USBM
ST. LOUIS	57-17-31	W	NW-NW	USGS		31-D	USBM
ST. LOUIS	57-18-2	W	NE-NW	USGS		2-C	USBM
ST. LOUIS	57-18-2	W	NW-SW	USGS		2-M	USBM
ST. LOUIS	57-18-3	W	NE-NE	USGS		3-A	USBM
ST. LOUIS	57-18-3	W	NW-NE	USGS		3-B	USBM
ST. LOUIS	57-18-3	W	SW-NE	USGS		3-G	USBM
ST. LOUIS	57-18-3	W	NW-NW	USGS		3-D	USBM
ST. LOUIS	57-18-3	W	SE-NW	USGS		3-F	USBM
ST. LOUIS	57-18-3	W	SE-SW	USGS		3-P	USBM
ST. LOUIS	57-18-3	W	NW-SE	USGS		3-K	USBM
ST. LOUIS	57-18-4	W	SE-NE	USGS		4-H	USBM
ST. LOUIS	57-18-4	W	SE-SW	USGS		4-P	USBM
ST. LOUIS	57-18-5	W	NW-NE	USGS		5-B	USBM
ST. LOUIS	57-18-5	W	SW-NW	USGS		5-E	USBM
ST. LOUIS	57-18-5	W	NE-SW	USGS		5-L	USBM
ST. LOUIS	57-18-5	W	NW-SE	USGS		5-B-A	USBM
ST. LOUIS	57-18-5	W	SW-SE	USGS		5-O	USBM
ST. LOUIS	57-18-6	W	NE-NE	USGS		6-A	USBM
ST. LOUIS	57-18-6	W	NW-NE	USGS		6-B	USBM
ST. LOUIS	57-18-6	W	SE-NE	USGS		6-H	USBM
ST. LOUIS	57-18-6	W	NW-NW	USGS		6-D	USBM
ST. LOUIS	57-18-6	W	SW-SW	USGS		6-N	USBM
ST. LOUIS	57-18-6	W	NE-SE	USGS		6-J	USBM
ST. LOUIS	57-18-7	W	NW-NE	USGS		7-B	USBM
ST. LOUIS	57-18-7	W	NE-SW	USGS		7-L	USBM
ST. LOUIS	57-18-7	W	NW-SW	USGS		7-M	USBM
ST. LOUIS	57-18-8	W	NE-NE	USGS		8-A	USBM
ST. LOUIS	57-18-8	W	NW-NE	USGS		8-B	USBM
ST. LOUIS	57-18-8	W	NW-NW	USGS		8-D	USBM
ST. LOUIS	57-18-8	W	NW-SE	USGS		8-K	USBM
ST. LOUIS	57-18-9	W	SW-NE	USGS		9-G	USBM
ST. LOUIS	57-18-9	W	NW-NW	USGS		9-D	USBM
ST. LOUIS	57-18-9	W	NE-SW	USGS		9-L	USBM
ST. LOUIS	57-18-9	W	SW-SW	USGS		9-N	USBM
ST. LOUIS	57-18-10	W	NE-NE	USGS		10-A	USBM
ST. LOUIS	57-18-10	W	NW-NE	USGS		10-B	USBM
ST. LOUIS	57-18-10	W	NW-SE	USGS		10-O	USBM
ST. LOUIS	57-18-11	W	SW-SW	USGS		A-1	USBM
ST. LOUIS	57-18-13	W	SE-NE	USGS		13-H	USBM
ST. LOUIS	57-18-13	W	SE-NW	USGS		13-F	USBM
ST. LOUIS	57-18-13	W	SE-SE	USGS		13-R	USBM
ST. LOUIS	57-18-15	W	NE-SE	USGS		15-J	USBM
ST. LOUIS	57-18-16	W	NE-NW	USGS		16-C	USBM
ST. LOUIS	57-18-16	W	SE-NW	USGS		16-F	USBM
ST. LOUIS	57-18-17	W	NW-NW	USGS		17-D	USBM
ST. LOUIS	57-18-17	W	SW-SE	USGS		17-O	USBM
ST. LOUIS	57-18-18	W	NW-NE	USGS		18-B	USBM
ST. LOUIS	57-18-19	W	NE-NW	USGS		19-C	USBM
ST. LOUIS	57-18-20	W	NW-NW	USGS		20-D	USBM
ST. LOUIS	57-18-20	W	NE-SE	USGS		20-J	USBM
ST. LOUIS	57-18-20	W	SE-SE	USGS		20-R	USBM
ST. LOUIS	57-18-21	W	NE-NE	USGS		21-A	USBM
ST. LOUIS	57-18-21	W	NE-NW	USGS		21-C	USBM
ST. LOUIS	57-18-21	W	SW-SW	USGS		21-N	USBM
ST. LOUIS	57-18-22	W	SW-SW	USGS		22-N	USBM
ST. LOUIS	57-18-22	W	SE-SW	USGS		22-P	USBM
ST. LOUIS	57-18-23	W	NW-SW	USGS		23-M	USBM
ST. LOUIS	57-18-23	W	SW-SW	USGS		23-N	USBM
ST. LOUIS	57-18-23	W	NW-SE	USGS		23-G	USBM
ST. LOUIS	57-18-24	W	NE-NE	USGS		24-A	USBM
ST. LOUIS	57-18-24	W	NE-SE	USGS		24-J	USBM
ST. LOUIS	57-18-24	W	NE-SE	USGS		24-J-A	USBM
ST. LOUIS	57-18-25	W	SW-NE	USGS		25-G	USBM
ST. LOUIS	57-18-25	W	NE-SE	USGS		25-J	USBM
ST. LOUIS	57-18-25	W	NE-SE	USGS		25-J-A	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	57-18-26	W	NW-NE	USGS		26-B	USBM
ST. LOUIS	57-18-26	W	SE-SW	USGS		A-3	USBM
ST. LOUIS	57-18-26	W	NW-SE	USGS		26-F	USBM
ST. LOUIS	57-18-26	W	NW-SE	USGS		26-J	USBM
ST. LOUIS	57-18-26	W	NW-SE	USGS		26-L	USBM
ST. LOUIS	57-18-26	W	NW-SE	USGS		26-P	USBM
ST. LOUIS	57-18-27	W	NW-SE	USGS		27-A	USBM
ST. LOUIS	57-18-27	W	NW-SE	USGS		27-A-A	USBM
ST. LOUIS	57-18-27	W	NW-SE	USGS		D1	USBM
ST. LOUIS	57-18-27	W	NW-SE	USGS		D2	USBM
ST. LOUIS	57-18-27	W	NW-SE	USGS		D3	USBM
ST. LOUIS	57-18-27	W	NW-SE	USGS		J1	USBM
ST. LOUIS	57-18-27	W	NW-SE	USGS		J2	USBM
ST. LOUIS	57-18-27	W	SW-SE	USGS		27-Q	USBM
ST. LOUIS	57-18-29	W	NW-NW	USGS		29-D	USBM
ST. LOUIS	57-18-30	W	NE-NW	USGS		30-C	USBM
ST. LOUIS	57-18-34	W	NE-NW	USGS		34-C	USBM
ST. LOUIS	57-18-34	W	NW-NW	USGS		34-D	USBM
ST. LOUIS	57-18-34	W	NW-SE	USGS		A1	USBM
ST. LOUIS	57-18-34	W	NW-SE	USGS		J1	USBM
ST. LOUIS	57-18-34	W	NW-SE	USGS		J1-A	USBM
ST. LOUIS	57-18-35	W	NW-SE	USGS		N1	USBM
ST. LOUIS	57-18-35	W	NW-SE	USGS		N2	USBM
ST. LOUIS	57-19- 1	W	SW-NE	USGS		1-G	USBM
ST. LOUIS	57-19- 7	W	NW-NE	USGS		7-B	USBM
ST. LOUIS	57-19- 9	W	NW-SE	USGS		9-R1	USBM
ST. LOUIS	57-19-10	W	NW-SE	USGS		10-Q	USBM
ST. LOUIS	57-19-11	W	SW-SW	USGS		UNK	USBM
ST. LOUIS	57-19-12	W	NW-SW	USGS		12-M	USBM
ST. LOUIS	57-19-12	W	SW-SE	USGS		12-Q	USBM
ST. LOUIS	57-19-13	W	NE-NE	USGS		13-A	USBM
ST. LOUIS	57-19-14	W	NE-NW	USGS		14-C	USBM
ST. LOUIS	57-19-14	W	SW-SW	USGS		14-N	USBM
ST. LOUIS	57-19-16	W	NW-SE	USGS		16-6A	USBM
ST. LOUIS	57-19-21	W	SW-SE	USGS		21-Q	USBM
ST. LOUIS	57-19-22	W	SW-SE	USGS		22-Q	USBM
ST. LOUIS	57-19-23	W	NW-NE	USGS		23-B	USBM
ST. LOUIS	57-19-24	W	NE-NE	USGS		24-A	USBM
ST. LOUIS	57-19-24	W	NE-NW	USGS		24-C	USBM
ST. LOUIS	57-19-24	W	SW-SW	USGS		24-N	USBM
ST. LOUIS	57-19-25	W	NE-NE	USGS		25-A	USBM
ST. LOUIS	57-19-28	W	NW-NW	USGS		28-D	USBM
ST. LOUIS	57-19-29	W	NW-NW	USGS		29-D	USBM
ST. LOUIS	57-19-36	W	NW-NW	MGS		2033	MGS
ST. LOUIS	57-20- 1	W	NW-SE	USGS		1-R	USBM
ST. LOUIS	57-20- 2	W	NW-SE	USGS		2-N	USBM
ST. LOUIS	57-20- 2	W	NW-SE	USGS		2-R	USBM
ST. LOUIS	57-20- 4	W	NW-NW	USGS		15	USBM
ST. LOUIS	57-20- 4	W	NW-NW	USGS		8	USBM
ST. LOUIS	57-20- 4	W	NW-SE	USGS		4-F	USBM
ST. LOUIS	57-20- 7	W	SW-SW	USGS		2	USBM
ST. LOUIS	57-20- 7	W	NW-SE	USGS		7-J	USBM
ST. LOUIS	57-20-10	W	NW-SE	USGS		10-A	USBM
ST. LOUIS	57-20-10	W	NW-SE	USGS		10-B	USBM
ST. LOUIS	57-20-11	W	NW-SE	USGS		11-C	USBM
ST. LOUIS	57-20-12	W	NW-SE	USGS		12-C	USBM
ST. LOUIS	57-20-14	W	NW-SE	USGS		14-E	USBM
ST. LOUIS	57-20-14	W	NW-SE	USGS		14-L	USBM
ST. LOUIS	57-20-15	W	NW-SE	USGS		15-F	USBM
ST. LOUIS	57-20-15	W	NW-SE	USGS		15-K	USBM
ST. LOUIS	57-20-15	W	NW-SE	USGS		15-L	USBM
ST. LOUIS	57-20-15	W	NW-SE	USGS		15-R3	USBM
ST. LOUIS	57-20-16	W	NW-SE	USGS		16-E	USBM
ST. LOUIS	57-20-16	W	NW-SE	USGS		16-F	USBM
ST. LOUIS	57-20-16	W	NW-SE	USGS		16-K	USBM
ST. LOUIS	57-20-17	W	NW-SE	USGS		17-F	USBM
ST. LOUIS	57-20-17	W	NW-SE	USGS		17-K	USBM
ST. LOUIS	57-20-18	W	SW-NE	USGS		6	USBM
ST. LOUIS	57-20-18	W	SW-NE	USGS		6-A	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	57-20-18	W	NW-SE	USGS		18-L	USBM
ST. LOUIS	57-20-18	W	NW-SE	USGS		18-P	USBM
ST. LOUIS	57-20-18	W	NW-SE	USGS		4	USBM
ST. LOUIS	57-20-19	W	SW-NE	USGS		5	USBM
ST. LOUIS	57-20-19	W	SE-NE	USGS		13	USBM
ST. LOUIS	57-20-19	W	NW-SE	USGS		19-C	USBM
ST. LOUIS	57-20-19	W	NW-SE	USGS		19-E1	USBM
ST. LOUIS	57-20-19	W	NW-SE	USGS		19-H1	USBM
ST. LOUIS	57-20-19	W	NW-SE	USGS		19-P1	USBM
ST. LOUIS	57-20-19	W	NW-SE	USGS		19-Q2	USBM
ST. LOUIS	57-20-19	W	NW-SE	USGS		19-R1	USBM
ST. LOUIS	57-20-19	W	SW-SE	USGS		12	USBM
ST. LOUIS	57-20-20	W	SW-SW	USGS		10	USBM
ST. LOUIS	57-20-20	W	NW-SE	USGS		20-P1	USBM
ST. LOUIS	57-20-20	W	NW-SE	USGS		20-R1	USBM
ST. LOUIS	57-20-21	W	NW-SE	USGS		21-L1	USBM
ST. LOUIS	57-20-25	W	NW-SE	USGS		25-D1	USBM
ST. LOUIS	57-20-26	W	NW-SE	USGS		26-D2	USBM
ST. LOUIS	57-20-27	W	NW-SE	USGS		27-A1	USBM
ST. LOUIS	57-20-27	W	NW-SE	USGS		27-B1	USBM
ST. LOUIS	57-20-27	W	NW-SE	USGS		27-C1	USBM
ST. LOUIS	57-20-28	W	NW-SE	USGS		28-A1	USBM
ST. LOUIS	57-20-29	W	NW-SE	USGS		14	USBM
ST. LOUIS	57-20-29	W	NW-SE	USGS		29-E1	USBM
ST. LOUIS	57-20-29	W	NW-SE	USGS		29-H1	USBM
ST. LOUIS	57-20-29	W	NW-SE	USGS		29-H2	USBM
ST. LOUIS	57-20-30	W	NW-SE	USGS		30-D1	USBM
ST. LOUIS	57-20-30	W	NW-SE	USGS		30-R1	USBM
ST. LOUIS	57-20-31	W	NW-SE	USGS		31-D1	USBM
ST. LOUIS	57-20-31	W	NW-SE	USGS		31-D2	USBM
ST. LOUIS	57-20-31	W	NW-SE	USGS		31-K1	USBM
ST. LOUIS	57-20-31	W	NW-SE	USGS		31-R1	USBM
ST. LOUIS	57-20-32	W	NW-SE	USGS		32-D3	USBM
ST. LOUIS	57-20-32	W	NW-SE	USGS		32-N1	USBM
ST. LOUIS	57-21-7	W	NW-SE	USGS		7-7A	USBM
ST. LOUIS	57-21-13	W	NE-NE	USGS		13-7A	USBM
ST. LOUIS	57-21-13	W	SW-SE	USGS		MESABI	USBM
ST. LOUIS	57-21-14	W	NW-SE	USGS		14-E1	USBM
ST. LOUIS	57-21-14	W	NW-SE	USGS		14-K1	USBM
ST. LOUIS	57-21-14	W	NW-SE	USGS		14-K2	USBM
ST. LOUIS	57-21-15	W	NW-SE	USGS		15-R1	USBM
ST. LOUIS	57-21-15	W	NW-SE	USGS		15-R2	USBM
ST. LOUIS	57-21-20	W	NW-SE	USGS		20-J1	USBM
ST. LOUIS	57-21-21	W	NW-SE	USGS		21-J1	USBM
ST. LOUIS	57-21-21	W	NW-SE	USGS		21-K1	USBM
ST. LOUIS	57-21-21	W	NW-SE	USGS		21-L1	USBM
ST. LOUIS	57-21-22	W	NW-SE	USGS		22-B1	USBM
ST. LOUIS	57-21-22	W	NW-SE	USGS		22-B2	USBM
ST. LOUIS	57-21-22	W	NW-SE	USGS		22-L1	USBM
ST. LOUIS	57-21-23	W	NW-SE	USGS		23-A1	USBM
ST. LOUIS	57-21-23	W	NW-SE	USGS		23-G1	USBM
ST. LOUIS	57-21-24	W	NW-SE	USGS		16	USBM
ST. LOUIS	57-21-24	W	NW-SE	USGS		24-A1	USBM
ST. LOUIS	57-21-24	W	NW-SE	USGS		24-B1	USBM
ST. LOUIS	57-21-24	W	NW-SE	USGS		24-B2	USBM
ST. LOUIS	57-21-24	W	NW-SE	USGS		24-D1	USBM
ST. LOUIS	57-21-24	W	NW-SE	USGS		24-G1	USBM
ST. LOUIS	57-21-24	W	NW-SE	USGS		24-G2	USBM
ST. LOUIS	57-21-24	W	NW-SE	USGS		24-M1	USBM
ST. LOUIS	57-21-24	W	NW-SE	USGS		24-P1	USBM
ST. LOUIS	57-21-25	W	NW-SE	USGS		25-F1	USBM
ST. LOUIS	57-21-25	W	NW-SE	USGS		25-J1	USBM
ST. LOUIS	57-21-25	W	NW-SE	USGS		25-J2	USBM
ST. LOUIS	57-21-25	W	NW-SE	USGS		25-L1	USBM
ST. LOUIS	57-21-25	W	NW-SE	USGS		25-Q1	USBM
ST. LOUIS	57-21-25	W	NW-SE	USGS		25-R1	USBM
ST. LOUIS	57-21-26	W	NW-SE	USGS		26-B1	USBM
ST. LOUIS	57-21-26	W	NW-SE	USGS		26-H1	USBM
ST. LOUIS	57-21-26	W	NW-SE	USGS		26-H2	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	57-21-26	W	NW-SE	USGS		26-Q1	USBM
ST. LOUIS	57-21-26	W	NW-SE	USGS		26-Q2	USBM
ST. LOUIS	57-21-26	W	NW-SE	USGS		26-R1	USBM
ST. LOUIS	57-21-27	W	NW-SE	USGS		27-A1	USBM
ST. LOUIS	57-21-27	W	NW-SE	USGS		27-E1	USBM
ST. LOUIS	57-21-27	W	NW-SE	USGS		27-G1	USBM
ST. LOUIS	57-21-28	W	NW-SE	USGS		28-E1	USBM
ST. LOUIS	57-21-28	W	NW-SE	USGS		28-F1	USBM
ST. LOUIS	57-21-28	W	NW-SE	USGS		28-G1	USBM
ST. LOUIS	57-21-28	W	NW-SE	USGS		28-P1	USBM
ST. LOUIS	57-21-28	W	NW-SE	USGS		28-P2	USBM
ST. LOUIS	57-21-28	W	NW-SE	USGS		28-R1	USBM
ST. LOUIS	57-21-28	W	NW-SE	USGS		28-R2	USBM
ST. LOUIS	57-21-29	W	NW-SE	USGS		29-F1	USBM
ST. LOUIS	57-21-30	W	NW-SE	USGS		30-F1	USBM
ST. LOUIS	57-21-30	W	NW-SE	USGS		30-F2	USBM
ST. LOUIS	57-21-30	W	NW-SE	USGS		30-G1	USBM
ST. LOUIS	57-21-30	W	NW-SE	USGS		30-H1	USBM
ST. LOUIS	57-21-30	W	NW-SE	USGS		30-M1	USBM
ST. LOUIS	57-21-30	W	NW-SE	USGS		30-R1	USBM
ST. LOUIS	57-21-33	W	NW-SE	USGS		33-Q1	USBM
ST. LOUIS	57-21-33	W	NW-SE	USGS		33-Q2	USBM
ST. LOUIS	57-21-34	W	NW-SE	USGS		34-A1	USBM
ST. LOUIS	57-21-35	W	NW-SE	USGS		34-Q1	USBM
ST. LOUIS	57-21-36	W	NW-SE	USGS		36-C1	USBM
ST. LOUIS	57-21-36	W	NW-SE	USGS		36-C2	USBM
ST. LOUIS	57-21-36	W	NW-SE	USGS		36-Q1	USBM
ST. LOUIS	58-14-3	W	NE-NE	EXXON		W-15	DNR
ST. LOUIS	58-14-3	W	NW-NW	EXXON		W-5	DNR
ST. LOUIS	58-14-4	W	SE-NW	BEAR CREEK		A3-2	USBM
ST. LOUIS	58-14-4	W	SE-SW	BEAR CREEK		A3-1	USBM
ST. LOUIS	58-14-4	W	NE-SE	EXXON		W-4	DNR
ST. LOUIS	58-14-4	W	SW-SE	BEAR CREEK		A2-7	USBM
ST. LOUIS	58-14-4	W	SE-SE	BEAR CREEK		A2-6	USBM
ST. LOUIS	58-14-7	W	NW-SE	USGS		7-P1	USBM
ST. LOUIS	58-14-8	W	NW-SE	USGS		8-P1	USBM
ST. LOUIS	58-14-8	W	NW-SE	USGS		8-R1	USBM
ST. LOUIS	58-14-9	W	NE-NE	BEAR CREEK		A2-3	USBM
ST. LOUIS	58-14-9	W	NE-NE	BEAR CREEK		A2-4	USBM
ST. LOUIS	58-14-9	W	NW-NE	BEAR CREEK		A2-2	USBM
ST. LOUIS	58-14-9	W	NE-SE	BEAR CREEK		A2-1	USBM
ST. LOUIS	58-14-9	W	NE-SE	BEAR CREEK		A2-5	USBM
ST. LOUIS	58-14-17	W	NW-SE	USGS		17-D1	USBM
ST. LOUIS	58-14-18	W	NW-SE	USGS		18-A	USBM
ST. LOUIS	58-14-22	W	NW-SE	EXXON		A-1	USBM
ST. LOUIS	58-14-22	W	NW-SE	EXXON		A-2	USBM
ST. LOUIS	58-14-22	W	NW-SE	EXXON		A-3	USBM
ST. LOUIS	58-14-22	W	NW-SE	EXXON		A-4	USBM
ST. LOUIS	58-14-22	W	NW-SE	EXXON		A-5	USBM
ST. LOUIS	58-14-34	W	NW-SE	USBM		3	USBM
ST. LOUIS	58-15-3	W	SW-NW	USGS		3-C1	USBM
ST. LOUIS	58-15-4	W	NW-SE	USGS		4-C2	USBM
ST. LOUIS	58-15-8	W	NW-SE	USGS		8-J1	USBM
ST. LOUIS	58-15-9	W	NW-NE	USGS		9-B	USBM
ST. LOUIS	58-15-9	W	NW-SE	USGS		9-B1	USBM
ST. LOUIS	58-15-9	W	NW-SE	USGS		9-G1	USBM
ST. LOUIS	58-15-9	W	NW-SE	USGS		9-M1	USBM
ST. LOUIS	58-15-9	W	NW-SE	USGS		9-Q1	USBM
ST. LOUIS	58-15-10	W	SE-NE	USGS		1	USBM
ST. LOUIS	58-15-10	W	SE-NE	USGS		2	USBM
ST. LOUIS	58-15-10	W	NE-NW	USGS		10-C	USBM
ST. LOUIS	58-15-10	W	SE-NW	USGS		3	USBM
ST. LOUIS	58-15-10	W	SE-SW	USGS		10-P	USBM
ST. LOUIS	58-15-10	W	NW-SE	USGS		10-H2	USBM
ST. LOUIS	58-15-10	W	NW-SE	USGS		10-J1	USBM
ST. LOUIS	58-15-10	W	SW-SE	USGS		10-Q	USBM
ST. LOUIS	58-15-10	W	SW-SE	USGS		4	USBM
ST. LOUIS	58-15-10	W	SE-SE	USGS		10-R	USBM
ST. LOUIS	58-15-13	W	NW-NE	USGS		13-B	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	58-15-14	W	SW-SW	USGS		5	USBM
ST. LOUIS	58-15-15	W	NW-NW	USGS		15-D	USBM
ST. LOUIS	58-15-15	W	SW-NW	USGS		15-E	USBM
ST. LOUIS	58-15-15	W	NW-SW	USGS		15-M	USBM
ST. LOUIS	58-15-15	W	SE-SW	USGS		15-P	USBM
ST. LOUIS	58-15-15	W	NW-SE	USGS		15-A1	USBM
ST. LOUIS	58-15-15	W	NW-SE	USGS		15-A2	USBM
ST. LOUIS	58-15-15	W	NW-SE	USGS		15-B1	USBM
ST. LOUIS	58-15-15	W	NW-SE	USGS		15-P1	USBM
ST. LOUIS	58-15-16	W	NE-NE	USGS		16-A	USBM
ST. LOUIS	58-15-16	W	NW-NW	USGS		16-D	USBM
ST. LOUIS	58-15-16	W	SW-SW	USGS		16-N	USBM
ST. LOUIS	58-15-16	W	NW-SE	USGS		16-J1	USBM
ST. LOUIS	58-15-16	W	SW-SE	USGS		16-Q	USBM
ST. LOUIS	58-15-19	W	NW-SE	USGS		19-E1	USBM
ST. LOUIS	58-15-20	W	NW-SW	USGS		20-M	USBM
ST. LOUIS	58-15-20	W	NW-SE	USGS		20-K	USBM
ST. LOUIS	58-15-21	W	SW-NE	USGS		21-G	USBM
ST. LOUIS	58-15-21	W	SW-NE	USGS		21-G-A	USBM
ST. LOUIS	58-15-21	W	NW-SW	USGS		21-M	USBM
ST. LOUIS	58-15-21	W	NW-SE	USGS		21-K	USBM
ST. LOUIS	58-15-22	W	SW-SE	USGS		22-Q	USBM
ST. LOUIS	58-15-24	W	NE-SW	USGS		24-L	USBM
ST. LOUIS	58-16-11	W	SE-NE	USGS		11-H	USBM
ST. LOUIS	58-16-15	W	SE-NE	USGS		15-H	USBM
ST. LOUIS	58-16-19	W	SW-SE	USGS		19-Q	USBM
ST. LOUIS	58-16-20	W	NW-NW	USGS		20-D	USBM
ST. LOUIS	58-16-20	W	SW-SW	USGS		20-N	USBM
ST. LOUIS	58-16-20	W	NE-SE	USGS		20-J	USBM
ST. LOUIS	58-16-20	W	NW-SE	USGS		20-K	USBM
ST. LOUIS	58-16-20	W	NW-SE	USGS		20-Q1	USBM
ST. LOUIS	58-16-20	W	NW-SE	USGS		20P	USBM
ST. LOUIS	58-16-21	W	SW-NW	USGS		21-E	USBM
ST. LOUIS	58-16-22	W	NW-SE	USGS		22-M1	USBM
ST. LOUIS	58-16-22	W	SW-SE	MGS		2	USBM
ST. LOUIS	58-16-23	W	NW-SE	USGS		23-G1	USBM
ST. LOUIS	58-16-24	W	NW-SE	USGS		24-E1	USBM
ST. LOUIS	58-16-26	W	NE-SW	USGS		26-L	USBM
ST. LOUIS	58-16-26	W	NW-SE	USGS		26-L1	USBM
ST. LOUIS	58-16-26	W	NW-SE	USGS		26-M	USBM
ST. LOUIS	58-16-26	W	NW-SE	USGS		26-P1	USBM
ST. LOUIS	58-16-27	W	SE-SW	USGS		27-P	USBM
ST. LOUIS	58-16-27	W	NW-SE	USGS		27-K	USBM
ST. LOUIS	58-16-28	W	SW-NE	USGS		28-G	USBM
ST. LOUIS	58-16-28	W	SE-NE	USGS		28-H	USBM
ST. LOUIS	58-16-28	W	NW-NW	USGS		28-D	USBM
ST. LOUIS	58-16-29	W	SW-NE	USGS		29-L	USBM
ST. LOUIS	58-16-29	W	NE-SW	USGS		29-B	USBM
ST. LOUIS	58-16-29	W	NW-SE	USGS		29-J1	USBM
ST. LOUIS	58-16-30	W	NW-SE	USGS		30-D1	USBM
ST. LOUIS	58-16-30	W	NW-SE	USGS		30-J1	USBM
ST. LOUIS	58-16-30	W	NW-SE	USGS		30-K1	USBM
ST. LOUIS	58-16-30	W	NW-SE	USGS		30-Q1	USBM
ST. LOUIS	58-16-31	W	NW-SE	USGS		31-L1	USBM
ST. LOUIS	58-16-32	W	NW-SE	USGS		32-B1	USBM
ST. LOUIS	58-16-32	W	NW-SE	USGS		32-D1	USBM
ST. LOUIS	58-16-33	W	NW-SE	USGS		33-P1	USBM
ST. LOUIS	58-16-34	W	NW-SE	USGS		34-R1	USBM
ST. LOUIS	58-16-35	W	NW-SE	USGS		35-K1	USBM
ST. LOUIS	58-16-35	W	NW-SE	USGS		UNK	USBM
ST. LOUIS	58-16-36	W	NW-SW	USGS		36-R1	USBM
ST. LOUIS	58-16-36	W	NW-SE	USGS		36-F1	USBM
ST. LOUIS	58-16-36	W	NW-SE	USGS		36-G2	USBM
ST. LOUIS	58-16-36	W	NW-SE	USGS		36-G3	USBM
ST. LOUIS	58-16-36	W	NW-SE	USGS		36-N1	USBM
ST. LOUIS	58-17- 4	W	SW-SW	JONES & LAUGHLIN		5703	USBM
ST. LOUIS	58-17- 4	W	SE-SW	JONES & LAUGHLIN		5702	USBM
ST. LOUIS	58-17- 5	W	NW-SE	JONES & LAUGHLIN		5701	USBM
ST. LOUIS	58-17- 6	W	NW-SW	USGS		6-M	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	58-17- 7	W	NW-NW	USGS		7-D	USBM
ST. LOUIS	58-17- 7	W	SE-SW	USGS		7-P	USBM
ST. LOUIS	58-17-17	W	SE-SW	USGS		17-M	USBM
ST. LOUIS	58-17-17	W	NW-SE	MN HWY DEPT		T-2	USBM
ST. LOUIS	58-17-17	W	NW-SE	MN HWY DEPT		T-3	USBM
ST. LOUIS	58-17-17	W	NW-SE	MN HWY DEPT		T-4	USBM
ST. LOUIS	58-17-17	W	NW-SE	MN HWY DEPT		T-5	USBM
ST. LOUIS	58-17-17	W	NW-SE	MN HWY DEPT		T-6	USBM
ST. LOUIS	58-17-17	W	NW-SE	MN HWY DEPT		T-7	USBM
ST. LOUIS	58-17-18	W	SW-NE	USGS		18-G	USBM
ST. LOUIS	58-17-18	W	SW-NE	USGS		18-M1	USBM
ST. LOUIS	58-17-18	W	SW-NW	USGS		18-E	USBM
ST. LOUIS	58-17-18	W	SE-NW	USGS		18-F	USBM
ST. LOUIS	58-17-18	W	SE-NW	USGS		18-M3	USBM
ST. LOUIS	58-17-18	W	NE-SW	USGS		18-L	USBM
ST. LOUIS	58-17-18	W	NE-SW	USGS		18-M10	USBM
ST. LOUIS	58-17-18	W	NW-SW	USGS		18-M	USBM
ST. LOUIS	58-17-18	W	SW-SW	USGS		18-M11	USBM
ST. LOUIS	58-17-18	W	SW-SW	USGS		18-N	USBM
ST. LOUIS	58-17-18	W	SW-SW	USGS		18-N-A	USBM
ST. LOUIS	58-17-18	W	SW-SW	USGS		18-N-B	USBM
ST. LOUIS	58-17-18	W	NW-SE	USGS		18-D5	USBM
ST. LOUIS	58-17-18	W	NW-SE	MN HWY DEPT		T-5	USBM
ST. LOUIS	58-17-18	W	SW-SE	USGS		18-Q	USBM
ST. LOUIS	58-17-18	W	SW-SE	USGS		18-Q-A	USBM
ST. LOUIS	58-17-19	W	NE-NW	USGS		19-C	USBM
ST. LOUIS	58-17-19	W	NW-NW	USGS		19-D	USBM
ST. LOUIS	58-17-23	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	58-17-23	W	NW-SE	MN HWY DEPT		T-2	USBM
ST. LOUIS	58-17-24	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	58-17-25	W	NE-SE	USGS		25-J	USBM
ST. LOUIS	58-17-25	W	NW-SE	MN HWY DEPT		T-3	USBM
ST. LOUIS	58-17-35	W	SW-NW	USGS		35-E	USBM
ST. LOUIS	58-17-35	W	NE-SE	USGS		35-J	USBM
ST. LOUIS	58-17-35	W	NW-SE	USGS		35-K	USBM
ST. LOUIS	58-17-35	W	NW-SE	USGS		35-N1	USBM
ST. LOUIS	58-17-35	W	NW-SE	USGS		35-N2	USBM
ST. LOUIS	58-17-36	W	SW-SW	USGS		36-N	USBM
ST. LOUIS	58-18-10	W	NE-SW	USGS		10-L	USBM
ST. LOUIS	58-18-10	W	NE-SW	USGS		OIM	USBM
ST. LOUIS	58-18-10	W	NE-SW	USGS		OIM 1	USBM
ST. LOUIS	58-18-10	W	NE-SW	USGS		OIM 2	USBM
ST. LOUIS	58-18-10	W	NE-SW	USGS		OIM 3	USBM
ST. LOUIS	58-18-10	W	SW-SW	USGS		10-N	USBM
ST. LOUIS	58-18-10	W	SE-SW	USGS		10-P	USBM
ST. LOUIS	58-18-11	W	SE-SE	USGS		11-R	USBM
ST. LOUIS	58-18-12	W	SW-NE	USGS		12-G	USBM
ST. LOUIS	58-18-12	W	NW-NW	USGS		12-D	USBM
ST. LOUIS	58-18-12	W	NW-SW	USGS		12-M	USBM
ST. LOUIS	58-18-12	W	SW-SW	USGS		12-A13	USBM
ST. LOUIS	58-18-12	W	SW-SW	USGS		12-C13	USBM
ST. LOUIS	58-18-12	W	SW-SW	USGS		12-N	USBM
ST. LOUIS	58-18-12	W	SE-SW	USGS		12-P	USBM
ST. LOUIS	58-18-12	W	NW-SE	MN HWY DEPT		T-4	USBM
ST. LOUIS	58-18-12	W	NW-SE	MN HWY DEPT		T-4A	USBM
ST. LOUIS	58-18-12	W	SE-SE	USGS		12-C13B	USBM
ST. LOUIS	58-18-13	W	NE-NE	USGS		13-A	USBM
ST. LOUIS	58-18-13	W	SW-NE	USGS		13-G	USBM
ST. LOUIS	58-18-13	W	SE-NW	USGS		13-F	USBM
ST. LOUIS	58-18-13	W	NW-SW	USGS		13-C62	USBM
ST. LOUIS	58-18-13	W	SW-SE	USGS		13-Q	USBM
ST. LOUIS	58-18-14	W	NE-NW	USGS		14-C13A	USBM
ST. LOUIS	58-18-14	W	SW-SW	USGS		14-C47	USBM
ST. LOUIS	58-18-14	W	NE-SE	USGS		14-C13C	USBM
ST. LOUIS	58-18-14	W	NE-SE	USGS		14-J	USBM
ST. LOUIS	58-18-14	W	NW-SE	USGS		14-K	USBM
ST. LOUIS	58-18-14	W	NW-SE	USGS		14-R	USBM
ST. LOUIS	58-18-14	W	SW-SE	USGS		UNK	USBM
ST. LOUIS	58-18-14	W	SW-SE	USGS		UNK-1	USBM

APPENDIX B. ALL DRILL CORE.

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	58-18-14	W	SW-SE	USGS		UNK-2	USBM
ST. LOUIS	58-18-14	W	SE-SE	USGS		UNK-3	USBM
ST. LOUIS	58-18-15	W	NW-NE	USGS		15-B	USBM
ST. LOUIS	58-18-15	W	NE-SW	USGS		15-L	USBM
ST. LOUIS	58-18-15	W	NW-SW	USGS		15-M	USBM
ST. LOUIS	58-18-15	W	NW-SE	USGS		15-K	USBM
ST. LOUIS	58-18-15	W	NW-SE	MN HWY DEPT		T-3	USBM
ST. LOUIS	58-18-15	W	NW-SE	MN HWY DEPT		T-3A	USBM
ST. LOUIS	58-18-16	W	NE-SE	USGS		16-J	USBM
ST. LOUIS	58-18-17	W	SE-NW	USGS		17-F	USBM
ST. LOUIS	58-18-18	W	SE-NE	USGS		18-H	USBM
ST. LOUIS	58-18-21	W	SE-NE	USGS		21-H	USBM
ST. LOUIS	58-18-21	W	SW-SW	USGS		21-N	USBM
ST. LOUIS	58-18-21	W	NW-SE	USGS		OIL A5	USBM
ST. LOUIS	58-18-21	W	SE-SE	USGS		21-R	USBM
ST. LOUIS	58-18-22	W	SW-NW	USGS		22-C59	USBM
ST. LOUIS	58-18-22	W	SE-NW	USGS		22-F	USBM
ST. LOUIS	58-18-23	W	NW-SW	USGS		23-C58	USBM
ST. LOUIS	58-18-23	W	NW-SW	USGS		23-M	USBM
ST. LOUIS	58-18-23	W	NE-SE	USGS		23-C15	USBM
ST. LOUIS	58-18-23	W	SW-SE	USGS		23-Q	USBM
ST. LOUIS	58-18-24	W	NE-NW	USGS		24-C	USBM
ST. LOUIS	58-18-25	W	NW-SW	USGS		25-C64	USBM
ST. LOUIS	58-18-25	W	NW-SW	USGS		25-M	USBM
ST. LOUIS	58-18-26	W	NW-NW	USGS		26-D	USBM
ST. LOUIS	58-18-26	W	SW-NW	USGS		26-C	USBM
ST. LOUIS	58-18-26	W	SW-NW	USGS		26-E	USBM
ST. LOUIS	58-18-26	W	SE-NW	USGS		26-F	USBM
ST. LOUIS	58-18-26	W	NW-SW	USGS		26-M	USBM
ST. LOUIS	58-18-26	W	SW-SW	USGS		26-N	USBM
ST. LOUIS	58-18-26	W	NW-SE	USGS		26-P1	USBM
ST. LOUIS	58-18-26	W	NW-SE	USGS		26-P2	USBM
ST. LOUIS	58-18-27	W	NW-NE	USGS		27-B	USBM
ST. LOUIS	58-18-27	W	NE-NW	USGS		27-C	USBM
ST. LOUIS	58-18-28	W	NE-NE	USGS		28-A	USBM
ST. LOUIS	58-18-28	W	SE-NE	USGS		28-H	USBM
ST. LOUIS	58-18-28	W	NE-SE	USGS		28-J	USBM
ST. LOUIS	58-18-29	W	NE-NE	USGS		29-A	USBM
ST. LOUIS	58-18-29	W	SE-NE	USGS		29-H	USBM
ST. LOUIS	58-18-29	W	NW-SW	USGS		29-A2	USBM
ST. LOUIS	58-18-29	W	NW-SW	USGS		29-M	USBM
ST. LOUIS	58-18-29	W	SW-SW	USGS		29-N	USBM
ST. LOUIS	58-18-30	W	NE-NE	USGS		30-A	USBM
ST. LOUIS	58-18-30	W	NE-SW	USGS		30-L	USBM
ST. LOUIS	58-18-30	W	NW-SE	USGS		30-K	USBM
ST. LOUIS	58-18-31	W	NW-NW	USGS		31-D	USBM
ST. LOUIS	58-18-32	W	SW-NE	USGS		32-G	USBM
ST. LOUIS	58-18-32	W	SE-NE	USGS		32-H	USBM
ST. LOUIS	58-18-32	W	NE-SE	USGS		32-J	USBM
ST. LOUIS	58-18-33	W	SW-NE	USGS		33-G	USBM
ST. LOUIS	58-18-33	W	NW-NW	USGS		33-D	USBM
ST. LOUIS	58-18-33	W	SW-NW	USGS		33-E	USBM
ST. LOUIS	58-18-33	W	SE-NW	USGS		33-F	USBM
ST. LOUIS	58-18-34	W	NE-NW	USGS		34-C	USBM
ST. LOUIS	58-18-34	W	NW-SW	USGS		34-M	USBM
ST. LOUIS	58-18-34	W	SE-SW	USGS		34-P	USBM
ST. LOUIS	58-18-34	W	NE-SE	USGS		34-J	USBM
ST. LOUIS	58-18-34	W	SW-SE	USGS		34-Q	USBM
ST. LOUIS	58-18-35	W	SW-NW	USGS		35-E	USBM
ST. LOUIS	58-18-35	W	NW-SE	USGS		35-K	USBM
ST. LOUIS	58-18-35	W	NW-SE	USGS		35-K1	USBM
ST. LOUIS	58-18-35	W	NW-SE	USGS		35-K2	USBM
ST. LOUIS	58-18-35	W	SW-SE	USGS		35-Q	USBM
ST. LOUIS	58-18-36	W	SW-SW	USGS		36-N	USBM
ST. LOUIS	58-19-25	W	SW-NE	USGS		25-G	USBM
ST. LOUIS	58-19-28	W	SE-NW	USGS		28-F	USBM
ST. LOUIS	58-19-28	W	NW-SE	USGS		28-G1	USBM
ST. LOUIS	58-19-36	W	NE-SE	USGS		36-A16	USBM
ST. LOUIS	58-20-8	W	SE-SE	USGS		8-R	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	58-20- 9	W	SE-SW	USGS		9-P	USBM
ST. LOUIS	58-20-15	W	NW-SE	USGS		15-M1	USBM
ST. LOUIS	58-20-16	W	NE-SW	USGS		16-L	USBM
ST. LOUIS	58-20-16	W	NW-SW	USGS		16-M	USBM
ST. LOUIS	58-20-16	W	SW-SW	USGS		16-N	USBM
ST. LOUIS	58-20-16	W	SE-SW	USGS		1	USBM
ST. LOUIS	58-20-16	W	NW-SE	USGS		16-F	USBM
ST. LOUIS	58-20-16	W	NW-SE	USGS		16-K2	USBM
ST. LOUIS	58-20-17	W	NE-SE	USGS		17-J	USBM
ST. LOUIS	58-20-17	W	SE-SE	USGS		17-R	USBM
ST. LOUIS	58-20-21	W	NW-NE	USGS		2	USBM
ST. LOUIS	58-20-21	W	SW-NE	USGS		21-G	USBM
ST. LOUIS	58-20-21	W	NW-NW	USGS		21-D	USBM
ST. LOUIS	58-20-21	W	SE-NW	USGS		21-F	USBM
ST. LOUIS	58-20-28	W	NW-SE	MN HWY DEPT		T-1	USBM
ST. LOUIS	58-20-28	W	NW-SE	MN HWY DEPT		T-2	USBM
ST. LOUIS	58-20-29	W	NW-SE	MN HWY DEPT		T-6	USBM
ST. LOUIS	58-20-29	W	NW-SE	MN HWY DEPT		T-7	USBM
ST. LOUIS	58-20-29	W	NW-SE	MN HWY DEPT		T-8	USBM
ST. LOUIS	58-20-29	W	NW-SE	MN HWY DEPT		T-9	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		1005	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		1006	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		1007	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		1008	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		1009	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		1011	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		1015	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		117	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		119	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		120	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		121	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		2	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		22	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		24	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		25	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		26	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		27	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		28	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		29	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		3	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		30	USBM
ST. LOUIS	58-20-32	W	NW-SW	PITTSBURGH PACIFIC		5	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		100	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1000	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1001	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1002	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1003	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1010	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1012	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1013	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1014	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1016	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1017	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1018	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1019	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		102	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		1020	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		105	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		106	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		107	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		111	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		112	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		113	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		114	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		115	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		116	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		17	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		21	USBM
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		93	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	58-20-32	W	SW-SW	PITTSBURGH PACIFIC		95	USBM
ST. LOUIS	58-20-32	W	NW-SE	PITTSBURGH PACIFIC		1	USBM
ST. LOUIS	58-20-32	W	NW-SE	PITTSBURGH PACIFIC		23	USBM
ST. LOUIS	58-20-32	W	NW-SE	PITTSBURGH PACIFIC		4	USBM
ST. LOUIS	58-20-32	W	NW-SE	PITTSBURGH PACIFIC		6	USBM
ST. LOUIS	58-20-36	W	SE-NW	MGS		5	USBM
ST. LOUIS	59-12-4	W	NW-NW	HUMBLE		BA-1	DNR
ST. LOUIS	59-12-5	W	NW-NW	INCO		34873	DNR
ST. LOUIS	59-12-7	W	SW-NE	HUMBLE		BA-5	DNR
ST. LOUIS	59-13-1	W	SE-SE	HUMBLE		BA-4	DNR
ST. LOUIS	59-13-2	W	NW-SE	U.S. STEEL		26096	DNR
ST. LOUIS	59-13-2	W	NW-SE	U.S. STEEL		26103	DNR
ST. LOUIS	59-13-2	W	NW-SE	U.S. STEEL		26118	DNR
ST. LOUIS	59-13-2	W	NW-SE	U.S. STEEL		26120	DNR
ST. LOUIS	59-13-2	W	NW-SE	U.S. STEEL		26127	DNR
ST. LOUIS	59-13-9	W	NW-SE	U.S. STEEL		26080	DNR
ST. LOUIS	59-13-10	W	NW-SE	U.S. STEEL		26073	DNR
ST. LOUIS	59-13-10	W	NW-SE	U.S. STEEL		26074	DNR
ST. LOUIS	59-13-10	W	NW-SE	U.S. STEEL		26078	DNR
ST. LOUIS	59-13-10	W	NW-SE	U.S. STEEL		26081	DNR
ST. LOUIS	59-13-10	W	NW-SE	U.S. STEEL		26115	DNR
ST. LOUIS	59-13-10	W	NW-SE	U.S. STEEL		26121	DNR
ST. LOUIS	59-13-10	W	NW-SE	U.S. STEEL		26123	DNR
ST. LOUIS	59-13-10	W	NW-SE	U.S. STEEL		26124	DNR
ST. LOUIS	59-13-11	W	NW-SE	U.S. STEEL		26075	DNR
ST. LOUIS	59-13-11	W	NW-SE	U.S. STEEL		26116	DNR
ST. LOUIS	59-13-11	W	NW-SE	U.S. STEEL		26122	DNR
ST. LOUIS	59-13-14	W	NE-NE	HUMBLE		BA-3	DNR
ST. LOUIS	59-13-16	W	NE-NW	BEAR CREEK	CN-7120	A4-11	DNR
ST. LOUIS	59-13-17	W	SW-NW	BEAR CREEK		A4-9	DNR
ST. LOUIS	59-13-17	W	SE-NW	EXXON		W-10	DNR
ST. LOUIS	59-13-17	W	NE-SW	EXXON		W-6	DNR
ST. LOUIS	59-13-17	W	NE-SW	EXXON		W-8B	DNR
ST. LOUIS	59-13-17	W	NW-SW	BEAR CREEK		A4-5	DNR
ST. LOUIS	59-13-17	W	NW-SW	BEAR CREEK		A4-8	DNR
ST. LOUIS	59-13-17	W	NW-SW	EXXON		W-7	DNR
ST. LOUIS	59-13-17	W	NW-SW	EXXON		W-9	DNR
ST. LOUIS	59-13-17	W	SW-SW	EXXON		W-11	DNR
ST. LOUIS	59-13-17	W	SE-SW	EXXON		W-1	DNR
ST. LOUIS	59-13-17	W	SE-SW	EXXON		W-14	DNR
ST. LOUIS	59-13-18	W	SE-SW	BEAR CREEK		A4-1	USBM
ST. LOUIS	59-13-18	W	NE-SE	BEAR CREEK		A4-3	USBM
ST. LOUIS	59-13-18	W	NE-SE	BEAR CREEK		A4-4	USBM
ST. LOUIS	59-13-18	W	NE-SE	BEAR CREEK		A4-7	USBM
ST. LOUIS	59-13-18	W	NW-SE	BEAR CREEK		A4-2	USBM
ST. LOUIS	59-13-18	W	SW-SE	BEAR CREEK		A4-6	USBM
ST. LOUIS	59-13-18	W	SE-SE	EXXON		W-13	DNR
ST. LOUIS	59-13-19	W	NW-NE	EXXON		W-12	DNR
ST. LOUIS	59-13-20	W	SW-NE	BEAR CREEK	CN-7121	A4-14	DNR
ST. LOUIS	59-13-20	W	NW-NW	EXXON		W-2	DNR
ST. LOUIS	59-13-30	W	SE-NE	BEAR CREEK		A1-1	USBM
ST. LOUIS	59-13-30	W	SE-NW	HUMBLE		BA-6	DNR
ST. LOUIS	59-14-25	W	SE-NE	BEAR CREEK	CN-7136	A4-12	DNR
ST. LOUIS	59-14-25	W	NE-SW	EXXON		W-3	DNR
ST. LOUIS	59-14-33	W	NE-SE	BEAR CREEK		A3-3	USBM
ST. LOUIS	59-14-34	W	NW-SW	BEAR CREEK		A3-4	USBM
ST. LOUIS	59-14-34	W	SW-SW	BEAR CREEK		A3-5	USBM
ST. LOUIS	59-14-36	W	NW-NW	AMAX	CN-7180	B-3	DNR
ST. LOUIS	59-15-25	W	NW-SE	GLEASON		1	USBM
ST. LOUIS	59-15-25	W	NW-SE	GLEASON		10	USBM
ST. LOUIS	59-15-25	W	NW-SE	GLEASON		11	USBM
ST. LOUIS	59-15-25	W	NW-SE	GLEASON		2	USBM
ST. LOUIS	59-15-25	W	NW-SE	GLEASON		3	USBM
ST. LOUIS	59-15-25	W	NW-SE	GLEASON		4	USBM
ST. LOUIS	59-15-25	W	NW-SE	GLEASON		5	USBM
ST. LOUIS	59-15-25	W	NW-SE	GLEASON		6	USBM
ST. LOUIS	59-15-25	W	NW-SE	GLEASON		7	USBM
ST. LOUIS	59-15-25	W	NW-SE	GLEASON		8	USBM
ST. LOUIS	59-15-25	W	NW-SE	GLEASON		9	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	59-15-29	W	NW-SE	GLEASON		1	USBM
ST. LOUIS	59-15-29	W	NW-SE	GLEASON		2	USBM
ST. LOUIS	59-15-29	W	NW-SE	GLEASON		3	USBM
ST. LOUIS	59-15-29	W	NW-SE	GLEASON		4	USBM
ST. LOUIS	59-15-29	W	NW-SE	GLEASON		5	USBM
ST. LOUIS	59-17-3	W	SW-SW	USGS		UNK	USBM
ST. LOUIS	59-17-4	W	NW-NW	USGS		4-A7	USBM
ST. LOUIS	59-17-14	W	NW-NW	USGS		14-C7	USBM
ST. LOUIS	59-18-5	W	SW-NE	USGS		UNK	USBM
ST. LOUIS	59-18-10	W	NW-SE	USGS		10-Q1	USBM
ST. LOUIS	59-18-11	W	NE-NW	USGS		11-A6	USBM
ST. LOUIS	59-18-13	W	NW-SE	USGS		13-A2	USBM
ST. LOUIS	59-18-15	W	NW-SE	USGS		15-B1	USBM
ST. LOUIS	59-18-15	W	NW-SE	USGS		15-B2	USBM
ST. LOUIS	59-18-15	W	NW-SE	USGS		15-G1	USBM
ST. LOUIS	59-18-24	W	NE-NE	USGS		UNK	USBM
ST. LOUIS	60-12-2	W	NW-NE	BEAR CREEK		B2-14	USBM
ST. LOUIS	60-12-2	W	SW-NE	BEAR CREEK		B2-10	USBM
ST. LOUIS	60-12-2	W	SW-NE	EXXON		D-2	DNR
ST. LOUIS	60-12-2	W	SW-NE	EXXON		D-3	DNR
ST. LOUIS	60-12-2	W	NE-NW	BEAR CREEK		B2-13	USBM
ST. LOUIS	60-12-2	W	NE-NW	BEAR CREEK		B2-15	USBM
ST. LOUIS	60-12-2	W	NW-NW	BEAR CREEK		B2-5	USBM
ST. LOUIS	60-12-2	W	NW-NW	BEAR CREEK		B2-6	USBM
ST. LOUIS	60-12-2	W	SW-NW	BEAR CREEK		B2-12	USBM
ST. LOUIS	60-12-2	W	SW-NW	BEAR CREEK		B2-2	USBM
ST. LOUIS	60-12-2	W	SW-NW	BEAR CREEK		B2-3	USBM
ST. LOUIS	60-12-2	W	SE-NW	BEAR CREEK		B2-11	USBM
ST. LOUIS	60-12-2	W	SE-NW	BEAR CREEK		B2-4	USBM
ST. LOUIS	60-12-2	W	SE-NW	BEAR CREEK		B2-8	USBM
ST. LOUIS	60-12-2	W	SE-NW	BEAR CREEK		B2-9	USBM
ST. LOUIS	60-12-2	W	NE-SW	EXXON		D-10	DNR
ST. LOUIS	60-12-2	W	NE-SW	EXXON		D-13	DNR
ST. LOUIS	60-12-2	W	NE-SW	EXXON		D-9	DNR
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		ELY-10	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		ELY-11	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		ELY-5	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		ELY-6	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		ELY-7	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		ELY-8	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		ELY-9	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		NM-33	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		NM-34	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		NM-35	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		NM-36	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		NM-41	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		NM-42	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		NM-43	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		NM-44	USBM
ST. LOUIS	60-12-2	W	NW-SE	NEWMONT		NM-48	USBM
ST. LOUIS	60-12-2	W	NW-SE	EXXON		D-1	DNR
ST. LOUIS	60-12-3	W	NW-SE	NEWMONT		NM-60	USBM
ST. LOUIS	60-12-3	W	NW-SE	BEAR CREEK		B2-1	USBM
ST. LOUIS	60-12-10	W	NE-NE	EXXON		D-4	DNR
ST. LOUIS	60-12-10	W	SE-NE	ERIE		G8162	DNR
ST. LOUIS	60-12-10	W	SE-SW	ERIE		G8161	DNR
ST. LOUIS	60-12-10	W	NW-SE	NEWMONT		DR-2	USBM
ST. LOUIS	60-12-10	W	NW-SE	NEWMONT		NM-24	USBM
ST. LOUIS	60-12-10	W	NW-SE	NEWMONT		NM-45	USBM
ST. LOUIS	60-12-10	W	NW-SE	NEWMONT		NM-46	USBM
ST. LOUIS	60-12-11	W	NW-NW	EXXON		D-5	DNR
ST. LOUIS	60-12-11	W	NW-NW	EXXON		D-6A	DNR
ST. LOUIS	60-12-11	W	NW-NW	EXXON		D-6	DNR
ST. LOUIS	60-12-34	W	NW-NW	AMAX	CN-7159	BA-2	DNR
ST. LOUIS	60-13-1	W	NW-NW	USGS		1	USBM
ST. LOUIS	60-13-30	W	NE-NE	RESERVE		59029	DNR
ST. LOUIS	60-13-36	W	NE-SE	BEAR CREEK	CN-7123	BI-125	DNR
ST. LOUIS	60-13-36	W	SE-SE	BEAR CREEK	CN-7123	BI-199	DNR
ST. LOUIS	60-15-13	W	SE-SW	USGS		UNK	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	60-17-31	W	SW-NE	USGS		UNK	USBM
ST. LOUIS	60-17-31	W	SE-NW	USGS		31-C11	USBM
ST. LOUIS	60-17-31	W	SE-NW	USGS		31-C11A	USBM
ST. LOUIS	60-18-4	W	SW-SW	USGS		UNK	USBM
ST. LOUIS	60-18-4	W	NW-SE	USGS		4-M1	USBM
ST. LOUIS	60-18-4	W	NW-SE	USGS		4-N1	USBM
ST. LOUIS	60-18-5	W	NW-SE	USGS		5-H1	USBM
ST. LOUIS	60-18-26	W	NW-SE	USGS		UNK	USBM
ST. LOUIS	60-18-26	W	SE-SE	USGS		UNK	USBM
ST. LOUIS	60-18-36	W	SE-NW	USGS		UNK	USBM
ST. LOUIS	61-12-13	W	SE-SE	BEAR CREEK		KAF-1W	USBM
ST. LOUIS	61-12-25	W	SW-SE	DUVAL		15	DNR
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		DR-8012	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		DR-8032	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		DR-8070	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-23	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-50	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-51	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-52	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-53	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-54	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-55	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-56	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-57	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-58	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-59	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-61	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-62	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-63	USBM
ST. LOUIS	61-12-26	W	NW-SE	NEWMONT		NM-64	USBM
ST. LOUIS	61-12-35	W	NE-NE	BEAR CREEK		BF-4	USBM
ST. LOUIS	61-12-35	W	SE-SW	BEAR CREEK		B2-7	USBM
ST. LOUIS	61-12-35	W	NE-SE	EXXON		D-7	DNR
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-13	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-13D	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-14	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-15	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-16	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-17	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-18	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-19	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-20	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-21	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-22	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-25	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-26	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-28	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-29	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-30	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-31	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-32	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-37	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-38	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-39	USBM
ST. LOUIS	61-12-35	W	NW-SE	NEWMONT		NM-47	USBM
ST. LOUIS	61-12-35	W	NW-SE	EXXON		D-8	DNR
ST. LOUIS	61-12-35	W	SW-SE	EXXON		D-11	DNR
ST. LOUIS	61-12-35	W	SW-SE	EXXON		D-12	DNR
ST. LOUIS	61-12-36	W	NE-NE	DUVAL	CN-7239	9	DNR
ST. LOUIS	61-12-36	W	NW-NW	DUVAL	CN-7239	11	DNR
ST. LOUIS	61-12-36	W	SW-SW	DUVAL	CN-7239	10	DNR
ST. LOUIS	61-13-23	W	SW-NW	US AIR FORCE		DV-CR39	USBM
ST. LOUIS	61-14-8	W	SW-NW	EXXON	CN-8038	SL-1	DNR
ST. LOUIS	61-14-8	W	SW-NW	EXXON	CN-8038	SL-2	DNR
ST. LOUIS	61-14-8	W	SW-NW	EXXON	CN-8038	SL-3	DNR
ST. LOUIS	61-14-27	W	NW-SE	CLEVELAND-CLIFFS		1	OTHER
ST. LOUIS	61-15-5	W	SW-SW			T-5	DNR
ST. LOUIS	61-15-6	W	SE-SE			T-6	DNR
ST. LOUIS	61-15-10	W	NE-NE	HUMBLE	CN-7419	ET-1	DNR

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	61-16-12	W	NW-NE	U.S. STEEL	CN-7597	26517	DNR
ST. LOUIS	61-18-21	W	NW-SE	USGS		21-N1	USBM
ST. LOUIS	61-18-28	W	NW-SE	USGS		28-D1	USBM
ST. LOUIS	61-18-28	W	NW-SE	USGS		28-E1	USBM
ST. LOUIS	61-18-29	W	NW-SE	USGS		29-R1	USBM
ST. LOUIS	61-18-31	W	NW-SE	USGS		31-R1	USBM
ST. LOUIS	61-18-32	W	NW-SE	USGS		32-N1	USBM
ST. LOUIS	61-18-32	W	NW-SE	USGS		32-R1	USBM
ST. LOUIS	62-12- 4	W	SW-SW			M-1	DNR
ST. LOUIS	62-12- 7	W	SE-NE			M-2	DNR
ST. LOUIS	62-12-17	W	SW-NW	BEAR CREEK		TL-1	OTHER
ST. LOUIS	62-12-17	W	SW-NW	BEAR CREEK		TL-4	USBM
ST. LOUIS	62-12-18	W	SE-NE	BEAR CREEK		TL-7	USBM
ST. LOUIS	62-13- 7	W	NW-SE	SIMMONS		51	USBM
ST. LOUIS	62-13- 7	W	NW-SE	SIMMONS		52	USBM
ST. LOUIS	62-13- 7	W	NW-SE	SIMMONS		53	USBM
ST. LOUIS	62-13- 7	W	NW-SE	SIMMONS		54	USBM
ST. LOUIS	62-13-12	W	NW-SE			TL-8	DNR
ST. LOUIS	62-13-14	W	NE-SW	BEAR CREEK		TL-9B	USBM
ST. LOUIS	62-13-14	W	NW-SE			TL-9	DNR
ST. LOUIS	62-13-18	W	NW-SE	SIMMONS		1	USBM
ST. LOUIS	62-13-18	W	NW-SE	SIMMONS		2	USBM
ST. LOUIS	62-14- 4	W	NW-SE	BERGLUND LUMBER		1	USBM
ST. LOUIS	62-14- 4	W	NW-SE	BERGLUND LUMBER		2	USBM
ST. LOUIS	62-14- 4	W	NW-SE	BERGLUND LUMBER		2A	USBM
ST. LOUIS	62-14- 4	W	NW-SE	BERGLUND LUMBER		3	USBM
ST. LOUIS	62-14- 5	W	NE-NE	HANNA	CN-7510	V-5	DNR
ST. LOUIS	62-14- 5	W	NE-NE	HANNA	CN-7510	V-6	DNR
ST. LOUIS	62-14-11	W	SE-NE	HUMBLE	CN-7412	CL-1	DNR
ST. LOUIS	62-14-11	W	SW-NW	HUMBLE	CN-7412	CL-3	DNR
ST. LOUIS	62-14-11	W	SE-NW	HUMBLE	CN-7412	CL-2	DNR
ST. LOUIS	62-14-13	W	NW-NW	UNIV OF MN		1	DNR
ST. LOUIS	62-14-14	W	NW-NW	MOORE		1	OTHER
ST. LOUIS	62-14-14	W	NW-NW	MOORE		2	OTHER
ST. LOUIS	62-14-14	W	NW-NW	MOORE		3	OTHER
ST. LOUIS	62-14-14	W	NW-NW	MOORE		4	OTHER
ST. LOUIS	62-14-14	W	NW-NW	MOORE		5	OTHER
ST. LOUIS	62-14-14	W	NW-SE	MOORE		M-1	OTHER
ST. LOUIS	62-14-15	W	SE-NE	HANNA	CN-7512	V-1	DNR
ST. LOUIS	62-14-18	W	SE-SW	HUMBLE	CN-7415	ARM-1	DNR
ST. LOUIS	62-14-18	W	SE-SW	HUMBLE	CN-7415	ARM-3	DNR
ST. LOUIS	62-14-18	W	SE-SE	HUMBLE	CN-7415	ARM-2	DNR
ST. LOUIS	62-15- 2	W	NW-NE			RL-10	DNR
ST. LOUIS	62-15- 6	W	SW-NW			P-1	DNR
ST. LOUIS	62-17-29	W	SE-SW			SC-1	DNR
ST. LOUIS	62-17-29	W	SE-SW	BEAR CREEK	CN-7803	SC-2	DNR
ST. LOUIS	62-21- 4	W	NW-NW	MOLY CORP		LP-1	DNR
ST. LOUIS	62-21- 4	W	NW-SW			LF-4	DNR
ST. LOUIS	62-21- 9	W	SW-SE	MOLY CORP		LP-2	DNR
ST. LOUIS	62-21-10	W	SW-SW			LF-5	DNR
ST. LOUIS	62-21-29	W	NE-NE	MOORE	CN-7608	C-H-4	DNR
ST. LOUIS	62-21-30	W	SW-SE	MOORE	CN-7609	CM-5	DNR
ST. LOUIS	63-12-16	W	NE-SW			LL-2	DNR
ST. LOUIS	63-12-16	W	NE-SW			LL-3	DNR
ST. LOUIS	63-12-16	W	SW-SW			LL-1	DNR
ST. LOUIS	63-12-16	W	SW-SW	GOLD FIELDS		EDH-13	DNR
ST. LOUIS	63-12-16	W	SW-SW	GOLD FIELDS		EDH-16	DNR
ST. LOUIS	63-12-25	W	SE-NE	JONES & LAUGHLIN		5512	USBM
ST. LOUIS	63-12-25	W	SE-NE	JONES & LAUGHLIN		5513	USBM
ST. LOUIS	63-12-25	W	SE-NE	JONES & LAUGHLIN		5614	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		108	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		109	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		112	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		113	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		114	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		115	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		116	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		117	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		118	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		119	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		120	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		121	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		122	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		201	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		202	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		203	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		204	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		205	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		206	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		210	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		211	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		212	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		213	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		214	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		215	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		216	USBM
ST. LOUIS	63-12-27	W	NW-SE	MERIDEN		217	USBM
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-1	DNR
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-10	DNR
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-11	DNR
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-12	DNR
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-14	DNR
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-18	DNR
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-20	DNR
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-21	DNR
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-23	DNR
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-24	DNR
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-7	DNR
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-8	DNR
ST. LOUIS	63-12-30	W	SW-SW	NICOR		R-3	DNR
ST. LOUIS	63-12-30	W	SW-SW	GOLD FIELDS		EDH-22	DNR
ST. LOUIS	63-12-30	W	SE-SW	BEAR CREEK		S-2	USBM
ST. LOUIS	63-12-30	W	SE-SW	BEAR CREEK		S-3	USBM
ST. LOUIS	63-12-30	W	NE-SE	BEAR CREEK		S-1	USBM
ST. LOUIS	63-12-35	W	SE-SE			WW-1	DNR
ST. LOUIS	63-13-25	W	NW-SE	U. S. STEEL		7	DNR
ST. LOUIS	63-13-25	W	NW-SE	U. S. STEEL		8	DNR
ST. LOUIS	63-13-25	W	NW-SE	U. S. STEEL		9	DNR
ST. LOUIS	63-13-25	W	SE-SE	GOLD FIELDS		EDH-15	DNR
ST. LOUIS	63-13-25	W	SE-SE	GOLD FIELDS		EDH-17	DNR
ST. LOUIS	63-13-25	W	SE-SE	GOLD FIELDS		EDH-19	DNR
ST. LOUIS	63-13-25	W	SE-SE	GOLD FIELDS		EDH-2	DNR
ST. LOUIS	63-13-25	W	SE-SE	GOLD FIELDS		EDH-3	DNR
ST. LOUIS	63-13-25	W	SE-SE	GOLD FIELDS		EDH-4	DNR
ST. LOUIS	63-13-25	W	SE-SE	GOLD FIELDS		EDH-5	DNR
ST. LOUIS	63-13-25	W	SE-SE	GOLD FIELDS		EDH-6	DNR
ST. LOUIS	63-13-25	W	SE-SE	GOLD FIELDS		EDH-9	DNR
ST. LOUIS	63-13-25	W	SE-SE	NICOR		R-1	DNR
ST. LOUIS	63-13-25	W	SE-SE	NICOR		R-2	DNR
ST. LOUIS	63-13-25	W	SE-SE	NICOR		R-4	DNR
ST. LOUIS	63-13-25	W	SE-SE	NICOR		R-5	DNR
ST. LOUIS	63-13-36	W	NW-SE	WHITESIDE		1	OTHER
ST. LOUIS	63-13-36	W	NW-SE	WHITESIDE		2	OTHER
ST. LOUIS	63-13-36	W	NW-SE	WHITESIDE		3	OTHER
ST. LOUIS	63-13-36	W	NW-SE	WHITESIDE		4	OTHER
ST. LOUIS	63-13-36	W	NW-SE	WHITESIDE		5	OTHER
ST. LOUIS	63-13-36	W	NW-SE	WHITESIDE		6	OTHER
ST. LOUIS	63-13-36	W	NW-SE	WHITESIDE		7	OTHER
ST. LOUIS	63-13-36	W	NW-SE	WHITESIDE		8	OTHER
ST. LOUIS	63-13-36	W	NW-SE	WHITESIDE		9	OTHER
ST. LOUIS	63-14-32	W	SW-SW	HANNA	CN-7525	V-2	DNR
ST. LOUIS	63-21-21	W	NW-SW			LF-1	DNR
ST. LOUIS	63-21-28	W	SW-NW			LF-2	DNR
ST. LOUIS	63-21-32	W	SE-NE			LF-3	DNR
ST. LOUIS	63-21-35	W	NW-SW	NEUBAUER		2	DNR
ST. LOUIS	64-12-36	W	NW-SE			BL-1	DNR
SCOTT	115-22- 5	W	NW-SE	MN HWY DEPT		T-1009	USBM
SCOTT	115-22- 5	W	NW-SE	MN HWY DEPT		T-1010	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
SCOTT	115-23- 1	W	NW-SE	MN HWY DEPT		T-30	USBM
SCOTT	115-23- 1	W	NW-SE	MN HWY DEPT		T-32	USBM
SCOTT	115-23- 2	W	NW-SE	MN HWY DEPT		T-44	USBM
SCOTT	115-23- 2	W	NW-SE	MN HWY DEPT		T-8	USBM
SCOTT	115-23- 2	W	NW-SE	MN HWY DEPT		T-9	USBM
SCOTT	115-23-10	W	NW-SE	MN HWY DEPT		T-4	USBM
SHERBURNE	32-26- 3	W	NW-SE	MN HWY DEPT		T-4	USBM
SHERBURNE	34-29-13	W	NW-SE	MN HWY DEPT		T-1	USBM
SHERBURNE	34-29-13	W	NW-SE	MN HWY DEPT		T-2	USBM
STEARNS	121-29- 2	W	NE-NW	USGS		W-4	USBM
STEARNS	121-29- 2	W	SW-NW	USGS		W-6	USBM
STEARNS	121-29- 3	W	SW-NE	USGS		W-3	USBM
STEARNS	121-29- 3	W	SE-NE	USGS		W-2	USBM
STEARNS	121-29- 3	W	SE-NE	USGS		W-2A	USBM
STEARNS	121-29- 3	W	SE-NW	USGS		W-1	USBM
STEARNS	121-29- 3	W	NE-SE	USGS		W-5	USBM
STEARNS	124-28-17	W	NW-SE	MN HWY DEPT		T-1	USBM
STEARNS	124-28-17	W	NW-SE	MN HWY DEPT		T-1A	USBM
STEARNS	124-28-17	W	NW-SE	MN HWY DEPT		T-2	USBM
STEARNS	124-28-17	W	NW-SE	MN HWY DEPT		T-3	USBM
STEARNS	124-31-22	W	NW-NE	U. S. STEEL		27010	DNR
STEARNS	124-31-33	W	SW-SE	U. S. STEEL		27011	DNR
STEARNS	124-32-15	W	SW-SE	U. S. STEEL		27012	DNR
STEARNS	125-32- 6	W	NW-SE	MN HWY DEPT		T-1	USBM
STEARNS	125-32- 6	W	NW-SE	MN HWY DEPT		T-2	USBM
STEARNS	126-33-33	W	NW-SE	MN HWY DEPT		T-3	USBM
STEARNS	126-33-33	W	NW-SE	MN HWY DEPT		T-4	USBM
STEARNS	126-34- 8	W	NW-SE	MN HWY DEPT		T-1	USBM
STEARNS	126-34- 8	W	NW-SE	MN HWY DEPT		T-3	USBM
STEELE	107-20- 8	W	NW-SE	MN HWY DEPT		T-1	USBM
STEELE	107-20- 8	W	NW-SE	MN HWY DEPT		T-2	USBM
STEELE	107-20- 9	W	NW-SE	MN HWY DEPT		T-1	USBM
STEELE	107-20- 9	W	NW-SE	MN HWY DEPT		T-1A	USBM
STEELE	107-20- 9	W	NW-SE	MN HWY DEPT		T-1B	USBM
STEELE	107-20- 9	W	NW-SE	MN HWY DEPT		T-2	USBM
STEELE	107-20- 9	W	NW-SE	MN HWY DEPT		T-2A	USBM
STEELE	107-20- 9	W	NW-SE	MN HWY DEPT		T-3	USBM
STEELE	107-20-20	W	NW-SE	MN HWY DEPT		T-1	USBM
STEELE	107-20-20	W	NW-SE	MN HWY DEPT		T-2	USBM
STEELE	107-20-20	W	NW-SE	MN HWY DEPT		T-3	USBM
STEELE	107-20-21	W	NW-SE	MN HWY DEPT		T-1	USBM
STEELE	107-20-21	W	NW-SE	MN HWY DEPT		T-1A	USBM
STEELE	107-20-21	W	NW-SE	MN HWY DEPT		T-2	USBM
STEELE	107-20-21	W	NW-SE	MN HWY DEPT		T-3	USBM
STEELE	107-20-21	W	NW-SE	MN HWY DEPT		T-3A	USBM
STEELE	107-20-23	W	NW-SE	MN HWY DEPT		T-1	USBM
STEELE	107-20-29	W	NW-SE	MN HWY DEPT		T-1	USBM
STEELE	107-20-29	W	NW-SE	MN HWY DEPT		T-2	USBM
STEELE	107-20-29	W	NW-SE	MN HWY DEPT		T-2A	USBM
STEELE	107-20-32	W	NW-SE	MN HWY DEPT		T-2	USBM
STEELE	107-20-32	W	NW-SE	MN HWY DEPT		T-3	USBM
STEELE	107-20-32	W	NW-SE	MN HWY DEPT		T-4	USBM
STEELE	107-21-11	W	NW-SE	MN HWY DEPT		T-1	USBM
STEELE	107-21-11	W	NW-SE	MN HWY DEPT		T-2	USBM
STEVENS	124-42-30	W	SE-SW	U. S. STEEL		27004	DNR
STEVENS	125-42-23	W	NE-SE	U. S. STEEL		27005	DNR
STEVENS	125-43-16	W	SW-NW	U. S. STEEL		27006	DNR
STEVENS	125-44-34	W	SW-SE	NDGS		RRVD-31A	NDGS
TODD	128-34-30	W	NW-NW	MGS		1648	MGS
TODD	129-35-25	W	NE-SE	MGS		1649	MGS
TODD	130-33-34	W	SE-SW	MGS		2000	MGS
TODD	130-35-13	W	NE-SE	MGS		1650	MGS
TODD	130-35-36	W	NE-SE	MGS		1651	MGS
TODD	131-32-34	W	NE-SW	MGS		1999	MGS
TODD	131-34-19	W	SE-SE	MGS		1645	MGS
TODD	132-33-14	W	SW-SE	MGS		1912	MGS
TODD	132-33-36	W	NW-SE	USBM		FL-1	USBM
TODD	132-33-36	W	NW-SE	USBM		FL-2	USBM
TODD	132-33-36	W	NW-SE	USBM		FL-3	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
TODD	132-33-36	W	NW-SE	USBM		FL-4	USBM
TODD	132-34-30	W	NE-NE	MGS		1644	MGS
TODD	133-32-16	W	SE-SE	IRON RANGE MINING	WC8447	TC-101	DNR
TODD	133-32-16	W	SE-SE	IRON RANGE MINING	WC8447	TC-102	DNR
TODD	133-34- 4	W	SW-SW	MGS		1640	MGS
TODD	133-34-29	W	NW-NW	MGS		1641	MGS
TODD	133-35-30	W	NW-NW	MGS		1643	MGS
TRAVERSE	129-47-10	W	NW-SW	NJ ZINC		D-4	USBM
TRAVERSE	129-47-11	W	NW-SW	NJ ZINC		D-1	USBM
WABASHA	109-10-11	W	NW-SE	MN HWY DEPT		T-1	USBM
WABASHA	109-10-11	W	NW-SE	MN HWY DEPT		T-10	USBM
WABASHA	109-10-11	W	NW-SE	MN HWY DEPT		T-3	USBM
WABASHA	109-10-11	W	NW-SE	MN HWY DEPT		T-9	USBM
WABASHA	110-12-29	W	NW-SE	MN HWY DEPT		T-1	USBM
WASECA	106-22- 8	W	NW-SE	MN HWY DEPT		T-1	USBM
WASECA	106-22-32	W	NW-SE	MN HWY DEPT		T-1	USBM
WASECA	106-22-32	W	NW-SE	MN HWY DEPT		T-2	USBM
WASECA	108-22- 4	W	SW-SW	MINNEGASCO		1	USBM
WASECA	108-22- 6	W	NW-NE	MINNEGASCO		1	USBM
WASECA	108-22-20	W	NE-SW	MINNEGASCO		1	USBM
WASECA	108-22-28	W	SE-SW	MINNEGASCO		1	USBM
WASECA	108-23- 2	W	SW-SE	MINNEGASCO		1	USBM
WASHINGTON	26-20- 4	W	NW-SE	MN HWY DEPT		TP-1	USBM
WASHINGTON	26-20- 4	W	NW-SE	MN HWY DEPT		TP-2	USBM
WASHINGTON	26-20- 8	W	NW-SE	MN HWY DEPT		THB-9	USBM
WASHINGTON	26-20- 9	W	NW-SE	MN HWY DEPT		T-A	USBM
WASHINGTON	26-20- 9	W	NW-SE	MN HWY DEPT		T-B	USBM
WASHINGTON	27-21-35	W	NW-SE	MN HWY DEPT		THA-1	USBM
WASHINGTON	27-21-35	W	NW-SE	MN HWY DEPT		THA-2	USBM
WASHINGTON	29-20-31	W	NW-SE	MN HWY DEPT		T-2	USBM
WASHINGTON	29-20-32	W	NW-SE	MN HWY DEPT		T-3	USBM
WASHINGTON	29-20-34	W	NW-SE	MN HWY DEPT		T-1	USBM
WASHINGTON	29-20-34	W	NW-SE	MN HWY DEPT		T-2	USBM
WASHINGTON	29-20-34	W	NW-SE	MN HWY DEPT		T-3	USBM
WASHINGTON	29-21- 8	W	NW-SE	MN HWY DEPT		T-2	USBM
WASHINGTON	29-21-17	W	NW-SE	MN HWY DEPT		T-4	USBM
WASHINGTON	29-21-32	W	NW-SE	MN HWY DEPT		T-1	USBM
WASHINGTON	29-21-35	W	NW-SE	MN HWY DEPT		T-1	USBM
WASHINGTON	30-20-15	W	NW-SE	MN HWY DEPT		T53-1	USBM
WASHINGTON	30-20-15	W	NW-SE	MN HWY DEPT		T53-2	USBM
WASHINGTON	30-20-15	W	NW-SE	MN HWY DEPT		T53-3	USBM
WASHINGTON	30-20-15	W	NW-SE	MN HWY DEPT		T53-5	USBM
WASHINGTON	30-20-22	W	NW-SE	MN HWY DEPT		T53-4	USBM
WASHINGTON	30-20-34	W	NW-SE	MN HWY DEPT		T52-1	USBM
WASHINGTON	30-20-34	W	NW-SE	MN HWY DEPT		T52-2	USBM
WASHINGTON	30-20-34	W	NW-SE	MN HWY DEPT		T52-3	USBM
WASHINGTON	32-21- 5	W	NW-SE	MN HWY DEPT		T-1	USBM
WATONWAN	107-31-11	W	SW-NW	MARATHON		SQ-8	DNR
WATONWAN	107-33-23	W	NW-NE	MARATHON		SQ-13	DNR
WILKIN	131-46- 6	W	SW-NE	NDGS		RRVD-23	NDGS
WINONA	105- 4-19	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	105- 4-19	W	NW-SE	MN HWY DEPT		T-4	USBM
WINONA	105- 4-19	W	NW-SE	MN HWY DEPT		T-5	USBM
WINONA	105- 4-19	W	NW-SE	MN HWY DEPT		T-6	USBM
WINONA	105- 4-19	W	NW-SE	MN HWY DEPT		T-7	USBM
WINONA	105- 4-19	W	NW-SE	MN HWY DEPT		T-8	USBM
WINONA	105- 4-33	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	105- 4-33	W	NW-SE	MN HWY DEPT		T-6	USBM
WINONA	105- 4-33	W	NW-SE	MN HWY DEPT		T-7	USBM
WINONA	105- 4-33	W	NW-SE	MN HWY DEPT		T-8	USBM
WINONA	105- 5- 2	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	105- 5- 2	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	105- 5- 2	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	105- 5- 2	W	NW-SE	MN HWY DEPT		T-4	USBM
WINONA	105- 5- 2	W	NW-SE	MN HWY DEPT		T-5	USBM
WINONA	105- 5- 2	W	NW-SE	MN HWY DEPT		T-6	USBM
WINONA	105- 5- 4	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	105- 5- 4	W	NW-SE	MN HWY DEPT		T-100	USBM
WINONA	105- 5- 4	W	NW-SE	MN HWY DEPT		T-101	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
WINONA	105- 5- 4	W	NW-SE	MN HWY DEPT		T-103	USBM
WINONA	105- 5- 4	W	NW-SE	MN HWY DEPT		T-104	USBM
WINONA	105- 5- 4	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	105- 5- 4	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	105- 5- 4	W	NW-SE	MN HWY DEPT		T-4	USBM
WINONA	105- 5- 4	W	NW-SE	MN HWY DEPT		T-53	USBM
WINONA	105- 5-12	W	NW-SE	MN HWY DEPT		T-6	USBM
WINONA	105- 6- 1	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	105- 6- 1	W	NW-SE	MN HWY DEPT		T-10	USBM
WINONA	105- 6- 1	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	105- 6- 1	W	NW-SE	MN HWY DEPT		T-5	USBM
WINONA	105- 6- 1	W	NW-SE	MN HWY DEPT		T-6	USBM
WINONA	105- 6- 1	W	NW-SE	MN HWY DEPT		T-7	USBM
WINONA	105- 6- 1	W	NW-SE	MN HWY DEPT		T-8	USBM
WINONA	105- 6- 7	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	105- 6- 7	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	105- 6- 7	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	105- 6- 7	W	NW-SE	MN HWY DEPT		T-4	USBM
WINONA	105- 6- 8	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	105- 6- 9	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	105- 7- 1	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	105- 7- 1	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	105- 7- 1	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	105- 7- 1	W	NW-SE	MN HWY DEPT		T-4	USBM
WINONA	105- 7- 1	W	NW-SE	MN HWY DEPT		T-5	USBM
WINONA	105- 9- 1	W	NW-SE	MN HWY DEPT		T-11	USBM
WINONA	105- 9- 1	W	NW-SE	MN HWY DEPT		T-21	USBM
WINONA	105- 9- 1	W	NW-SE	MN HWY DEPT		T-22	USBM
WINONA	105- 9- 1	W	NW-SE	MN HWY DEPT		T-23	USBM
WINONA	105- 9- 1	W	NW-SE	MN HWY DEPT		T-25	USBM
WINONA	105- 9- 1	W	NW-SE	MN HWY DEPT		T-25A	USBM
WINONA	105- 9- 1	W	NW-SE	MN HWY DEPT		T-26	USBM
WINONA	105- 9- 1	W	NW-SE	MN HWY DEPT		T-27	USBM
WINONA	105- 9- 2	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	105- 9- 2	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	105- 9- 2	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	105- 9- 2	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	105- 9- 2	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	105- 9- 2	W	NW-SE	MN HWY DEPT		T-5	USBM
WINONA	105- 9- 2	W	NW-SE	MN HWY DEPT		T-5	USBM
WINONA	105- 9- 2	W	NW-SE	MN HWY DEPT		T-6	USBM
WINONA	105- 9- 3	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	105- 9- 3	W	NW-SE	MN HWY DEPT		T-4	USBM
WINONA	105- 9- 6	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	105- 9- 6	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	105- 9- 6	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	106- 7-16	W	NW-SE	MN HWY DEPT		T-50	USBM
WINONA	106- 7-29	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	106- 8-32	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	106- 8-32	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	106- 8-32	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	106- 8-32	W	NW-SE	MN HWY DEPT		T-4	USBM
WINONA	106- 8-32	W	NW-SE	MN HWY DEPT		T-5	USBM
WINONA	106- 8-35	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	106- 8-36	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	106- 8-36	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	106- 8-36	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	106- 9-36	W	NW-SE	MN HWY DEPT		T-4	USBM
WINONA	106-10- 3	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	106-10- 3	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	106-10-30	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	106-10-30	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	106-10-30	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	106-10-34	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	106-10-34	W	NW-SE	MN HWY DEPT		T-3	USBM
WINONA	106-10-34	W	NW-SE	MN HWY DEPT		T-4	USBM
WINONA	106-10-34	W	NW-SE	MN HWY DEPT		T-5	USBM
WINONA	106-10-34	W	NW-SE	MN HWY DEPT		T-6	USBM
WINONA	107- 8-11	W	NW-SE	MN HWY DEPT		T-1	USBM

APPENDIX B. ALL DRILL CORE

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	COMPANY (OWNER)	STATE LEASE NUMBER	DRILL HOLE NUMBER	CORE STORAGE LOCATION
WINONA	107- 8-11	W	NW-SE	MN HWY DEPT		T-2	USBM
WINONA	107-10-11	W	NW-SE	MN HWY DEPT		T-1	USBM
WINONA	108- 8-21	W	NW-SE	MN HWY DEPT		T-5	USBM
WINONA	108- 8-34	W	NW-SE	MN HWY DEPT		T-2	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-31	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-32	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-33	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-35	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-36	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-36A	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-38	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-39	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-40	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-41	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-42	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-42A	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-43	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-44	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-44A	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-45	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-45A	USBM
WRIGHT	122-25-33	W	NW-SE	N STATES POWER		BOR-6	USBM

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
AITKIN	46-25-36	W	NE-NE	DRILL CORE	1	AU, CU, ZN	OTHER
BECKER	138-37- 6	W	NE-NW	DRILL CORE	1-4	BAX	OTHER
BECKER	138-37- 6	W	NE-NW	DRILL CORE	1-5	BAX, SUL	OTHER
BECKER	138-37- 6	W	NW-NW	DRILL CORE	1-1	SUL	OTHER
BECKER	138-37- 6	W	NE-SW	DRILL CORE	1-3	SUL	OTHER
BECKER	139-37-36	W	SE-NW	DRILL CORE	6-1	PYR	OTHER
BELTRAMI	150-31-29	W	NW-NW	DRILL CORE	BID-3	AG, AU, CU, ZN	DNR
BELTRAMI	150-31-29	W	SW-NW	DRILL CORE	RL-28-1	CR, CU, GRF, NI	DNR
BELTRAMI	150-32-13	W	SE-NE	DRILL CORE	BID-2	CU, GRF	DNR
BELTRAMI	151-30- 7	W	NE-NW	DRILL CORE	RL 42-1	GRF, ZN	DNR
BELTRAMI	151-30- 8	W	NW-NE	DRILL CORE	RL 43-1	AU, CU, GRF, PYR, ZN, PYO	DNR
BELTRAMI	151-32-36	W	NW-NW	DRILL CORE	RL-25	AS, AU	DNR
BELTRAMI	152-30-30	W	NE-NE	DRILL CORE	RL-39	CU, GRF	DNR
BELTRAMI	152-30-31	W	NW-SW	TESTPIT		AU, GAR, CAR, PYR	
BELTRAMI	158-36- 7	W	NE-NE	DRILL CORE	FT-10	AS, AU, HG	DNR
BELTRAMI	158-36- 7	W	SE-NE	DRILL CORE	FT-21	AS, AU	DNR
BELTRAMI	158-36- 7	W	NE-SE	DRILL CORE	FT-12	AS, AU, HG	DNR
BELTRAMI	158-36-13	W	NW-SE	DRILL CORE	FT-14	AG, AS, AU, B, HG	DNR
BELTRAMI	158-36-23	W	SE-SW	DRILL CORE	FT-3	AG, CU, ZN	DNR
BELTRAMI	158-36-23	W	SW-SE	DRILL CORE	FT-2	AG, ZN	DNR
BELTRAMI	158-36-23	W	SE-SE	DRILL CORE	FT-1	CU	DNR
BELTRAMI	158-36-24	W	NW-SW	DRILL CORE	T25A-1	AG, CU, ZN	DNR
BELTRAMI	158-36-25	W	NE-NW	DRILL CORE	T25B-2	AG, ZN	DNR
BELTRAMI	158-36-26	W	SE-NW	DRILL CORE	FT-4	AG, AU, AS, HG, ZN	DNR
BENTON	37-30-27	W	NW-SE	TESTPIT		AU	
BENTON	37-31-16	W	NW-SE	OUTCROP		BE, F	
CARLTON	46-18-16	W	NW-SE	FLOAT		AU	
CARLTON	46-19- 2	W	NE-NE	OUTCROP		GAR, PYR, TOU, CU	
CARLTON	46-19-19	W	NE-SE	DRILL CORE	AW-2	CU, GRF, MO, U, V	DNR
CARLTON	46-19-19	W	SW-SE	DRILL CORE	PS-2	CR, NI, TI	DNR
CARLTON	46-20- 7	W	SW-SE	DRILL CORE	MG-5	CU, MO, TH, ZN	DNR
CARLTON	46-20- 8	W	SW-SW	DRILL CORE	MG-7	AG, MO, P, TH, ZN	DNR
CARLTON	46-20-16	W	NW-SE	TESTPIT		AU	
CARLTON	46-20-28	W	NE-NW	DRILL CORE	ML-48	AG	DNR
CARLTON	46-20-28	W	NW-SE	TESTPIT		AU	
CARLTON	47-17-16	W	NW-SE	OUTCROP		AU	
CARLTON	47-18- 4	W	NE-NW	TESTPIT		P, U	
CARLTON	47-18- 5	W	SW-SE	TESTPIT		GRF, PYR	
CARLTON	47-18- 6	W	NW-SE	TESTPIT		PYR	
CARLTON	47-19-15	W	NW-SE	OUTCROP		AU, PYR	
CARLTON	48-16- 1	W	SW-NE	OUTCROP		CU, PYO, PYR	
CARLTON	48-16- 5	W	SW-SW	OUTCROP		TOU, CAR, PYR	
CARLTON	48-16- 5	W	NW-SE	OUTCROP		PYR, AU, CU, SUL	
CARLTON	48-16- 6	W	NW-SE	TESTPIT		AU	
CARLTON	48-17-19	W	NW-SE	FLOAT		CU	
CARLTON	48-18-32	W	SW-NW	TESTPIT		AU, TH, U, GRF, P	
CARLTON	48-18-32	W	SE-NW	DRILL CORE	MLCH-3	U	DNR
CARVER	115-23-16	W	NW-SE	FLOAT		CU	
CASS	143-27-16	W	NW-SE	OUTCROP		CAR, CU, PYR	
CHISAGO	33-19- 1	W	NW-SE	OUTCROP		CU	
CHISAGO	34-19- 1	W	NW-SE	FLOAT		CU	
CHISAGO	34-19- 1	W	NW-SE	OUTCROP		CU, KAO	
CHISAGO	34-19-16	W	NW-SE	OUTCROP		AG	
CHISAGO	34-19-16	W	NW-SE	OUTCROP		CU	
CHISAGO	34-19-16	W	NW-SE	OUTCROP		P	
CHISAGO	34-19-25	W	NW-SE	TESTPIT		CU	
CHISAGO	34-19-25	W	NW-SE	OUTCROP		AU, CU	
CHISAGO	34-19-25	W	NW-SE	TESTPIT		AG, CU	
CLAY	142-44-29	W	SW-NE	DRILL CORE	SL-1	AS, ZN	DNR
COOK	59- 4-13	W	NW-SE	OUTCROP		CU	
COOK	60- 2- 1	W	NW-SE	OUTCROP		CU	
COOK	60- 2-16	W	NW-SE	OUTCROP		CU	
COOK	60- 3-25	W	NW-SE	OUTCROP		CU	
COOK	60- 3-31	W	NW-SE	TESTPIT		CU	
COOK	60- 3-34	W	NW-SE	OUTCROP		CU	
COOK	61- 1-12	E	NW-SE	OUTCROP		CU	
COOK	61- 1-16	W	NW-SE	OUTCROP		CAR, CU	
COOK	61- 1-24	W	NW-SE	OUTCROP		CU	
COOK	61- 1-27	W	NW-SE	OUTCROP		CU	

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
COOK	61- 2- 9	E	NW-SE	OUTCROP		CU	
COOK	61- 2-15	W	NW-SE	OUTCROP		CU	
COOK	62- 1-13	E	NW-SE	OUTCROP		ZEO	
COOK	62- 1-16	W	NW-SE	OUTCROP		CU	
COOK	62- 2-16	W	NW-SE	OUTCROP		CU	
COOK	62- 2-36	W	NW-SE	OUTCROP		CU, KAO, PRE	
COOK	62- 3-26	E	NW-SE	OUTCROP		MAG, TI	
COOK	62- 3-16	W	NW-SE	OUTCROP		CU	
COOK	62- 4- 4	W	NW-SW	TESTPIT		MAG, TI	
COOK	62- 4- 4	W	NW-SE	TESTPIT		MAG, TI	
COOK	62- 4- 9	W	NW-SE	TESTPIT		MAG, TI	
COOK	63- 1- 1	E	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1- 2	E	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-11	E	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-21	E	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-22	E	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1- 3	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1- 7	W	SW-SW	OUTCROP		MAG, TI	
COOK	63- 1- 7	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1- 8	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1- 9	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-10	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-13	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-14	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-15	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-16	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-16	W	NW-SE	OUTCROP		CU	
COOK	63- 1-17	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-18	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-23	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-24	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-25	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 1-26	W	NW-SE	OUTCROP		OLV, SUL	
COOK	63- 2- 7	W	SW-NE	OUTCROP		P, TI	
COOK	63- 2-12	W	SE-SE	OUTCROP		MAG, TI	
COOK	63- 2-13	W	NW-SE	OUTCROP		MAG, TI	
COOK	63- 2-14	W	NW-SE	OUTCROP		MAG, TI	
COOK	63- 2-15	W	NW-SE	OUTCROP		MAG, TI	
COOK	63- 2-16	W	NW-SE	OUTCROP		CU	
COOK	63- 3-16	W	NW-SE	OUTCROP		CU	
COOK	63- 3-30	W	NW-SE	OUTCROP		MAG, OLV, TI	
COOK	63- 3-31	W	NW-SE	OUTCROP		MAG, TI	
COOK	63- 3-32	W	NW-SE	OUTCROP		MAG, TI	
COOK	63- 3-33	W	NW-SE	OUTCROP		MAG, TI	
COOK	63- 4- 2	W	NW-SE	DRILL CORE	8	MAG, TI	DNR
COOK	63- 4- 2	W	NW-SE	DRILL CORE	9	MAG, TI	DNR
COOK	63- 4-16	W	NW-SE	OUTCROP		MAG, P, TI	
COOK	63- 4-21	W	NW-SE	OUTCROP		MAG, TI, CU	
COOK	63- 4-23	W	NW-SE	OUTCROP		MAG, TI	
COOK	63- 4-25	W	NW-SE	OUTCROP		MAG, TI	
COOK	63- 4-26	W	NW-SE	OUTCROP		MAG, TI	
COOK	63- 4-27	W	NW-SE	TESTPIT		MAG, TI	
COOK	63- 4-28	W	NW-SE	TESTPIT		MAG, TI	
COOK	63- 4-29	W	NW-SE	OUTCROP		MAG, TI	
COOK	63- 4-32	W	NW-SE	OUTCROP		MAG, TI	
COOK	63- 4-33	W	NW-SE	OUTCROP		MAG, TI	
COOK	63- 4-35	W	NW-SE	TESTPIT		MAG, TI	
COOK	63- 5- 1	E	NW-SE	OUTCROP		CU, NI	
COOK	63- 5- 2	E	NW-SE	OUTCROP		CU, NI	
COOK	63- 5-17	E	NW-SE	OUTCROP		CAR, CU, PYR	
COOK	63- 5-25	E	NW-SE	OUTCROP		CU	
COOK	63- 6- 6	E	NW-SE	OUTCROP		CU, PYO	
COOK	64- 1- 8	E	NW-SE	OUTCROP		MAG, SUL, TI	
COOK	64- 1-16	E	NW-SE	OUTCROP		MAG, OLV, P	
COOK	64- 1-29	E	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1-30	E	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1-31	E	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1-32	E	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1-34	E	NW-SE	OUTCROP		OLV, SUL	

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
COOK	64- 1-35	E	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1- 5	W	NE-NW	OUTCROP		MN	
COOK	64- 1- 5	W	NW-SE	OUTCROP		MAG, MN, TI	
COOK	64- 1- 6	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 1- 7	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 1- 8	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 1-25	W	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1-26	W	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1-27	W	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1-28	W	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1-29	W	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1-30	W	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1-33	W	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1-34	W	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 1-36	W	NW-SE	OUTCROP		OLV, SUL	
COOK	64- 2- 5	E	SE-SE	TESTPIT		AG, CAR, PYR	
COOK	64- 2- 8	E	NW-SE	OUTCROP		PYO	
COOK	64- 2-10	E	NW-SE	OUTCROP		MAG, TI	
COOK	64- 2-16	E	NW-SE	OUTCROP		P	
COOK	64- 2- 1	W	NW-SW	OUTCROP		MAG, TI	
COOK	64- 2- 1	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 2- 1	W	NW-SE	OUTCROP		CU, MAG, TI	
COOK	64- 2- 2	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 2- 3	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 2- 4	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 2- 6	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 2- 8	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 2-26	W	SW-NW	TESTPIT		MAG, OLV	
COOK	64- 3- 3	E	NW-SE	OUTCROP		CAR, PYR	
COOK	64- 3- 5	E	NW-SE	TESTPIT		AG, CAR, PB, PYR	
COOK	64- 3- 6	E	NW-SE	OUTCROP		AG, AU, PYR	
COOK	64- 3- 9	E	NW-SE	OUTCROP		AG	
COOK	64- 3-12	E	NE-SE	TESTPIT		CAR	
COOK	64- 3-12	E	NW-SE	TESTPIT		CAR	
COOK	64- 3-16	E	NW-SE	OUTCROP		MAG, P	
COOK	64- 3- 1	W	NE-NE	DRILL CORE	12	CR, FE, TI, V	OTHER
COOK	64- 3- 1	W	NE-NE	DRILL CORE	13	CR, FE, TI, V	OTHER
COOK	64- 3- 1	W	NE-NE	DRILL CORE	14	CR, FE, TI, V	OTHER
COOK	64- 3- 1	W	NE-NE	DRILL CORE	15	CR, FE, TI, V	OTHER
COOK	64- 3- 1	W	NE-NE	TESTPIT		CR, MAG	
COOK	64- 3- 1	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 3- 2	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 3- 3	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 3- 4	W	NW-NE	OUTCROP		MAG, TI	
COOK	64- 3- 5	W	SW-NW	OUTCROP		MAG, TI	
COOK	64- 3- 5	W	NW-SE	OUTCROP		CU	
COOK	64- 3- 6	W	NW-NW	OUTCROP		GOS	
COOK	64- 3- 6	W	NE-SE	OUTCROP		MAG, TI	
COOK	64- 3- 6	W	NW-SE	OUTCROP		CU	
COOK	64- 3- 6	W	NW-SE	OUTCROP		CU	
COOK	64- 3- 6	W	NW-SE	OUTCROP		GOS	
COOK	64- 3- 6	W	NW-SE	OUTCROP		GOS	
COOK	64- 3- 6	W	NW-SE	OUTCROP		PYO	
COOK	64- 3- 6	W	NW-SE	OUTCROP		PYO	
COOK	64- 3- 7	W	NW-SE	OUTCROP		CU	
COOK	64- 3- 7	W	NW-SE	OUTCROP		CU	
COOK	64- 3- 7	W	NW-SE	OUTCROP		GOS	
COOK	64- 3- 7	W	NW-SE	OUTCROP		GOS	
COOK	64- 3- 7	W	NW-SE	OUTCROP		PYO	
COOK	64- 3- 7	W	NW-SE	OUTCROP		PYO	
COOK	64- 3- 8	W	NW-SE	OUTCROP		CU	
COOK	64- 3- 8	W	NW-SE	OUTCROP		CU	
COOK	64- 3- 8	W	NW-SE	OUTCROP		GOS	
COOK	64- 3- 8	W	NW-SE	OUTCROP		GOS	
COOK	64- 3- 8	W	NW-SE	OUTCROP		PYO	
COOK	64- 3- 8	W	NW-SE	OUTCROP		PYO	
COOK	64- 3-16	W	NW-SE	OUTCROP		FE	
COOK	64- 4- 1	W	NE-NE	OUTCROP		GOS, MAG, TI	
COOK	64- 4- 1	W	NE-NE	OUTCROP		GOS	

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
COOK	64- 4- 1	W	NW-SE	OUTCROP		CU	
COOK	64- 4- 1	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 1	W	NW-SE	OUTCROP		OLV	
COOK	64- 4- 1	W	NW-SE	OUTCROP		PYO	
COOK	64- 4- 1	W	NW-SE	OUTCROP		SUL	
COOK	64- 4- 2	W	NW-SE	OUTCROP		CU	
COOK	64- 4- 2	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 2	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 2	W	NW-SE	OUTCROP		OLV	
COOK	64- 4- 2	W	NW-SE	OUTCROP		PYO	
COOK	64- 4- 2	W	NW-SE	OUTCROP		SUL	
COOK	64- 4- 3	W	NW-SE	OUTCROP		CU	
COOK	64- 4- 3	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 3	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 3	W	NW-SE	OUTCROP		OLV	
COOK	64- 4- 3	W	NW-SE	OUTCROP		PYO	
COOK	64- 4- 3	W	NW-SE	OUTCROP		SUL	
COOK	64- 4- 4	W	NW-SE	OUTCROP		CU	
COOK	64- 4- 4	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 4	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 4	W	NW-SE	OUTCROP		OLV	
COOK	64- 4- 4	W	NW-SE	OUTCROP		PYO	
COOK	64- 4- 4	W	NW-SE	OUTCROP		SUL	
COOK	64- 4- 5	W	NE-NE	OUTCROP		TI	
COOK	64- 4- 5	W	NW-SE	OUTCROP		CU	
COOK	64- 4- 5	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 5	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 5	W	NW-SE	OUTCROP		OLV	
COOK	64- 4- 5	W	NW-SE	OUTCROP		PYO	
COOK	64- 4- 5	W	NW-SE	OUTCROP		SUL	
COOK	64- 4- 5	W	NW-SE	OUTCROP		MAG	
COOK	64- 4- 8	W	NW-SE	OUTCROP		CU	
COOK	64- 4- 8	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 8	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 8	W	NW-SE	OUTCROP		OLV	
COOK	64- 4- 8	W	NW-SE	OUTCROP		PYO	
COOK	64- 4- 8	W	NW-SE	OUTCROP		SUL	
COOK	64- 4- 8	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 4- 9	W	SW-NE	OUTCROP		GOS	
COOK	64- 4- 9	W	NE-SE	OUTCROP		GOS	
COOK	64- 4- 9	W	NW-SE	OUTCROP		CU	
COOK	64- 4- 9	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 9	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 9	W	NW-SE	OUTCROP		OLV	
COOK	64- 4- 9	W	NW-SE	OUTCROP		PYO	
COOK	64- 4- 9	W	NW-SE	OUTCROP		SUL	
COOK	64- 4- 9	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 4- 10	W	NW-SE	OUTCROP		CU	
COOK	64- 4- 10	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 10	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 10	W	NW-SE	OUTCROP		OLV	
COOK	64- 4- 10	W	NW-SE	OUTCROP		PYO	
COOK	64- 4- 10	W	NW-SE	OUTCROP		SUL	
COOK	64- 4- 11	W	SW-NW	OUTCROP		GOS	
COOK	64- 4- 11	W	SE-SW	OUTCROP		GOS	
COOK	64- 4- 11	W	NW-SE	OUTCROP		CU	
COOK	64- 4- 11	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 11	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 11	W	NW-SE	OUTCROP		OLV	
COOK	64- 4- 11	W	NW-SE	OUTCROP		PYO	
COOK	64- 4- 11	W	NW-SE	OUTCROP		SUL	
COOK	64- 4- 12	W	NW-SE	OUTCROP		CU	
COOK	64- 4- 12	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 12	W	NW-SE	OUTCROP		GOS	
COOK	64- 4- 12	W	NW-SE	OUTCROP		OLV	
COOK	64- 4- 12	W	NW-SE	OUTCROP		PYO	
COOK	64- 4- 12	W	NW-SE	OUTCROP		SUL	
COOK	64- 4- 14	W	NW-SE	OUTCROP		CU	
COOK	64- 4- 14	W	NW-SE	OUTCROP		GOS	

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
COOK	64- 4-14	W	NW-SE	OUTCROP		GOS	
COOK	64- 4-14	W	NW-SE	OUTCROP		OLV	
COOK	64- 4-14	W	NW-SE	OUTCROP		PYO	
COOK	64- 4-14	W	NW-SE	OUTCROP		SUL	
COOK	64- 4-15	W	NW-SE	OUTCROP		SUL	
COOK	64- 4-15	W	NW-SE	OUTCROP		CU	
COOK	64- 4-15	W	NW-SE	OUTCROP		GOS	
COOK	64- 4-15	W	NW-SE	OUTCROP		GOS	
COOK	64- 4-15	W	NW-SE	OUTCROP		OLV	
COOK	64- 4-15	W	NW-SE	OUTCROP		PYO	
COOK	64- 5-21	E	NW-SW	OUTCROP		CAR, GOS, PYR	
COOK	64- 5-25	E	NW-SE	OUTCROP		MAG, TI	
COOK	64- 5-28	E	NW-SE	OUTCROP		CAR, PB	
COOK	64- 5-28	E	NW-SE	OUTCROP		SUL	
COOK	64- 5-29	E	NW-SE	OUTCROP		CAR, PYR	
COOK	64- 5-31	E	NW-SE	OUTCROP		CAR, CU, PYO, PYR, SUL	
COOK	64- 5-35	E	SW-NW	TESTPIT		CAR	
COOK	64- 5-35	E	SE-NW	TESTPIT		PYR	
COOK	64- 5-35	E	NE-SW	OUTCROP		CAR, CU, PYO	
COOK	64- 5-35	E	NE-SW	TESTPIT		CAR, SUL	
COOK	64- 5-35	E	SE-SW	OUTCROP		NI, OLV, PYO, CU	
COOK	64- 5-35	E	NE-SE	OUTCROP		SUL	
COOK	64- 5-35	E	NW-SE	TESTPIT		AU	
COOK	64- 5-35	E	NW-SE	TESTPIT		CU, NI, PYO	
COOK	64- 5-35	E	SW-SE	OUTCROP		CU, NI, SUL	
COOK	64- 5-35	E	SW-SE	TESTPIT		SUL	
COOK	64- 5-35	E	SE-SE	OUTCROP		CAR	
COOK	64- 5-35	E	SE-SE	OUTCROP		PYR	
COOK	64- 5-35	E	SE-SE	TESTPIT		SUL	
COOK	64- 5-36	E	NW-NE	OUTCROP		GRF, PYR	
COOK	64- 5-36	E	SW-NE	OUTCROP		GRF, PYR, SUL	
COOK	64- 5-36	E	NE-SE	TESTPIT		CU, PYO	
COOK	64- 5- 1	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 5- 7	W	NW-NW	OUTCROP		MAG, TI	
COOK	64- 5-12	W	NW-SE	OUTCROP		MAG, TI	
COOK	64- 6-19	E	SE-NE	TESTPIT		CAR, SUL	
COOK	64- 6-19	E	SW-SW	TESTPIT		SUL	
COOK	64- 6-27	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 6-28	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 6-28	E	NW-SE	OUTCROP		CU, OLV, PYO	
COOK	64- 6-29	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 6-29	E	NW-SE	OUTCROP		CU, PYO, PYR	
COOK	64- 6-29	E	NW-SE	TESTPIT		CU, PYR, SUL	
COOK	64- 6-29	E	SE-SE	TESTPIT		CU, GOS, PYR	
COOK	64- 6-31	E	NE-NE	OUTCROP		CAR, CU, PYO	
COOK	64- 6-31	E	NW-NE	TESTPIT		GOS, SUL	
COOK	64- 6-31	E	SW-NW	OUTCROP		CAR, PYR	
COOK	64- 6-31	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 6-32	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 6-33	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 6-34	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 7-27	E	NE-NE	TESTPIT		BA	
COOK	64- 7-27	E	NW-SE	OUTCROP		BA, CAR, CU, PB, PYR, ZN	
COOK	64- 7-28	E	NW-SE	TESTPIT		BA, CU, PYR, ZN	
COOK	64- 7-31	E	NW-SE	OUTCROP		CAR, CU	
COOK	64- 7-32	E	NW-SW	TESTPIT		AU	
COOK	64- 7-32	E	NW-SW	TESTPIT		BA	
COOK	64- 7-32	E	NW-SW	TESTPIT		CAR	
COOK	64- 7-32	E	NW-SW	TESTPIT		CU, GRF	
COOK	64- 7-32	E	NW-SW	TESTPIT		PB	
COOK	64- 7-32	E	NW-SW	TESTPIT		PYR	
COOK	64- 7-32	E	NW-SE	OUTCROP		BA, CAR	
COOK	64- 7-32	E	NW-SE	TESTPIT		BA	
COOK	64- 7-32	E	NW-SE	TESTPIT		CAR	
COOK	64- 7-32	E	NW-SE	TESTPIT		CU	
COOK	64- 7-32	E	NW-SE	TESTPIT		PB	
COOK	64- 7-32	E	NW-SE	TESTPIT		PYR	
COOK	64- 7-32	E	NW-SE	TESTPIT		ZN	
COOK	64- 7-32	E	NW-SE	TESTPIT		AG, CU	

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
COOK	64- 7-32	E	NW-SE	OUTCROP		BA, CAR	
COOK	64- 7-32	E	NW-SE	TESTPIT		BA, CAR, CU, GRF	
COOK	64- 7-32	E	NW-SE	TESTPIT		BA, SUL	
COOK	65- 1-33	W	SW-SW	TESTPIT		CAR	
COOK	65- 1-33	W	SW-SW	TESTPIT		AG, CAR	
COOK	65- 2-31	E	NW-SE	TESTPIT		AU, CAR, CU, PB, PYR, ZN	
COOK	65- 2-31	E	SE-SE	TESTPIT		CAR, SUL	
COOK	65- 2-32	E	SW-SW	TESTPIT		CAR, SUL	
COOK	65- 2-32	E	NW-SE	TESTPIT		CAR, CU, PB, PYR, ZN	
COOK	65- 2-19	W	NW-SE	OUTCROP		PYO	
COOK	65- 2-20	W	NW-SE	OUTCROP		PYO	
COOK	65- 2-30	W	NW-SE	OUTCROP		PYO	
COOK	65- 2-30	W	NW-SE	OUTCROP		CU, SUL	
COOK	65- 2-30	W	NW-SE	OUTCROP		TI	
COOK	65- 2-31	W	NW-SW	OUTCROP		MAG, TI	
COOK	65- 2-31	W	NW-SE	OUTCROP		V	
COOK	65- 2-31	W	NW-SE	OUTCROP		CU, SUL	
COOK	65- 2-31	W	NW-SE	OUTCROP		CR, MAG, OLV, TI	
COOK	65- 2-32	W	NW-SE	OUTCROP		CU, SUL	
COOK	65- 2-32	W	NW-SE	OUTCROP		MAG, TI	
COOK	65- 2-33	W	NW-SE	OUTCROP		CU, SUL	
COOK	65- 2-33	W	NW-SE	OUTCROP		MAG, TI	
COOK	65- 2-35	W	NW-SE	OUTCROP		CU	
COOK	65- 2-36	W	NW-SE	OUTCROP		CU, SUL	
COOK	65- 3-32	E	NW-SE	OUTCROP		AG, PB, PYR	
COOK	65- 3-25	W	NW-SE	OUTCROP		PYO	
COOK	65- 3-25	W	NW-SE	TESTPIT		PYO	
COOK	65- 3-28	W	NW-SE	TESTPIT		PYO	
COOK	65- 3-29	W	NW-SE	TESTPIT		PYO	
COOK	65- 3-30	W	SE-SW	OUTCROP		GOS	
COOK	65- 3-30	W	NW-SE	OUTCROP		CU	
COOK	65- 3-30	W	NW-SE	OUTCROP		CU, PYO	
COOK	65- 3-30	W	NW-SE	TESTPIT		SUL	
COOK	65- 3-30	W	NW-SE	TESTPIT		CU, PYO	
COOK	65- 3-31	W	NE-SE	OUTCROP		GOS	
COOK	65- 3-31	W	NW-SE	OUTCROP		CU	
COOK	65- 3-31	W	NW-SE	OUTCROP		PYO	
COOK	65- 3-31	W	NW-SE	OUTCROP		SUL	
COOK	65- 3-32	W	SE-SE	OUTCROP		MAG, TI	
COOK	65- 3-33	W	NW-SE	TESTPIT		CU	
COOK	65- 3-34	W	NW-SE	OUTCROP		AU	
COOK	65- 3-34	W	NW-SE	TESTPIT		AS, AU, CO, CU, PYO, PYR	
COOK	65- 3-34	W	SE-SE	OUTCROP		MAG, TI	
COOK	65- 3-35	W	SW-SW	OUTCROP		MAG, TI	
COOK	65- 3-36	W	SE-SW	OUTCROP		MAG, TI	
COOK	65- 3-36	W	NW-SE	OUTCROP		MAG	
COOK	65- 3-36	W	NW-SE	OUTCROP		CR, CU, FE, MAG, OLV, TI, V	
COOK	65- 3-36	W	NW-SE	OUTCROP		MAG, OLV, TI	
COOK	65- 3-36	W	NW-SE	TESTPIT		FE, OLV, TI	
COOK	65- 4-16	W	NW-SE	OUTCROP		NI, P	
COOK	65- 4-24	W	NW-SE	OUTCROP		PYO	
COOK	65- 4-25	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-26	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-27	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-27	W	SW-SE	OUTCROP		GOS	
COOK	65- 4-27	W	SE-SE	OUTCROP		GOS	
COOK	65- 4-28	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-29	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-33	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-34	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-35	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-36	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 5-13	W	NW-SE	TESTPIT		AU, CAR	
COOK	66- 4-14	W	NW-SE	OUTCROP		AU, F	
COOK	66- 5-14	W	SE-NW	OUTCROP		AG, AU, F	
COOK	66- 5-14	W	NW-SE	OUTCROP		AU, CAR, F	
CROW WING	45-28-25	W	NW-SE	OUTCROP		AU	
CROW WING	46-29- 3	W	NW-SE	TESTPIT		MN	
CROW WING	46-29-10	W	NE-NW	TESTPIT		BA	

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
CROW WING	47-29-30	W	NW-SE	OUTCROP		AS, CU	
DAKOTA	113-18- 8	W	NW-SE	FLOAT		CU	
FILLMORE	103-10-13	W	NW-SE	OUTCROP		PB	
FILLMORE	103-11-29	W	NW-SE	FLOAT		PB	
FILLMORE	103-13-26	W	NW-SE	FLOAT		AU, PB	
FILLMORE	103-13-31	W	NW-SE	FLOAT		AU, CU	
FILLMORE	104-12-31	W	NW-SE	FLOAT		AU, CU	
GOODHUE	109-16-16	W	NW-SE	OUTCROP		P	
GOODHUE	110-15-16	W	NW-SE	FLOAT		CU	
GOODHUE	110-16-16	W	NW-SE	FLOAT		CU	
GOODHUE	110-16-29	W	NW-SE	OUTCROP		ZN	
GOODHUE	110-17-16	W	NW-SE	FLOAT		CU	
GOODHUE	112-17-20	W	NW-SE	FLOAT		CU	
HENNEPIN	29-23-16	W	NW-SE	FLOAT		CU	
HENNEPIN	119-21-16	W	NW-SE	FLOAT		CU	
HENNEPIN	120-22-16	W	NW-SE	FLOAT		CU	
ITASCA	58-22-16	W	NW-SE	OUTCROP		AU	
ITASCA	60-25-29	W	SE-NE	DRILL CORE	CN-16	CU	DNR
ITASCA	61-24- 6	W	NE-SW	DRILL CORE	26516	CU	DNR
ITASCA	61-24-11	W	SW-SE	DRILL CORE	T-13	CU	DNR
ITASCA	61-25- 1	W	NW-SE	OUTCROP		CR, OLV	
ITASCA	61-25- 1	W	NW-SE	OUTCROP		SUL	
ITASCA	61-25- 2	W	NW-SE	OUTCROP		CR, OLV	
ITASCA	61-25-10	W	SE-SW	DRILL CORE	26512	CU	DNR
ITASCA	61-25-10	W	SE-SW	DRILL CORE	26513	CU, NI	DNR
ITASCA	61-25-10	W	NW-SE	OUTCROP		CR, OLV	
ITASCA	61-25-11	W	NW-SE	OUTCROP		CR, OLV	
ITASCA	61-25-12	W	NW-SW	DRILL CORE	26508	CU	DNR
ITASCA	61-25-12	W	NW-SE	OUTCROP		CR, OLV	
ITASCA	61-25-12	W	NW-SE	OUTCROP		NI, PYO, PYR	
ITASCA	61-25-15	W	NW-SE	OUTCROP		CR, OLV	
ITASCA	61-25-15	W	NW-SE	OUTCROP		SUL	
ITASCA	61-25-16	W	SW-NE	DRILL CORE	26514	NI	DNR
ITASCA	61-25-16	W	NW-SE	OUTCROP		CR, OLV	
ITASCA	61-25-16	W	NW-SE	OUTCROP		CR, CU, NI, ZN	
ITASCA	62-22- 7	W	SW-SE	DRILL CORE	COOK 8-1	AG, ZN	DNR
ITASCA	62-24-17	W	SE-SW	DRILL CORE	T-7	ALN, PYR, ZN	DNR
ITASCA	62-24-30	W	SW-NE	DRILL CORE	40927	CU, NI	DNR
ITASCA	62-24-31	W	NW-SE	OUTCROP		CR	
ITASCA	150-28-16	W	NW-SE	OUTCROP		AU	
KANABEC	42-22- 6	W	NW-SE	FLOAT		CU	
KANABEC	42-23- 4	W	NW-SE	OUTCROP		MO, GAR	
KANDIYOHI	122-36- 5	W	NW-SE	FLOAT		AU	
KOOCHICHING	63-25-27	W	SE-NW	DRILL CORE	FL-32-1	AG, GRF, ZN	DNR
KOOCHICHING	67-25-23	W	NW-SE	TESTPIT		AU	
KOOCHICHING	68-23- 2	W	NW-SW	TESTPIT		FE	
KOOCHICHING	71-22-23	W	NW-SE	TESTPIT		AU, CAR, PYR, TOU	
KOOCHICHING	71-22-23	W	SE-SE	TESTPIT		AU, PYR	
KOOCHICHING	71-22-25	W	SW-SW	TESTPIT		AU	
KOOCHICHING	71-22-26	W	SW-SW	TESTPIT		AU	
KOOCHICHING	71-22-26	W	NW-SE	TESTPIT		AU, ANK, PYR, TOU	
KOOCHICHING	71-22-27	W	NW-SE	TESTPIT		AU	
KOOCHICHING	71-22-33	W	NW-SE	TESTPIT		AU, ANK, CU, PYR, TOU	
KOOCHICHING	71-23-26	W	NW-SE	OUTCROP		AU	
KOOCHICHING	71-23-30	W	NW-SE	TESTPIT		AU, PYR, TOU	
KOOCHICHING	151-28-16	W	NW-SE	FLOAT		AG	
KOOCHICHING	151-28-21	W	SW-NW	DRILL CORE	G-2	AU, CU	DNR
KOOCHICHING	152-27-22	W	NE-NE	DRILL CORE	MIZ A-1	CU	DNR
KOOCHICHING	158-27- 4	W	SE-NE	DRILL CORE	R-4-1	CU, PYO, PYR, ZN	DNR
KOOCHICHING	158-28- 5	W	SE-SW	DRILL CORE	A-9-1	AG, CU, PYO, PYR	DNR
KOOCHICHING	158-28- 7	W	SW-SW	DRILL CORE	A-8-1	CU	DNR
KOOCHICHING	159-25- 4	W	NW-SE	OUTCROP		AU, PYR	
KOOCHICHING	159-25- 8	W	SE-SW	OUTCROP		AG, AU	
KOOCHICHING	159-25-10	W	NW-NE	DRILL CORE	IH-13	AU, CR	DNR
KOOCHICHING	159-25-16	W	SW-NW	DRILL CORE	IH-10	AG, AU	DNR
KOOCHICHING	159-25-16	W	SW-NW	DRILL CORE	IH-11	AG, ZN	DNR
KOOCHICHING	159-25-16	W	SW-NW	DRILL CORE	IH-12	AG, NI	DNR
KOOCHICHING	159-25-16	W	SE-SW	OUTCROP		AU	
KOOCHICHING	159-25-16	W	SE-SW	OUTCROP		AG	

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
KOOCHICHING	159-25-16	W	NW-SE	OUTCROP		AG, CU	
KOOCHICHING	159-25-17	W	NW-NE	OUTCROP		AU	
KOOCHICHING	159-25-17	W	SE-NE	OUTCROP		AU	
KOOCHICHING	159-26-7	W	NE-NE	DRILL CORE	RR-80-2	AG, CU	DNR
KOOCHICHING	159-27-15	W	NW-SW	DRILL CORE	R-2-1	AG, CU, ZN	DNR
KOOCHICHING	159-27-16	W	NE-SE	DRILL CORE	R-2-1A	AG, CU, ZN	DNR
KOOCHICHING	159-27-16	W	SE-SE	DRILL CORE	NCB-2	AG, ZN, CU	DNR
KOOCHICHING	159-27-16	W	SE-SE	DRILL CORE	S-43-1	CU	DNR
KOOCHICHING	159-27-16	W	SE-SE	DRILL CORE	S-43-2	AG, PYO, PYR, ZN	DNR
KOOCHICHING	159-27-16	W	NE-SE	DRILL CORE	R. R. 6-1	CU	DNR
KOOCHICHING	159-27-20	W	SW-SE	DRILL CORE	R. R. 6-2	CU	DNR
KOOCHICHING	159-27-21	W	NW-NE	DRILL CORE	R-2-2	CU, NI, ZN	DNR
KOOCHICHING	159-27-29	W	NW-NW	DRILL CORE	R-3-1	CU	DNR
KOOCHICHING	159-27-30	W	NW-NW	DRILL CORE	R-3-3	CU, PYO, PYR	DNR
KOOCHICHING	159-28-7	W	NW-SE	OUTCROP		GOS	
KOOCHICHING	159-28-10	W	SW-NE	DRILL CORE	R. R. 12-1	AG, AS	DNR
KOOCHICHING	159-28-14	W	NW-SE	OUTCROP		CU, SUL	
KOOCHICHING	159-28-17	W	SW-SE	OUTCROP		CU, PYO, PYR	
KOOCHICHING	159-28-17	W	SW-SE	OUTCROP		CU, NI	
KOOCHICHING	159-28-17	W	SW-SE	OUTCROP		AG, AU, CU	
KOOCHICHING	159-28-17	W	SW-SE	OUTCROP		CU	
KOOCHICHING	159-28-26	W	NE-SW	DRILL CORE	R-5-1	CU, PYO, PYR, ZN	DNR
KOOCHICHING	159-28-26	W	NE-SW	DRILL CORE	R-5-2	ZN	DNR
KOOCHICHING	160-26-35	W	SW-SE	OUTCROP		AG, AU, ZN	
KOOCHICHING	160-26-35	W	SW-SE	OUTCROP		AG, AU	
KOOCHICHING	160-26-36	W	NW-SE	OUTCROP		AG, AU, CU, MAG, NI, PYO, ZN	
LAC QUI PARLE	120-45-3	W	NW-SE	OUTCROP		FE, GAR	
LAKE	52-11-2	W	SE-NE	OUTCROP		CAR, CU, ZEO	
LAKE	52-11-12	W	NE-NW	OUTCROP		CU, ZEO	
LAKE	52-11-16	W	NE-NW	TESTPIT		CU	
LAKE	54-9-22	W	NW-SE	OUTCROP		CU	
LAKE	55-8-2	W	NW-SE	TESTPIT		CU	
LAKE	55-8-11	W	NW-SE	OUTCROP		CU, OLV, P, PYR	
LAKE	55-8-14	W	NW-SE	OUTCROP		P, CU, OLV, P, PYR	
LAKE	55-8-15	W	NW-SE	OUTCROP		CU, OLV, P, PYR	
LAKE	55-8-22	W	NW-SE	FLOAT		MAG, TI	
LAKE	55-8-22	W	NW-SE	OUTCROP		CU, OLV, P, PYR	
LAKE	56-7-21	W	NW-SE	FLOAT		CU, PB, ZN	
LAKE	57-7-16	W	NW-SE	OUTCROP		CU	
LAKE	57-7-17	W	NW-SE	OUTCROP		SUL	
LAKE	57-7-36	W	NW-SE	OUTCROP		CU	
LAKE	58-7-33	W	NE-NE	OUTCROP		P	
LAKE	58-7-34	W	SW-NW	OUTCROP		CU, MAG, P, PYO, TI	
LAKE	58-7-34	W	NW-SW	OUTCROP		P, SUL	
LAKE	59-10-30	W	SW-SE	OUTCROP		CU, PYO	
LAKE	60-10-16	W	NW-SE	OUTCROP		CR, MAG, OLV, TI	
LAKE	61-10-16	W	NW-SE	OUTCROP		CR, FE, OLV, TI	
LAKE	61-10-26	W	SE-NW	OUTCROP		CU, PYO	
LAKE	61-11-1	W	NW-SE	OUTCROP		CR, MN, TI, V	
LAKE	61-11-28	W	NW-SE	OUTCROP		MAG, TI	
LAKE	62-6-21	W	NW-SE	OUTCROP		SUL	
LAKE	62-6-22	W	NW-SE	OUTCROP		CU, PYO	
LAKE	62-7-9	W	NE-NE	OUTCROP		MAG	
LAKE	62-10-19	W	NW-SE	OUTCROP		CU, PYO, SUL	
LAKE	62-11-24	W	NW-SE	OUTCROP		CU, PYO	
LAKE	62-11-25	W	NW-SE	OUTCROP		CU, PYO	
LAKE	62-11-26	W	NW-SE	OUTCROP		CU, PYO, MAG, TI	
LAKE	62-11-27	W	NW-SE	OUTCROP		CU, PYO	
LAKE	62-11-33	W	NW-SE	OUTCROP		CU, PYO	
LAKE	63-7-6	W	NW-SE	OUTCROP		MAG, TI	
LAKE	63-8-2	W	NW-SW	OUTCROP		MAG, TI	
LAKE	63-8-7	W	SW-SE	OUTCROP		MAG, TI	
LAKE	63-9-6	W	NW-SE	OUTCROP		CU, PYR	
LAKE	63-9-8	W	NW-SE	OUTCROP		CAR, MUS, TOU	
LAKE	63-9-14	W	NW-SE	OUTCROP		MAG, TI	
LAKE	63-9-14	W	NW-SE	TESTPIT		MAG, TI	
LAKE	63-9-15	W	NW-SE	OUTCROP		MAG, TI	
LAKE	63-9-17	W	NW-SE	OUTCROP		SUL	
LAKE	63-9-20	W	NW-SE	OUTCROP		MAG, TI	
LAKE	63-9-29	W	NW-SE	OUTCROP		MAG, TI	

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
LAKE	63- 9-30	W	NW-SE	OUTCROP		MAG, TI	
LAKE	63-10- 8	W	NW-SE	TESTPIT		CAR, GRF	
LAKE	63-10-16	W	NW-SE	OUTCROP		SUL	
LAKE	63-10-25	W	NW-SE	OUTCROP		MAG, TI	
LAKE	63-10-31	W	NW-SE	OUTCROP		MAG, TOU	
LAKE	63-10-36	W	NW-SE	OUTCROP		MAG, TI	
LAKE	63-10-36	W	NW-SE	TESTPIT		FE, TI	
LAKE	63-11-11	W	NW-SE	OUTCROP		CAR	
LAKE	63-11-13	W	NW-SE	OUTCROP		CAR, F, SUL	
LAKE	63-11-16	W	NW-SE	OUTCROP		AU	
LAKE	64- 6-14	W	NW-SE	OUTCROP		MAG, TI	
LAKE	64- 6-15	W	NW-SE	OUTCROP		MAG, TI	
LAKE	64- 6-19	W	NW-SE	OUTCROP		MAG, TI	
LAKE	64- 7-14	W	NW-SE	TESTPIT		FE, OLV	
LAKE	64- 7-32	W	NW-SE	OUTCROP		MAG, TI	
LAKE	64- 7-34	W	NW-SE	OUTCROP		MAG, TI	
LAKE	64- 9-28	W	NW-SE	OUTCROP		CU, PYR	
LAKE	64- 9-29	W	NW-SE	OUTCROP		ZN, CU, PYR	
LAKE	64-10-30	W	NW-SE	OUTCROP		CAR	
LAKE	64-10-34	W	NW-SE	TESTPIT		CAR, PYR	
LAKE	64-10-36	W	NW-SE	OUTCROP		CAR, PYR	
LAKE	64-11-16	W	NW-SE	OUTCROP		AU, CU, PYR, TOU, AG, CR, NI, PD	
LAKE	64-11-32	W	NW-SE	OUTCROP		CR	
LAKE	64-11-33	W	NW-SE	OUTCROP		CR, NI, PD	
LAKE	65- 6-20	W	NW-SE	OUTCROP		TI	
LAKE OF THE WOODS	157-34- 5	W	SW-NE	DRILL CORE	B31-5	CU, PYO, PYR	DNR
LAKE OF THE WOODS	157-34- 5	W	SE-NW	DRILL CORE	B31-1	AG, AS, CU, MO, PYO, PYR, ZN, AU	DNR
LAKE OF THE WOODS	157-34-14	W	SE-NE	DRILL CORE	40926	CU, GRF, SUL	DNR
LAKE OF THE WOODS	158-33- 2	W	NW-NW	DRILL CORE	B21-3	AU, CU, PYO, PYR, ZN	DNR
LAKE OF THE WOODS	158-33- 3	W	NE-NW	DRILL CORE	B21-2	ZN	DNR
LAKE OF THE WOODS	158-33- 6	W	SE-SE	DRILL CORE	MSD-1	CU, ZN	DNR
LAKE OF THE WOODS	158-33-19	W	SE-SE	DRILL CORE	B24-4	CU, PYO, PYR	DNR
LAKE OF THE WOODS	158-33-30	W	NE-NE	DRILL CORE	B24-1	AS, CO, PYO, PYR	DNR
LAKE OF THE WOODS	158-33-30	W	NE-NE	DRILL CORE	B24-2	AS, PB, PYO, PYR, ZN	DNR
LAKE OF THE WOODS	158-33-32	W	NW-NW	DRILL CORE	MED-1	AG, CU	DNR
LAKE OF THE WOODS	158-34-11	W	SE-SW	DRILL CORE	MOD-2	AG, AU, CU	DNR
LAKE OF THE WOODS	158-34-11	W	SW-SE	DRILL CORE	B-0-1	CU, NI	DNR
LAKE OF THE WOODS	158-34-12	W	NE-SE	DRILL CORE	MDD-1	AG, CU	DNR
LAKE OF THE WOODS	158-34-17	W	NW-NW	DRILL CORE	B54-1	CU	DNR
LAKE OF THE WOODS	158-34-25	W	SW-NE	DRILL CORE	MMD-1	AG, ZN	DNR
LAKE OF THE WOODS	158-34-25	W	SE-SE	DRILL CORE	B5-1	CU, ZN	DNR
LAKE OF THE WOODS	159-32-12	W	SW-SE	DRILL CORE	BD-1	SUL	DNR
LAKE OF THE WOODS	159-32-14	W	NE-SW	DRILL CORE	BD-3	AG, B	DNR
LAKE OF THE WOODS	159-32-15	W	SE-SW	DRILL CORE	BD-2	CU	DNR
LAKE OF THE WOODS	159-33-25	W	SE-SE	DRILL CORE	40919	CU, MAG, PYO, PYR	DNR
LAKE OF THE WOODS	159-33-29	W	SE-SW	DRILL CORE	40920	CU, PYR	DNR
LAKE OF THE WOODS	159-33-34	W	SE-SE	DRILL CORE	B21-1	AG, AS, CO, ZN	DNR
LAKE OF THE WOODS	160-30- 9	W	SW-SW	DRILL CORE	B-57-1	AG, CU, GRF, SUL, ZN	DNR
LAKE OF THE WOODS	160-30-16	W	NE-NW	DRILL CORE	B-3-3	AG, CU, ZN	DNR
LAKE OF THE WOODS	160-30-17	W	NE-NE	DRILL CORE	B-3-2	CU, ZN	DNR
LAKE OF THE WOODS	160-30-23	W	NW-NW	DRILL CORE	B-7-1	TOU, CU	DNR
LAKE OF THE WOODS	160-30-23	W	NW-NW	DRILL CORE	B-7-2	CU, PB	DNR
LAKE OF THE WOODS	160-30-23	W	NW-NW	DRILL CORE	B-7-3	CU	DNR
LAKE OF THE WOODS	166-34-16	W	NW-SE	OUTCROP		AU	
LAKE OF THE WOODS	167-33- 1	W	NW-SE	OUTCROP		TAL	
LAKE OF THE WOODS	167-33- 6	W	SW-NE	TESTPIT		GAR, MUS, W	
LAKE OF THE WOODS	168-34-32	W	NE-SE	TESTPIT		K, U	
MARSHALL	158-40-15	W	NW-SE	DRILL CORE	M-1	CU, PYO, PYR, ZN	DNR
MARSHALL	158-44-20	W	NW-NW	OUTCROP		AU	
MILLE LACS	38-27-16	W	NW-SE	FLOAT		CU	
MORRISON	40-29- 8	W	NW-NE	TESTPIT		AU, PYR	
MORRISON	40-32-16	W	NW-SE	OUTCROP		MAR	
MORRISON	128-29-32	W	NW-SE	OUTCROP		AU	
NORMAN	143-44-34	W	SW-NE	DRILL CORE	HL-1	AG, ZN	DNR
NORMAN	143-45-20	W	NW-NE	DRILL CORE	RK-1	ZN	DNR
NORMAN	145-44-15	W	SW-NE	DRILL CORE	ST-2	AS, AU, CU	DNR
NORMAN	145-44-15	W	NW-SE	DRILL CORE	ST-1	AG, AS, CU	DNR
NORMAN	146-44-36	W	SE-SE	DRILL CORE	GA-1	AU, CR, NI	DNR
OLMSTED	107-14-16	W	NW-SE	FLOAT		AU	

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
OLMSTED	107-14-25	W	NW-SE	TESTPIT		PB	
OLMSTED	108-13-16	W	NW-SE	OUTCROP		P	
OLMSTED	108-14-16	W	NW-SE	FLOAT		AU	
OTTER TAIL	137-39-22	W	SE-SE	DRILL CORE	3-1	CU	OTHER
PINE	38-20-16	W	NW-SE	FLOAT		CU	
PINE	38-21-16	W	NW-SE	TESTPIT		CU	
PINE	39-21-25	W	NW-SE	TESTPIT		CU	
PINE	39-21-34	W	NW-SE	TESTPIT		CU	
PINE	40-19-19	W	NW-SE	OUTCROP		CAR, CU	
PINE	40-19-33	W	SW-SW	TESTPIT		CAR, CU	
PINE	40-20-12	W	NW-SE	OUTCROP		CU	
PINE	41-16-16	W	NW-SE	FLOAT		CU	
PINE	41-19-19	W	NW-SE	OUTCROP		AG, CU	
PINE	41-20-26	W	NW-NW	TESTPIT		CU	
PINE	41-20-34	W	NW-SE	OUTCROP		AG, CU	
PINE	43-16-22	W	SW-NW	FLOAT		CU	
PINE	44-21-19	W	NW-SE	OUTCROP		F	
PINE	44-21-20	W	NW-SE	OUTCROP		F	
PINE	45-20- 4	W	NW-SE	TESTPIT		AU	
PINE	45-20-16	W	NW-SE	OUTCROP		MAR	
PINE	45-20-19	W	NW-NE	OUTCROP		GAR, STA	
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-56C	CU, GRF, MO, P, U	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-45C	CU, AG, AS, F, MO, P, PB SE, TH, U, V	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-49C	AG, CU, MO	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-53C	AG, CU, MO, ZN	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	MLCH-6	F	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-43C	CAR, GRF, MO, S, U, V, CU	DNR
PINE	45-20-29	W	NW-SE	DRILL CORE	ML-23	NI, ZN	DNR
PINE	45-21- 9	W	SE-NW	DRILL CORE	D-2	P	DNR
PINE	45-21-25	W	NW-SE	OUTCROP		AG, AU, CU, PB, ZN	
PINE	45-21-33	W	NW-NE	TESTPIT		CU, MAG	
POLK	148-45-19	W	NW-SE	DRILL CORE	P4-B	FE, TI, V	DNR
RAMSEY	28-23- 5	W	NE-SW	OUTCROP		ZN	
RAMSEY	29-22-16	W	NW-SE	OUTCROP		P	
RAMSEY	30-22-24	W	NW-SE	FLOAT		CU	
RENVILLE	112-33-18	W	NW-SE	OUTCROP		AG	
RENVILLE	113-34- 7	W	NW-SE	OUTCROP		CR, MG, NI	
RENVILLE	113-34-31	W	NW-SE	OUTCROP		SUL	
RENVILLE	113-34-33	W	NW-SE	OUTCROP		AG	
RENVILLE	113-35-22	W	NW-SE	OUTCROP		ZN	
RENVILLE	113-35-22	W	NW-SE	OUTCROP		AG	
RENVILLE	113-35-32	W	NW-SE	OUTCROP		AS	
RENVILLE	113-36- 4	W	NW-SE	OUTCROP		AU	
RICE	110-20-33	W	SW-SE	FLOAT		AU, CU	
ROSEAU	161-36- 6	W	NW-SE	DRILL CORE	W3-1	CU	DNR
ROSEAU	161-37-12	W	SE-NE	DRILL CORE	W1-1	CU	DNR
ROSEAU	162-36-10	W	NW-SW	DRILL CORE	W9-1	CU	DNR
ROSEAU	162-36-18	W	SW-SW	DRILL CORE	W13-1	CU, CR, NI	DNR
ROSEAU	162-36-35	W	SE-NW	DRILL CORE	W8-1	CU, MAG	DNR
ST. LOUIS	49-15-32	W	NW-SE	OUTCROP		CU, PYR	
ST. LOUIS	49-15-34	W	NW-SE	OUTCROP		TAL, MAG, OLV, TI	
ST. LOUIS	50-14- 7	W	NW-SW	TESTPIT		MAG, TI	
ST. LOUIS	50-14-16	W	NW-SE	TESTPIT		AG, CU, SUL	
ST. LOUIS	50-14-16	W	NW-SE	OUTCROP		CAR, CU, F	
ST. LOUIS	50-14-20	W	NW-SE	OUTCROP		P, TI, FE	
ST. LOUIS	50-14-23	W	NW-SE	OUTCROP		AU	
ST. LOUIS	50-14-30	W	NW-SE	OUTCROP		MAG, P	
ST. LOUIS	50-15-25	W	NW-SE	TESTPIT		FE	
ST. LOUIS	51-12- 4	W	NW-SE	OUTCROP		CU	
ST. LOUIS	51-12-16	W	NW-SE	TESTPIT		CU, PRE	
ST. LOUIS	51-12-17	W	NW-SE	OUTCROP		CU	
ST. LOUIS	51-12-17	W	NW-SE	TESTPIT		CU	
ST. LOUIS	52-12-17	W	NW-SE	FLOAT		CU	
ST. LOUIS	52-12-25	W	SW-SE	FLOAT		CU	
ST. LOUIS	52-12-26	W	SE-NE	TESTPIT		CU	
ST. LOUIS	52-12-26	W	SW-SE	DRILL CORE	3	CU	OTHER
ST. LOUIS	52-12-26	W	SW-SE	TESTPIT		CAR, CU, PRE, ZEO	
ST. LOUIS	52-12-36	W	NW-SE	FLOAT		CU	
ST. LOUIS	53-14- 7	W	NW-NE	DRILL CORE	IV-9	CU	DNR
ST. LOUIS	53-14- 7	W	SW-NE	DRILL CORE	IV-7	CU, NI	DNR

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
ST. LOUIS	53-14-7	W	SE-NE	DRILL CORE	IV-6	CU, NI	DNR
ST. LOUIS	53-14-7	W	SE-NE	DRILL CORE	IV-8	CU, NI	DNR
ST. LOUIS	53-14-8	W	SW-NW	DRILL CORE	IV-1	CU	DNR
ST. LOUIS	53-15-25	W	NW-SE	DRILL CORE	V-2	CU	DNR
ST. LOUIS	53-15-36	W	NW-SE	DRILL CORE	UNK	GRF, OLV, SUL, TI, P	OTHER
ST. LOUIS	54-14-9	W	SE-SE	DRILL CORE	I-6	CU	DNR
ST. LOUIS	54-14-10	W	SW-NW	DRILL CORE	I-1A	CU	DNR
ST. LOUIS	54-14-10	W	SE-NW	DRILL CORE	I-5A	CU	DNR
ST. LOUIS	54-14-16	W	NE-NE	DRILL CORE	I-7	CU	DNR
ST. LOUIS	54-14-16	W	SW-NE	DRILL CORE	I-12	CU	DNR
ST. LOUIS	54-14-16	W	SE-NE	DRILL CORE	I-9	CU	DNR
ST. LOUIS	54-14-16	W	SE-NW	DRILL CORE	I-3	CU	DNR
ST. LOUIS	54-14-16	W	NE-SW	DRILL CORE	I-10	CU	DNR
ST. LOUIS	54-14-16	W	NE-SW	DRILL CORE	I-2	CU	DNR
ST. LOUIS	54-14-16	W	SE-SW	DRILL CORE	I-8	CU	DNR
ST. LOUIS	54-14-16	W	NW-SE	DRILL CORE	I-13	CU	DNR
ST. LOUIS	54-14-16	W	NW-SE	DRILL CORE	I-4	CU	DNR
ST. LOUIS	54-14-23	W	NE-NW	DRILL CORE	VIII-2	CU	DNR
ST. LOUIS	55-12-20	W	NW-SE	OUTCROP		OLV, SUL	
ST. LOUIS	55-14-9	W	NW-SE	DRILL CORE	CV-2	CU	DNR
ST. LOUIS	55-14-29	W	NW-SW	DRILL CORE	CV-1	CU	DNR
ST. LOUIS	57-14-16	W	NE-NE	DRILL CORE	II-3	CU	DNR
ST. LOUIS	57-14-16	W	SE-NE	DRILL CORE	II-1	CU	DNR
ST. LOUIS	57-14-16	W	SE-NE	DRILL CORE	II-4	CU	DNR
ST. LOUIS	57-14-16	W	SE-SW	DRILL CORE	II-2	CU	DNR
ST. LOUIS	57-14-16	W	NE-SE	DRILL CORE	II-6	CU	DNR
ST. LOUIS	57-14-16	W	NW-SE	DRILL CORE	II-5	CU	DNR
ST. LOUIS	57-14-28	W	NW-SE	OUTCROP		OLV, TI, GRF, SUL	
ST. LOUIS	57-14-34	W	SE-SW	DRILL CORE	BC-80-1	AG	DNR
ST. LOUIS	57-17-16	W	NW-SE	DRILL CORE	3	SUL	
ST. LOUIS	58-17-22	W	NW-NE	OUTCROP		AU, PYR	
ST. LOUIS	58-17-29	W	NW-SE	OUTCROP		CU, PYR, ZN	
ST. LOUIS	58-18-1	W	NW-SE	FLOAT		ZN	
ST. LOUIS	58-21-35	W	NW-NW	OUTCROP	2275	TI	
ST. LOUIS	59-13-16	W	NW-SE	TESTPIT		MAG, TI	
ST. LOUIS	60-12-2	W	NW-SE	OUTCROP		MAG, TI	
ST. LOUIS	60-12-3	W	NW-SE	OUTCROP		MAG, TI	
ST. LOUIS	60-13-29	W	NW-SE	TESTPIT		AU	
ST. LOUIS	60-13-29	W	NW-SE	TESTPIT		PYR	
ST. LOUIS	61-12-26	W	NW-SE	OUTCROP		MAG, TI	
ST. LOUIS	61-12-34	W	NW-SE	OUTCROP		MAG, TI	
ST. LOUIS	61-12-35	W	NW-SE	OUTCROP		MAG, TI	
ST. LOUIS	61-14-8	W	SW-NW	DRILL CORE	SL-1	AG, CU, ZN	DNR
ST. LOUIS	61-14-8	W	SW-NW	DRILL CORE	SL-2	AG, AU, CU, HG, S, ZN	DNR
ST. LOUIS	61-14-8	W	SW-NW	DRILL CORE	SL-3	AG, AU, CO, CU, NI	DNR
ST. LOUIS	61-15-4	W	NW-SE	TESTPIT		AG, AU, CAR, CU, FE, PYR	
ST. LOUIS	61-15-4	W	NW-SE	DRILL CORE		AG, AU	OTHER
ST. LOUIS	61-15-5	W	SW-SW	DRILL CORE	T-5	ZN	DNR
ST. LOUIS	61-15-6	W	SE-SE	DRILL CORE	T-6	ZN	DNR
ST. LOUIS	61-19-25	W	NW-SW	TESTPIT		PYR	
ST. LOUIS	62-12-4	W	SW-SW	DRILL CORE	M-1	ZN	DNR
ST. LOUIS	62-12-4	W	SE-SE	OUTCROP		AG	
ST. LOUIS	62-12-7	W	SE-NE	DRILL CORE	M-2	AG, CU, ZN	DNR
ST. LOUIS	62-12-16	W	NW-SE	OUTCROP		CU, PYO, ZN	
ST. LOUIS	62-13-1	W	NW-SE	OUTCROP		CU, PYO, ZN	
ST. LOUIS	62-13-3	W	NW-SE	OUTCROP		CU, PYO, ZN	
ST. LOUIS	62-13-4	W	NW-NE	OUTCROP		CU, PYO, ZN	
ST. LOUIS	62-13-12	W	NW-SE	DRILL CORE	TL-8	AG, CU, GRF, ZN	DNR
ST. LOUIS	62-13-14	W	NW-SE	DRILL CORE	TL-9	AG, CU, ZN	DNR
ST. LOUIS	62-13-18	W	NW-SE	OUTCROP		AG, AU, CU, NI, ZN	
ST. LOUIS	62-14-3	W	SW-NW	TESTPIT		CAR, CU, PYR	
ST. LOUIS	62-14-4	W	NW-NW	OUTCROP		CU	
ST. LOUIS	62-14-5	W	NE-NE	DRILL CORE	V-6	AG	DNR
ST. LOUIS	62-14-5	W	NW-SE	TESTPIT		FE	
ST. LOUIS	62-14-13	W	NW-SE	TESTPIT		FE	
ST. LOUIS	62-14-14	W	NW-SE	FLOAT		AU, PYR	
ST. LOUIS	62-14-14	W	NW-SE	TESTPIT		FE, AU	
ST. LOUIS	62-14-16	W	NW-SE	TESTPIT		AU	
ST. LOUIS	62-14-36	W	NW-SE	TESTPIT		AU	
ST. LOUIS	62-15-2	W	NW-NE	DRILL CORE	RL-10	AG, CU, ZN	DNR
ST. LOUIS	62-15-6	W	SW-NW	DRILL CORE	P-1	AS, CU, HG, ZN	DNR
ST. LOUIS	62-15-15	W	NW-SE	OUTCROP		AU, PYR, CAR	
ST. LOUIS	62-15-15	W	NW-SE	OUTCROP		CU	

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
ST. LOUIS	62-15-16	W	NW-SE	OUTCROP		CU	
ST. LOUIS	62-15-17	W	NW-SE	OUTCROP		CU	
ST. LOUIS	62-15-27	W	NW-SE	OUTCROP		CU, KAO, PYR	
ST. LOUIS	62-15-27	W	NW-SE	TESTPIT		CU, FE	
ST. LOUIS	62-15-28	W	NW-SE	TESTPIT		CU, KAO, PYR	
ST. LOUIS	62-15-32	W	NW-SE	OUTCROP		SUL	
ST. LOUIS	62-15-32	W	NW-SE	TESTPIT		CU	
ST. LOUIS	62-16- 4	W	NW-SE	OUTCROP		AU, PYR	
ST. LOUIS	62-16- 6	W	NW-SE	OUTCROP		CAR, PYR, TOU	
ST. LOUIS	62-16- 6	W	NW-SE	TESTPIT		AU	
ST. LOUIS	62-16- 9	W	SE-NW	TESTPIT		AU	
ST. LOUIS	62-16- 9	W	NW-SE	OUTCROP		ANK, AU, CU, PYR, TOU	
ST. LOUIS	62-16- 9	W	NW-SE	OUTCROP		AU, CAR, PYR	
ST. LOUIS	62-16- 9	W	NW-SE	TESTPIT		AU	
ST. LOUIS	62-16-10	W	NW-NW	TESTPIT		AU, CU, PYR	
ST. LOUIS	62-16-10	W	NW-SE	TESTPIT		PYR, AU	
ST. LOUIS	62-16-26	W	SW-SW	OUTCROP		AU	
ST. LOUIS	62-16-27	W	NW-SE	TESTPIT		FE	
ST. LOUIS	62-17-29	W	SE-SW	DRILL CORE	SC-1	AG	DNR
ST. LOUIS	62-18- 3	W	NW-SE	TESTPIT		FE	
ST. LOUIS	62-20-11	W	SW-SW	TESTPIT		ASB	
ST. LOUIS	62-21- 4	W	NW-SW	DRILL CORE	LF-4	F	DNR
ST. LOUIS	62-21-10	W	SW-SW	DRILL CORE	LF-5	F	DNR
ST. LOUIS	63-12- 1	W	NW-SE	OUTCROP		CR, OLV	
ST. LOUIS	63-12- 4	W	SW-NW	TESTPIT		FE	
ST. LOUIS	63-12- 9	W	NW-SE	OUTCROP		CR, OLV	
ST. LOUIS	63-12- 9	W	SW-SE	OUTCROP		SUL	
ST. LOUIS	63-12-11	W	NW-NW	OUTCROP		SUL	
ST. LOUIS	63-12-16	W	NE-SW	DRILL CORE	LL-2	ZN	DNR
ST. LOUIS	63-12-16	W	NE-SW	DRILL CORE	LL-3	CU	DNR
ST. LOUIS	63-12-16	W	SW-SW	DRILL CORE	LL-1	ZN	DNR
ST. LOUIS	63-12-16	W	NW-SE	OUTCROP		PYR	
ST. LOUIS	63-12-16	W	NW-SE	OUTCROP		TOU	
ST. LOUIS	63-12-27	W	NW-SE	OUTCROP		CAR, CU, F, KAO, P, PYO	
ST. LOUIS	63-12-27	W	NW-SE	OUTCROP		PYR	
ST. LOUIS	63-12-27	W	NW-SE	OUTCROP		TOU	
ST. LOUIS	63-12-27	W	NW-SE	OUTCROP		CU, PYO, PYR	
ST. LOUIS	63-12-30	W	SW-SW	OUTCROP		AG, AU, CU, PB, PYR, SB, ZN	
ST. LOUIS	63-12-33	W	NW-SE	OUTCROP		CU, PYO, ZN	
ST. LOUIS	63-12-35	W	SE-SE	DRILL CORE	WW-1	CU, ZN	DNR
ST. LOUIS	63-13-25	W	NW-SE	OUTCROP		CAR, FCH	
ST. LOUIS	63-13-26	W	NW-SE	OUTCROP		CAR, FCH	
ST. LOUIS	63-13-27	W	NW-SE	OUTCROP		CAR, FCH	
ST. LOUIS	63-14-16	W	NW-SE	TESTPIT		FE	
ST. LOUIS	63-14-32	W	NW-SE	OUTCROP		PYR	
ST. LOUIS	63-14-33	W	NW-SE	OUTCROP		PYR	
ST. LOUIS	63-15-33	W	NW-SE	OUTCROP		PYR	
ST. LOUIS	63-16-10	W	NE-NW	OUTCROP		CU, PYR	
ST. LOUIS	63-16-16	W	NW-SE	TESTPIT		AU	
ST. LOUIS	63-16-23	W	NW-SE	OUTCROP		AU	
ST. LOUIS	63-16-31	W	NW-SE	OUTCROP		CU	
ST. LOUIS	63-16-36	W	NW-SE	OUTCROP		PYR	
ST. LOUIS	63-17-16	W	NW-SE	OUTCROP		ANK, AU, CU, PYR, TOU	
ST. LOUIS	63-18-13	W	NW-SE	OUTCROP		AU	
ST. LOUIS	63-20-16	W	NW-SE	OUTCROP		AG, AU, CU, PB	
ST. LOUIS	63-20-36	W	NW-SE	OUTCROP		AU	
ST. LOUIS	63-21-21	W	NW-SW	DRILL CORE	LF-1	F	DNR
ST. LOUIS	63-21-28	W	SW-NW	DRILL CORE	LF-2	F	DNR
ST. LOUIS	63-21-32	W	SE-NE	DRILL CORE	LF-3	F	DNR
ST. LOUIS	63-21-35	W	NW-SE	OUTCROP		P	
ST. LOUIS	64-12-36	W	NW-SE	DRILL CORE	BL-1	NI	DNR
ST. LOUIS	64-20-16	W	NW-SE	OUTCROP		CU, PYR	
ST. LOUIS	64-20-31	W	NW-SE	OUTCROP		AG, AU, CAR, CU, PB, SUL	
ST. LOUIS	64-21-25	W	NW-SE	OUTCROP		AG, AU, CU, PB	
ST. LOUIS	65-17- 3	W	NW-SE	OUTCROP		AU, PYO	
ST. LOUIS	66-17- 3	W	NE-SW	TESTPIT		FE	
ST. LOUIS	66-17-33	W	NE-NE	TESTPIT		ANK	
ST. LOUIS	66-17-33	W	NE-NE	TESTPIT		AG	
ST. LOUIS	66-17-33	W	NE-NE	TESTPIT		PYO, CAR, FE, GAR, MN, PYR	

APPENDIX C. ALL ORE MINERAL OCCURRENCES

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
ST. LOUIS	66-17-33	W	NE-NE	TESTPIT		ZN	
ST. LOUIS	66-17-33	W	NW-SE	OUTCROP		CU, PYO	
ST. LOUIS	66-17-33	W	NW-SE	TESTPIT		AU	
ST. LOUIS	66-17-33	W	NW-SE	TESTPIT		SUL	
ST. LOUIS	67-17-16	W	NW-SE	TESTPIT		AG, AU, MO	
ST. LOUIS	67-18-36	W	NW-SE	TESTPIT		AU, CU, PYO, PYR	
ST. LOUIS	69-18- 6	W	NW-SE	TESTPIT		GAR	
ST. LOUIS	71-21-28	W	NW-SE	TESTPIT		AU	
ST. LOUIS	71-21-28	W	NW-SE	OUTCROP		GOS	
STEARNS	123-30-16	W	NW-SE	OUTCROP		CU, PYR	
STEARNS	124-30-16	W	NW-SE	OUTCROP		CU	
STEARNS	124-30-16	W	NW-SE	OUTCROP		P, PYR	
TODD	133-32-16	W	NW-SE	OUTCROP		MAG, P, TI	
WABASHA	109-13-21	W	NW-SE	OUTCROP		PB	
WABASHA	109-14-25	W	NW-SE	FLOAT		AU	
WABASHA	110-10-17	W	NW-SE	OUTCROP		PB	
WABASHA	110-14-25	W	NW-SE	FLOAT		AU	
WASHINGTON	27-20-15	W	NW-SE	FLOAT		CU	
WASHINGTON	28-20-16	W	NW-SE	TESTPIT		AU, FE	
WASHINGTON	29-20-22	W	NW-SE	FLOAT		CU	
WASHINGTON	29-20-27	W	NW-SE	FLOAT		CU	
WASHINGTON	29-20-30	W	NW-SE	OUTCROP		P, PYR	
WASHINGTON	30-20-20	W	NW-SE	FLOAT		TRI	
WINONA	105- 4-18	W	NE-NE	OUTCROP		PB	
WINONA	105- 4-18	W	NE-NE	OUTCROP		PYR	
WINONA	105- 4-18	W	NW-SE	TESTPIT		PB	
WINONA	105- 4-18	W	NW-SE	TESTPIT		PB, PYR	
YELLOW MEDICINE	113-39-29	W	NW-SE	OUTCROP		U	
YELLOW MEDICINE	115-39- 3	W	NW-SE	OUTCROP		GAR, MAG, P	
YELLOW MEDICINE	115-39- 4	W	NW-SE	TESTPIT		AU, PYR	
YELLOW MEDICINE	115-39-10	W	NW-SE	OUTCROP		CU	
YELLOW MEDICINE	115-39-10	W	NW-SE	OUTCROP		AG	
YELLOW MEDICINE	115-39-11	W	NW-SE	OUTCROP		GAR	
YELLOW MEDICINE	116-39-33	W	NW-SE	OUTCROP		CR, NI	

APPENDIX D. OCCURRENCES OF GOLD AND SILVER

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
AITKIN	46-25-36	W	NE-NE	DRILL CORE	1	AU, CU, ZN	OTHER
BELTRAMI	150-31-29	W	NW-NW	DRILL CORE	BID-3	AG, AU, CU, ZN	DNR
BELTRAMI	151-30- 8	W	NW-NE	DRILL CORE	RL 43-1	AU, CU, GRF, PYR, ZN, PYO	DNR
BELTRAMI	151-32-36	W	NW-NW	DRILL CORE	RL-25	AS, AU	DNR
BELTRAMI	152-30-31	W	NW-SW	TESTPIT		AU, GAR, CAR, PYR	
BELTRAMI	158-36- 7	W	NE-NE	DRILL CORE	FT-10	AS, AU, HG	DNR
BELTRAMI	158-36- 7	W	SE-NE	DRILL CORE	FT-21	AS, AU	DNR
BELTRAMI	158-36- 7	W	NE-SE	DRILL CORE	FT-12	AS, AU, HG	DNR
BELTRAMI	158-36-13	W	NW-SE	DRILL CORE	FT-14	AG, AS, AU, B, HG	DNR
BELTRAMI	158-36-23	W	SE-SW	DRILL CORE	FT-3	AG, CU, ZN	DNR
BELTRAMI	158-36-23	W	SW-SE	DRILL CORE	FT-2	AG, ZN	DNR
BELTRAMI	158-36-24	W	NW-SW	DRILL CORE	T25A-1	AG, CU, ZN	DNR
BELTRAMI	158-36-25	W	NE-NW	DRILL CORE	T25B-2	AG, ZN	DNR
BELTRAMI	158-36-26	W	SE-NW	DRILL CORE	FT-4	AG, AU, AS, HG, ZN	DNR
BENTON	37-30-27	W	NW-SE	TESTPIT		AU	
CARLTON	46-18-16	W	NW-SE	FLOAT		AU	
CARLTON	46-20- 8	W	SW-SW	DRILL CORE	MG-7	AG, MO, P, TH, ZN	DNR
CARLTON	46-20-16	W	NW-SE	TESTPIT		AU	
CARLTON	46-20-28	W	NE-NW	DRILL CORE	ML-48	AG	DNR
CARLTON	46-20-28	W	NW-SE	TESTPIT		AU	
CARLTON	47-17-16	W	NW-SE	OUTCROP		AU	
CARLTON	47-19-15	W	NW-SE	OUTCROP		AU, PYR	
CARLTON	48-16- 5	W	NW-SE	OUTCROP		PYR, AU, CU, SUL	
CARLTON	48-16- 6	W	NW-SE	TESTPIT		AU	
CARLTON	48-18-32	W	SW-NW	TESTPIT		AU, TH, U, GRF, P	
CHISAGO	34-19-16	W	NW-SE	OUTCROP		AG	
CHISAGO	34-19-25	W	NW-SE	OUTCROP		AU, CU	
CHISAGO	34-19-25	W	NW-SE	TESTPIT		AG, CU	
COOK	64- 2- 5	E	SE-SE	TESTPIT		AG, CAR, PYR	
COOK	64- 3- 5	E	NW-SE	TESTPIT		AG, CAR, PB, PYR	
COOK	64- 3- 6	E	NW-SE	OUTCROP		AG, AU, PYR	
COOK	64- 3- 9	E	NW-SE	OUTCROP		AG	
COOK	64- 5-35	E	NW-SE	TESTPIT		AU	
COOK	64- 7-32	E	NW-SW	TESTPIT		AU	
COOK	64- 7-32	E	NW-SE	TESTPIT		AG, CU	
COOK	65- 1-33	W	SW-SW	TESTPIT		AG, CAR	
COOK	65- 2-31	E	NW-SE	TESTPIT		AU, CAR, CU, PB, PYR, ZN	
COOK	65- 3-32	E	NW-SE	OUTCROP		AG, PB, PYR	
COOK	65- 3-34	W	NW-SE	OUTCROP		AU	
COOK	65- 3-34	W	NW-SE	TESTPIT		AS, AU, CO, CU, PYO, PYR	
COOK	65- 5-13	W	NW-SE	TESTPIT		AU, CAR	
COOK	66- 4-14	W	NW-SE	OUTCROP		AU, F	
COOK	66- 5-14	W	SE-NW	OUTCROP		AG, AU, F	
COOK	66- 5-14	W	NW-SE	OUTCROP		AU, CAR, F	
CROW WING	45-28-25	W	NW-SE	OUTCROP		AU	
FILLMORE	103-13-26	W	NW-SE	FLOAT		AU, PB	
FILLMORE	103-13-31	W	NW-SE	FLOAT		AU, CU	
FILLMORE	104-12-31	W	NW-SE	FLOAT		AU, CU	
ITASCA	58-22-16	W	NW-SE	OUTCROP		AU	
ITASCA	62-22- 7	W	SW-SE	DRILL CORE	COOK 8-1	AG, ZN	DNR
ITASCA	150-28-16	W	NW-SE	OUTCROP		AU	
KANDIYOHI	122-36- 5	W	NW-SE	FLOAT		AU	
KOOCHICHING	63-25-27	W	SE-NW	DRILL CORE	FL-32-1	AG, GRF, ZN	DNR
KOOCHICHING	67-25-23	W	NW-SE	TESTPIT		AU	
KOOCHICHING	71-22-23	W	NW-SE	TESTPIT		AU, CAR, PYR, TOU	
KOOCHICHING	71-22-23	W	SE-SE	TESTPIT		AU, PYR	
KOOCHICHING	71-22-25	W	SW-SW	TESTPIT		AU	
KOOCHICHING	71-22-26	W	SW-SW	TESTPIT		AU	
KOOCHICHING	71-22-26	W	NW-SE	TESTPIT		AU, ANK, PYR, TOU	
KOOCHICHING	71-22-27	W	NW-SE	TESTPIT		AU	
KOOCHICHING	71-22-33	W	NW-SE	TESTPIT		AU, ANK, CU, PYR, TOU	
KOOCHICHING	71-23-26	W	NW-SE	OUTCROP		AU	
KOOCHICHING	71-23-30	W	NW-SE	TESTPIT		AU, PYR, TOU	
KOOCHICHING	151-28-16	W	NW-SE	FLOAT		AG	
KOOCHICHING	151-28-21	W	SW-NW	DRILL CORE	G-2	AU, CU	DNR
KOOCHICHING	158-28- 5	W	SE-SW	DRILL CORE	A-9-1	AG, CU, PYO, PYR	DNR
KOOCHICHING	159-25- 4	W	NW-SE	OUTCROP		AU, PYR	
KOOCHICHING	159-25- 8	W	SE-SW	OUTCROP		AG, AU	
KOOCHICHING	159-25-10	W	NW-NE	DRILL CORE	IH-13	AU, CR	DNR

APPENDIX D. OCCURRENCES OF GOLD AND SILVER

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
KOOCHICHING	159-25-16	W	SW-NW	DRILL CORE	IH-10	AG, AU	DNR
KOOCHICHING	159-25-16	W	SW-NW	DRILL CORE	IH-11	AG, ZN	DNR
KOOCHICHING	159-25-16	W	SW-NW	DRILL CORE	IH-12	AG, NI	DNR
KOOCHICHING	159-25-16	W	SE-SW	OUTCROP		AU	
KOOCHICHING	159-25-16	W	SE-SW	OUTCROP		AG	
KOOCHICHING	159-25-16	W	NW-SE	OUTCROP		AG, CU	
KOOCHICHING	159-25-17	W	NW-NE	OUTCROP		AU	
KOOCHICHING	159-25-17	W	SE-NE	OUTCROP		AU	
KOOCHICHING	159-26-7	W	NE-NE	DRILL CORE	RR-80-2	AG, CU	DNR
KOOCHICHING	159-27-15	W	NW-SW	DRILL CORE	R-2-1	AG, CU, ZN	DNR
KOOCHICHING	159-27-16	W	NE-SE	DRILL CORE	R-2-1A	AG, CU, ZN	DNR
KOOCHICHING	159-27-16	W	SE-SE	DRILL CORE	NCB-2	AG, ZN, CU	DNR
KOOCHICHING	159-27-16	W	SE-SE	DRILL CORE	S-43-2	AG, PYO, PYR, ZN	DNR
KOOCHICHING	159-28-10	W	SW-NE	DRILL CORE	R.R. 12-1	AG, AS	DNR
KOOCHICHING	159-28-17	W	SW-SE	OUTCROP		AG, AU, CU	
KOOCHICHING	160-26-35	W	SW-SE	OUTCROP		AG, AU, ZN	
KOOCHICHING	160-26-35	W	SW-SE	OUTCROP		AG, AU	
KOOCHICHING	160-26-36	W	NW-SE	OUTCROP		AG, AU, CU, MAG, NI, PYO, ZN	
LAKE	63-11-16	W	NW-SE	OUTCROP		AU	
LAKE	64-11-16	W	NW-SE	OUTCROP		AU, CU, PYR, TOU, AG, CR, NI, PD	
LAKE OF THE WOODS	157-34-5	W	SE-NW	DRILL CORE	B31-1	AG, AS, CU, MO, PYO, PYR, ZN, AU	DNR
LAKE OF THE WOODS	158-33-2	W	NW-NW	DRILL CORE	B21-3	AU, CU, PYO, PYR, ZN	DNR
LAKE OF THE WOODS	158-33-32	W	NW-NW	DRILL CORE	MED-1	AG, CU	DNR
LAKE OF THE WOODS	158-34-11	W	SE-SW	DRILL CORE	MOQ-2	AG, AU, CU	DNR
LAKE OF THE WOODS	158-34-12	W	NE-SE	DRILL CORE	MDD-1	AG, CU	DNR
LAKE OF THE WOODS	158-34-25	W	SW-NE	DRILL CORE	MMD-1	AG, ZN	DNR
LAKE OF THE WOODS	159-32-14	W	NE-SW	DRILL CORE	BD-3	AG, B	DNR
LAKE OF THE WOODS	159-33-34	W	SE-SE	DRILL CORE	B21-1	AG, AS, CO, ZN	DNR
LAKE OF THE WOODS	160-30-9	W	SW-SW	DRILL CORE	B-57-1	AG, CU, GRF, SUL, ZN	DNR
LAKE OF THE WOODS	160-30-16	W	NE-NW	DRILL CORE	B-3-3	AG, CU, ZN	DNR
LAKE OF THE WOODS	166-34-16	W	NW-SE	OUTCROP		AU	
MARSHALL	158-44-20	W	NW-NW	OUTCROP		AU	
MORRISON	40-29-8	W	NW-NE	TESTPIT		AU, PYR	
MORRISON	128-29-32	W	NW-SE	OUTCROP		AU	
NORMAN	143-44-34	W	SW-NE	DRILL CORE	HL-1	AG, ZN	DNR
NORMAN	145-44-15	W	SW-NE	DRILL CORE	ST-2	AS, AU, CU	DNR
NORMAN	145-44-15	W	NW-SE	DRILL CORE	ST-1	AG, AS, CU	DNR
NORMAN	146-44-36	W	SE-SE	DRILL CORE	GA-1	AU, CR, NI	DNR
OLMSTED	107-14-16	W	NW-SE	FLOAT		AU	
OLMSTED	108-14-16	W	NW-SE	FLOAT		AU	
PINE	41-19-19	W	NW-SE	OUTCROP		AG, CU	
PINE	41-20-34	W	NW-SE	OUTCROP		AG, CU	
PINE	45-20-4	W	NW-SE	TESTPIT		AU	
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-45C	CU, AG, AS, F, MO, P, PB, SE, TH, U, V	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-49C	AG, CU, MO	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-53C	AG, CU, MO, ZN	DNR
PINE	45-21-25	W	NW-SE	OUTCROP		AG, AU, CU, PB, ZN	
RENVILLE	112-33-18	W	NW-SE	OUTCROP		AG	
RENVILLE	113-34-33	W	NW-SE	OUTCROP		AG	
RENVILLE	113-35-22	W	NW-SE	OUTCROP		AG	
RENVILLE	113-36-4	W	NW-SE	OUTCROP		AU	
RICE	110-20-33	W	SW-SE	FLOAT		AU, CU	
ST. LOUIS	50-14-16	W	NW-SE	TESTPIT		AG, CU, SUL	
ST. LOUIS	50-14-23	W	NW-SE	OUTCROP		AU	
ST. LOUIS	57-14-34	W	SE-SW	DRILL CORE	BC-80-1	AG	DNR
ST. LOUIS	58-17-22	W	NW-NE	OUTCROP		AU, PYR	
ST. LOUIS	60-13-29	W	NW-SE	TESTPIT		AU	
ST. LOUIS	61-14-8	W	SW-NW	DRILL CORE	SL-1	AG, CU, ZN	DNR
ST. LOUIS	61-14-8	W	SW-NW	DRILL CORE	SL-2	AG, AU, CU, HG, S, ZN	DNR
ST. LOUIS	61-14-8	W	SW-NW	DRILL CORE	SL-3	AG, AU, CO, CU, NI	DNR
ST. LOUIS	61-15-4	W	NW-SE	TESTPIT		AG, AU, CAR, CU, FE, PYR	
ST. LOUIS	61-15-4	W	NW-SE	DRILL CORE		AG, AU	OTHER
ST. LOUIS	62-12-4	W	SE-SE	OUTCROP		AG	
ST. LOUIS	62-12-7	W	SE-NE	DRILL CORE	M-2	AG, CU, ZN	DNR
ST. LOUIS	62-13-12	W	NW-SE	DRILL CORE	TL-8	AG, CU, GRF, ZN	DNR
ST. LOUIS	62-13-14	W	NW-SE	DRILL CORE	TL-9	AG, CU, ZN	DNR
ST. LOUIS	62-13-18	W	NW-SE	OUTCROP		AG, AU, CU, NI, ZN	
ST. LOUIS	62-14-5	W	NE-NE	DRILL CORE	V-6	AG	DNR
ST. LOUIS	62-14-14	W	NW-SE	FLOAT		AU, PYR	
ST. LOUIS	62-14-14	W	NW-SE	TESTPIT		FE, AU	
ST. LOUIS	62-14-16	W	NW-SE	TESTPIT		AU	
ST. LOUIS	62-14-36	W	NW-SE	TESTPIT		AU	
ST. LOUIS	62-15-2	W	NW-NE	DRILL CORE	RL-10	AG, CU, ZN	DNR

APPENDIX D. OCCURRENCES OF GOLD AND SILVER

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
ST. LOUIS	62-15-15	W	NW-SE	OUTCROP		AU, PYR, CAR	
ST. LOUIS	62-16-4	W	NW-SE	OUTCROP		AU, PYR	
ST. LOUIS	62-16-6	W	NW-SE	TESTPIT		AU	
ST. LOUIS	62-16-9	W	SE-NW	TESTPIT		AU	
ST. LOUIS	62-16-9	W	NW-SE	OUTCROP		ANK, AU, CU, PYR, TOU	
ST. LOUIS	62-16-9	W	NW-SE	OUTCROP		AU, CAR, PYR	
ST. LOUIS	62-16-9	W	NW-SE	TESTPIT		AU	
ST. LOUIS	62-16-10	W	NW-NW	TESTPIT		AU, CU, PYR	
ST. LOUIS	62-16-10	W	NW-SE	TESTPIT		PYR, AU	
ST. LOUIS	62-16-26	W	SW-SW	OUTCROP		AU	
ST. LOUIS	62-17-29	W	SE-SW	DRILL CORE	SC-1	AG	DNR
ST. LOUIS	63-12-30	W	SW-SW	OUTCROP		AG, AU, CU, PB, PYR, SB, ZN	
ST. LOUIS	63-16-16	W	NW-SE	TESTPIT		AU	
ST. LOUIS	63-16-23	W	NW-SE	OUTCROP		AU	
ST. LOUIS	63-17-16	W	NW-SE	OUTCROP		ANK, AU, CU, PYR, TOU	
ST. LOUIS	63-18-13	W	NW-SE	OUTCROP		AU	
ST. LOUIS	63-20-16	W	NW-SE	OUTCROP		AG, AU, CU, PB	
ST. LOUIS	63-20-36	W	NW-SE	OUTCROP		AU	
ST. LOUIS	64-20-31	W	NW-SE	OUTCROP		AG, AU, CAR, CU, PB, SUL	
ST. LOUIS	64-21-25	W	NW-SE	OUTCROP		AG, AU, CU, PB	
ST. LOUIS	65-17-3	W	NW-SE	OUTCROP		AU, PYO	
ST. LOUIS	66-17-33	W	NE-NE	TESTPIT		AG	
ST. LOUIS	66-17-33	W	NW-SE	TESTPIT		AU	
ST. LOUIS	67-17-16	W	NW-SE	TESTPIT		AG, AU, MO	
ST. LOUIS	67-18-36	W	NW-SE	TESTPIT		AU, CU, PYO, PYR	
ST. LOUIS	71-21-28	W	NW-SE	TESTPIT		AU	
WABASHA	109-14-25	W	NW-SE	FLOAT		AU	
WABASHA	110-14-25	W	NW-SE	FLOAT		AU	
WASHINGTON	28-20-16	W	NW-SE	TESTPIT		AU, FE	
YELLOW MEDICINE	115-39-4	W	NW-SE	TESTPIT		AU, PYR	
YELLOW MEDICINE	115-39-10	W	NW-SE	OUTCROP		AG	

APPENDIX E. OCCURRENCES OF COPPER AND ZINC

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
AITKIN	46-25-36	W	NE-NE	DRILL CORE	1	AU, CU, ZN	OTHER
BELTRAMI	150-31-29	W	NW-NW	DRILL CORE	BID-3	AG, AU, CU, ZN	DNR
BELTRAMI	150-31-29	W	SW-NW	DRILL CORE	RL-28-1	CR, CU, GRF, NI	DNR
BELTRAMI	150-32-13	W	SE-NE	DRILL CORE	BID-2	CU, GRF	DNR
BELTRAMI	151-30-7	W	NE-NW	DRILL CORE	RL 42-1	GRF, ZN	DNR
BELTRAMI	151-30-8	W	NW-NE	DRILL CORE	RL 43-1	AU, CU, GRF, PYR, ZN, PYO	DNR
BELTRAMI	152-30-30	W	NE-NE	DRILL CORE	RL-39	CU, GRF	DNR
BELTRAMI	158-36-23	W	SE-SW	DRILL CORE	FT-3	AG, CU, ZN	DNR
BELTRAMI	158-36-23	W	SW-SE	DRILL CORE	FT-2	AG, ZN	DNR
BELTRAMI	158-36-23	W	SE-SE	DRILL CORE	FT-1	CU	DNR
BELTRAMI	158-36-24	W	NW-SW	DRILL CORE	T25A-1	AG, CU, ZN	DNR
BELTRAMI	158-36-25	W	NE-NW	DRILL CORE	T25B-2	AG, ZN	DNR
BELTRAMI	158-36-26	W	SE-NW	DRILL CORE	FT-4	AG, AU, AS, HG, ZN	DNR
CARLTON	46-19-2	W	NE-NE	OUTCROP		GAR, PYR, TOU, CU	
CARLTON	46-19-19	W	NE-SE	DRILL CORE	AW-2	CU, GRF, MO, U, V	DNR
CARLTON	46-20-7	W	SW-SE	DRILL CORE	MG-5	CU, MO, TH, ZN	DNR
CARLTON	46-20-8	W	SW-SW	DRILL CORE	MG-7	AG, MO, P, TH, ZN	DNR
CARLTON	48-16-1	W	SW-NE	OUTCROP		CU, PYO, PYR	
CARLTON	48-16-5	W	NW-SE	OUTCROP		PYR, AU, CU, SUL	
CARLTON	48-17-19	W	NW-SE	FLOAT		CU	
CARVER	115-23-16	W	NW-SE	FLOAT		CU	
CASS	143-27-16	W	NW-SE	OUTCROP		CAR, CU, PYR	
CHISAGO	33-19-1	W	NW-SE	OUTCROP		CU	
CHISAGO	34-19-1	W	NW-SE	FLOAT		CU	
CHISAGO	34-19-1	W	NW-SE	OUTCROP		CU, KAO	
CHISAGO	34-19-16	W	NW-SE	OUTCROP		CU	
CHISAGO	34-19-25	W	NW-SE	FLOAT		CU	
CHISAGO	34-19-25	W	NW-SE	OUTCROP		AU, CU	
CHISAGO	34-19-25	W	NW-SE	TESTPIT		AG, CU	
CLAY	142-44-29	W	SW-NE	DRILL CORE	SL-1	AS, ZN	DNR
COOK	59-4-13	W	NW-SE	OUTCROP		CU	
COOK	60-2-1	W	NW-SE	OUTCROP		CU	
COOK	60-2-16	W	NW-SE	OUTCROP		CU	
COOK	60-3-25	W	NW-SE	OUTCROP		CU	
COOK	60-3-31	W	NW-SE	TESTPIT		CU	
COOK	60-3-34	W	NW-SE	OUTCROP		CU	
COOK	61-1-12	E	NW-SE	OUTCROP		CU	
COOK	61-1-16	W	NW-SE	OUTCROP		CAR, CU	
COOK	61-1-24	W	NW-SE	OUTCROP		CU	
COOK	61-1-27	W	NW-SE	OUTCROP		CU	
COOK	61-2-9	E	NW-SE	OUTCROP		CU	
COOK	61-2-15	W	NW-SE	OUTCROP		CU	
COOK	62-1-16	W	NW-SE	OUTCROP		CU	
COOK	62-2-16	W	NW-SE	OUTCROP		CU	
COOK	62-2-36	W	NW-SE	OUTCROP		CU, KAO, PRE	
COOK	62-3-16	W	NW-SE	OUTCROP		CU	
COOK	63-1-16	W	NW-SE	OUTCROP		CU	
COOK	63-2-16	W	NW-SE	OUTCROP		CU	
COOK	63-3-16	W	NW-SE	OUTCROP		CU	
COOK	63-4-21	W	NW-SE	OUTCROP		MAG, TI, CU	
COOK	63-5-1	E	NW-SE	OUTCROP		CU, NI	
COOK	63-5-2	E	NW-SE	OUTCROP		CU, NI	
COOK	63-5-17	E	NW-SE	OUTCROP		CAR, CU, PYR	
COOK	63-5-25	E	NW-SE	OUTCROP		CU	
COOK	63-6-6	E	NW-SE	OUTCROP		CU, PYO	
COOK	64-2-1	W	NW-SE	OUTCROP		CU, MAG, TI	
COOK	64-3-5	W	NW-SE	OUTCROP		CU	
COOK	64-3-6	W	NW-SE	OUTCROP		CU	
COOK	64-3-6	W	NW-SE	OUTCROP		CU	
COOK	64-3-7	W	NW-SE	OUTCROP		CU	
COOK	64-3-7	W	NW-SE	OUTCROP		CU	
COOK	64-3-8	W	NW-SE	OUTCROP		CU	
COOK	64-3-8	W	NW-SE	OUTCROP		CU	
COOK	64-4-1	W	NW-SE	OUTCROP		CU	
COOK	64-4-2	W	NW-SE	OUTCROP		CU	
COOK	64-4-3	W	NW-SE	OUTCROP		CU	
COOK	64-4-4	W	NW-SE	OUTCROP		CU	
COOK	64-4-5	W	NW-SE	OUTCROP		CU	
COOK	64-4-8	W	NW-SE	OUTCROP		CU	

APPENDIX E. OCCURRENCES OF COPPER AND ZINC

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
COOK	64- 4- 9	W	NW-SE	OUTCROP		CU	
COOK	64- 4-10	W	NW-SE	OUTCROP		CU	
COOK	64- 4-11	W	NW-SE	OUTCROP		CU	
COOK	64- 4-12	W	NW-SE	OUTCROP		CU	
COOK	64- 4-14	W	NW-SE	OUTCROP		CU	
COOK	64- 4-15	W	NW-SE	OUTCROP		CU	
COOK	64- 5-31	E	NW-SE	OUTCROP		CAR, CU, PYO, PYR, SUL	
COOK	64- 5-35	E	NE-SW	OUTCROP		CAR, CU, PYO	
COOK	64- 5-35	E	SE-SW	OUTCROP		NI, OLV, PYO, CU	
COOK	64- 5-35	E	NW-SE	TESTPIT		CU, NI, PYO	
COOK	64- 5-35	E	SW-SE	OUTCROP		CU, NI, SUL	
COOK	64- 5-36	E	NE-SE	TESTPIT		CU, PYO	
COOK	64- 6-27	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 6-28	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 6-28	E	NW-SE	OUTCROP		CU, OLV, PYO	
COOK	64- 6-29	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 6-29	E	NW-SE	OUTCROP		CU, PYO, PYR	
COOK	64- 6-29	E	NW-SE	TESTPIT		CU, PYR, SUL	
COOK	64- 6-29	E	SE-SE	OUTCROP		CU, GOS, PYR	
COOK	64- 6-31	E	NE-NE	OUTCROP		CAR, CU, PYO	
COOK	64- 6-31	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 6-32	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 6-33	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 6-34	E	NW-SE	OUTCROP		CU, NI	
COOK	64- 7-27	E	NW-SE	OUTCROP		BA, CAR, CU, PB, PYR, ZN	
COOK	64- 7-28	E	NW-SE	TESTPIT		BA, CU, PYR, ZN	
COOK	64- 7-31	E	NW-SE	OUTCROP		CAR, CU	
COOK	64- 7-32	E	NW-SW	TESTPIT		CU, GRF	
COOK	64- 7-32	E	NW-SE	TESTPIT		CU	
COOK	64- 7-32	E	NW-SE	TESTPIT		ZN	
COOK	64- 7-32	E	NW-SE	FLOAT		AG, CU	
COOK	64- 7-32	E	NW-SE	TESTPIT		BA, CAR, CU, GRF	
COOK	65- 2-31	E	NW-SE	TESTPIT		AU, CAR, CU, PB, PYR, ZN	
COOK	65- 2-32	E	NW-SE	TESTPIT		CAR, CU, PB, PYR, ZN	
COOK	65- 2-30	W	NW-SE	OUTCROP		CU, SUL	
COOK	65- 2-31	W	NW-SE	OUTCROP		CU, SUL	
COOK	65- 2-32	W	NW-SE	OUTCROP		CU, SUL	
COOK	65- 2-33	W	NW-SE	OUTCROP		CU, SUL	
COOK	65- 2-35	W	NW-SE	OUTCROP		CU	
COOK	65- 2-36	W	NW-SE	OUTCROP		CU, SUL	
COOK	65- 3-30	W	NW-SE	OUTCROP		CU	
COOK	65- 3-30	W	NW-SE	OUTCROP		CU, PYO	
COOK	65- 3-30	W	NW-SE	TESTPIT		CU, PYO	
COOK	65- 3-31	W	NW-SE	OUTCROP		CU	
COOK	65- 3-33	W	NW-SE	TESTPIT		CU	
COOK	65- 3-34	W	NW-SE	TESTPIT		AS, AU, CO, CU, PYO, PYR	
COOK	65- 3-36	W	NW-SE	OUTCROP		CR, CU, FE, MAG, OLV, TI, V	
COOK	65- 4-25	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-26	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-27	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-28	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-29	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-33	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-34	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-35	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
COOK	65- 4-36	W	NW-SE	OUTCROP		CU, GOS, PYO, SUL	
CROW WING	47-29-30	W	NW-SE	OUTCROP		AS, CU	
DAKOTA	113-18- 8	W	NW-SE	FLOAT		CU	
FILLMORE	103-13-31	W	NW-SE	FLOAT		AU, CU	
FILLMORE	104-12-31	W	NW-SE	FLOAT		AU, CU	
GOODHUE	110-15-16	W	NW-SE	FLOAT		CU	
GOODHUE	110-16-16	W	NW-SE	FLOAT		CU	
GOODHUE	110-16-29	W	NW-SE	OUTCROP		ZN	
GOODHUE	110-17-16	W	NW-SE	FLOAT		CU	
GOODHUE	112-17-20	W	NW-SE	FLOAT		CU	
HENNEPIN	29-23-16	W	NW-SE	FLOAT		CU	
HENNEPIN	119-21-16	W	NW-SE	FLOAT		CU	
HENNEPIN	120-22-16	W	NW-SE	FLOAT		CU	
ITASCA	60-25-29	W	SE-NE	DRILL CORE	CN-16	CU	DNR

APPENDIX E. OCCURRENCES OF COPPER AND ZINC

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
ITASCA	61-24- 6	W	NE-SW	DRILL CORE	26516	CU	DNR
ITASCA	61-24-11	W	SW-SE	DRILL CORE	T-13	CU	DNR
ITASCA	61-25-10	W	SE-SW	DRILL CORE	26512	CU	DNR
ITASCA	61-25-10	W	SE-SW	DRILL CORE	26513	CU, NI	DNR
ITASCA	61-25-12	W	NW-SW	DRILL CORE	26508	CU	DNR
ITASCA	61-25-16	W	NW-SE	OUTCROP		CR, CU, NI, ZN	USBM
ITASCA	62-22- 7	W	SW-SE	DRILL CORE	COOK 8-1	AG, ZN	DNR
ITASCA	62-24-17	W	SE-SW	DRILL CORE	T-7	ALN, PYR, ZN	DNR
ITASCA	62-24-30	W	SW-NE	DRILL CORE	40927	CU, NI	DNR
KANABEC	42-22- 6	W	NW-SE	FLOAT		CU	
KOOCHICHING	63-25-27	W	SE-NW	DRILL CORE	FL-32-1	AG, GRF, ZN	DNR
KOOCHICHING	71-22-33	W	NW-SE	TESTPIT		AU, ANK, CU, PYR, TOU	
KOOCHICHING	151-28-21	W	SW-NW	DRILL CORE	G-2	AU, CU	DNR
KOOCHICHING	152-27-22	W	NE-NE	DRILL CORE	MIZ A-1	CU	DNR
KOOCHICHING	158-27- 4	W	SE-NE	DRILL CORE	R-4-1	CU, PYO, PYR, ZN	DNR
KOOCHICHING	158-28- 5	W	SE-SW	DRILL CORE	A-9-1	AG, CU, PYO, PYR	DNR
KOOCHICHING	158-28- 7	W	SW-SW	DRILL CORE	A-8-1	CU	DNR
KOOCHICHING	159-25-16	W	SW-NW	DRILL CORE	IH-11	AG, ZN	DNR
KOOCHICHING	159-25-16	W	NW-SE	OUTCROP		AG, CU	
KOOCHICHING	159-26- 7	W	NE-NE	DRILL CORE	RR-80-2	AG, CU	DNR
KOOCHICHING	159-27-15	W	NW-SW	DRILL CORE	R-2-1	AG, CU, ZN	DNR
KOOCHICHING	159-27-16	W	NE-SE	DRILL CORE	R-2-1A	AG, CU, ZN	DNR
KOOCHICHING	159-27-16	W	SE-SE	DRILL CORE	NCB-2	AG, ZN, CU	DNR
KOOCHICHING	159-27-16	W	SE-SE	DRILL CORE	S-43-1	CU	DNR
KOOCHICHING	159-27-16	W	SE-SE	DRILL CORE	S-43-2	AG, PYO, PYR, ZN	DNR
KOOCHICHING	159-27-20	W	NE-SE	DRILL CORE	R. R. 6-1	CU	DNR
KOOCHICHING	159-27-20	W	SW-SE	DRILL CORE	R. R. 6-2	CU	DNR
KOOCHICHING	159-27-21	W	NW-NE	DRILL CORE	R-2-2	CU, NI, ZN	DNR
KOOCHICHING	159-27-29	W	NW-NW	DRILL CORE	R-3-1	CU	DNR
KOOCHICHING	159-27-30	W	NW-NW	DRILL CORE	R-3-3	CU, PYO, PYR	DNR
KOOCHICHING	159-28-14	W	NW-SE	OUTCROP		CU, SUL	
KOOCHICHING	159-28-17	W	SW-SE	OUTCROP		CU, PYO, PYR	
KOOCHICHING	159-28-17	W	SW-SE	OUTCROP		CU, NI	
KOOCHICHING	159-28-17	W	SW-SE	OUTCROP		AG, AU, CU	
KOOCHICHING	159-28-17	W	SW-SE	OUTCROP		CU	
KOOCHICHING	159-28-26	W	NE-SW	DRILL CORE	R-5-1	CU, PYO, PYR, ZN	DNR
KOOCHICHING	159-28-26	W	NE-SW	DRILL CORE	R-5-2	ZN	DNR
KOOCHICHING	160-26-35	W	SW-SE	OUTCROP		AG, AU, ZN	
KOOCHICHING	160-26-36	W	NW-SE	OUTCROP		AG, AU, CU, MAG, NI, PYO, ZN	
LAKE	52-11- 2	W	SE-NE	OUTCROP		CAR, CU, ZEO	
LAKE	52-11-12	W	NE-NW	OUTCROP		CU, ZEO	
LAKE	52-11-16	W	NE-NW	TESTPIT		CU	
LAKE	54- 9-22	W	NW-SE	OUTCROP		CU	
LAKE	55- 8- 2	W	NW-SE	TESTPIT		CU	
LAKE	55- 8-11	W	NW-SE	OUTCROP		CU, OLV, P, PYR	
LAKE	55- 8-14	W	NW-SE	OUTCROP		P, CU, OLV, P, PYR	
LAKE	55- 8-15	W	NW-SE	OUTCROP		CU, OLV, P, PYR	
LAKE	55- 8-22	W	NW-SE	OUTCROP		CU, OLV, P, PYR	
LAKE	56- 7-21	W	NW-SE	FLOAT		CU, PB, ZN	
LAKE	57- 7-16	W	NW-SE	OUTCROP		CU	
LAKE	57- 7-36	W	NW-SE	OUTCROP		CU	
LAKE	58- 7-34	W	SW-NW	OUTCROP		CU, MAG, P, PYO, TI	
LAKE	59-10-30	W	SW-SE	OUTCROP		CU, PYO	
LAKE	61-10-26	W	SE-NW	OUTCROP		CU, PYO	
LAKE	62- 6-22	W	NW-SE	OUTCROP		CU, PYO	
LAKE	62-10-19	W	NW-SE	OUTCROP		CU, PYO, SUL	
LAKE	62-11-24	W	NW-SE	OUTCROP		CU, PYO	
LAKE	62-11-25	W	NW-SE	OUTCROP		CU, PYO	
LAKE	62-11-26	W	NW-SE	OUTCROP		CU, PYO, MAG, TI	
LAKE	62-11-27	W	NW-SE	OUTCROP		CU, PYO	
LAKE	62-11-33	W	NW-SE	OUTCROP		CU, PYO	
LAKE	63- 9- 6	W	NW-SE	OUTCROP		CU, PYR	
LAKE	64- 9-28	W	NW-SE	OUTCROP		CU, PYR	
LAKE	64- 9-29	W	NW-SE	OUTCROP		ZN, CU, PYR	
LAKE	64-11-16	W	NW-SE	OUTCROP		AU, CU, PYR, TOU, AG, CR, NI, PD	
LAKE OF THE WOODS	157-34- 5	W	SW-NE	DRILL CORE	B31-5	CU, PYO, PYR	DNR
LAKE OF THE WOODS	157-34- 5	W	SE-NW	DRILL CORE	B31-1	AG, AS, CU, MO, PYO, PYR, ZN, AU	DNR
LAKE OF THE WOODS	157-34-14	W	SE-NE	DRILL CORE	40926	CU, GRF, SUL	DNR
LAKE OF THE WOODS	158-33- 2	W	NW-NW	DRILL CORE	B21-3	AU, CU, PYO, PYR, ZN	DNR
LAKE OF THE WOODS	158-33- 3	W	NE-NW	DRILL CORE	B21-2	ZN	DNR

APPENDIX E. OCCURRENCES OF COPPER AND ZINC

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
LAKE OF THE WOODS	158-33- 6	W	SE-SE	DRILL CORE	MSD-1	CU, ZN	DNR
LAKE OF THE WOODS	158-33-19	W	SE-SE	DRILL CORE	B24-4	CU, PYO, PYR	DNR
LAKE OF THE WOODS	158-33-30	W	NE-NE	DRILL CORE	B24-2	AS, PB, PYO, PYR, ZN	DNR
LAKE OF THE WOODS	158-33-32	W	NW-NW	DRILL CORE	MED-1	AG, CU	DNR
LAKE OF THE WOODS	158-34-11	W	SE-SW	DRILL CORE	MOQ-2	AG, AU, CU	DNR
LAKE OF THE WOODS	158-34-11	W	SW-SE	DRILL CORE	B-Q-1	CU, NI	DNR
LAKE OF THE WOODS	158-34-12	W	NE-SE	DRILL CORE	MDD-1	AG, CU	DNR
LAKE OF THE WOODS	158-34-17	W	NW-NW	DRILL CORE	B54-1	CU	DNR
LAKE OF THE WOODS	158-34-25	W	SW-NE	DRILL CORE	MMD-1	AG, ZN	DNR
LAKE OF THE WOODS	158-34-25	W	SE-SE	DRILL CORE	B5-1	CU, ZN	DNR
LAKE OF THE WOODS	159-32-15	W	SE-SW	DRILL CORE	BD-2	CU	DNR
LAKE OF THE WOODS	159-33-25	W	SE-SE	DRILL CORE	40919	CU, MAG, PYO, PYR	DNR
LAKE OF THE WOODS	159-33-29	W	SE-SW	DRILL CORE	40920	CU, PYR	DNR
LAKE OF THE WOODS	159-33-34	W	SE-SE	DRILL CORE	B21-1	AG, AS, CO, ZN	DNR
LAKE OF THE WOODS	160-30- 9	W	SW-SW	DRILL CORE	B-57-1	AG, CU, GRF, SUL, ZN	DNR
LAKE OF THE WOODS	160-30-16	W	NE-NW	DRILL CORE	B-3-3	AG, CU, ZN	DNR
LAKE OF THE WOODS	160-30-17	W	NE-NE	DRILL CORE	B-3-2	CU, ZN	DNR
LAKE OF THE WOODS	160-30-23	W	NW-NW	DRILL CORE	B-7-1	TOU, CU	DNR
LAKE OF THE WOODS	160-30-23	W	NW-NW	DRILL CORE	B-7-2	CU, PB	DNR
LAKE OF THE WOODS	160-30-23	W	NW-NW	DRILL CORE	B-7-3	CU	DNR
MARSHALL	158-40-15	W	NW-SE	DRILL CORE	M-1	CU, PYO, PYR, ZN	DNR
MILLE LACS	38-27-16	W	NW-SE	FLOAT		CU	
NORMAN	143-44-34	W	SW-NE	DRILL CORE	HL-1	AG, ZN	DNR
NORMAN	143-45-20	W	NW-NE	DRILL CORE	RK-1	ZN	DNR
NORMAN	145-44-15	W	SW-NE	DRILL CORE	ST-2	AS, AU, CU	DNR
NORMAN	145-44-15	W	NW-SE	DRILL CORE	ST-1	AG, AS, CU	DNR
OTTER TAIL	137-39-22	W	SE-SE	DRILL CORE	3-1	CU	OTHER
PINE	38-20-16	W	NW-SE	FLOAT		CU	
PINE	38-21-16	W	NW-SE	TESTPIT		CU	
PINE	39-21-25	W	NW-SE	TESTPIT		CU	
PINE	39-21-34	W	NW-SE	TESTPIT		CU	
PINE	40-19-19	W	NW-SE	OUTCROP		CAR, CU	
PINE	40-19-33	W	SW-SW	TESTPIT		CAR, CU	
PINE	40-20-12	W	NW-SE	OUTCROP		CU	
PINE	41-16-16	W	NW-SE	FLOAT		CU	
PINE	41-19-19	W	NW-SE	OUTCROP		AG, CU	
PINE	41-20-26	W	NW-NW	TESTPIT		CU	
PINE	41-20-34	W	NW-SE	OUTCROP		AG, CU	
PINE	43-16-22	W	SW-NW	FLOAT		CU	
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-56C	CU, GRF, MO, P, U	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-45C	CU, AG, AS, F, MO, P, PB, SE, TH, U, V	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-49C	AG, CU, MO	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-53C	AG, CU, MO, ZN	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-43C	CAR, CRF, MO, S, U, V, CU	DNR
PINE	45-20-29	W	NW-SE	DRILL CORE	ML-23	NI, ZN	DNR
PINE	45-21-25	W	NW-SE	OUTCROP		AG, AU, CU, PB, ZN	
PINE	45-21-33	W	NW-NE	TESTPIT		CU, MAG	
RAMSEY	28-23- 5	W	NE-SW	OUTCROP		ZN	
RAMSEY	30-22-24	W	NW-SE	FLOAT		CU	
RENVILLE	113-35-22	W	NW-SE	OUTCROP		ZN	
RICE	110-20-33	W	SW-SE	FLOAT		AU, CU	
ROSEAU	161-36- 6	W	NW-SE	DRILL CORE	W3-1	CU	DNR
ROSEAU	161-37-12	W	SE-NE	DRILL CORE	W1-1	CU	DNR
ROSEAU	162-36-10	W	NW-SW	DRILL CORE	W9-1	CU	DNR
ROSEAU	162-36-18	W	SW-SW	DRILL CORE	W13-1	CU, CR, NI	DNR
ROSEAU	162-36-35	W	SE-NW	DRILL CORE	W8-1	CU, MAG	DNR
ST. LOUIS	49-15-32	W	NW-SE	OUTCROP		CU, PYR	
ST. LOUIS	50-14-16	W	NW-SE	TESTPIT		AG, CU, SUL	
ST. LOUIS	50-14-16	W	NW-SE	OUTCROP		CAR, CU, F	
ST. LOUIS	51-12- 4	W	NW-SE	OUTCROP		CU	
ST. LOUIS	51-12-16	W	NW-SE	TESTPIT		CU, PRE	
ST. LOUIS	51-12-17	W	NW-SE	OUTCROP		CU	
ST. LOUIS	51-12-17	W	NW-SE	TESTPIT		CU	
ST. LOUIS	52-12-17	W	NW-SE	FLOAT		CU	
ST. LOUIS	52-12-25	W	SW-SE	FLOAT		CU	
ST. LOUIS	52-12-26	W	SE-NE	TESTPIT		CU	
ST. LOUIS	52-12-26	W	SW-SE	DRILL CORE	3	CU	OTHER
ST. LOUIS	52-12-26	W	SW-SE	TESTPIT		CAR, CU, PRE, ZEO	
ST. LOUIS	52-12-36	W	NW-SE	FLOAT		CU	
ST. LOUIS	53-14- 7	W	NW-NE	DRILL CORE	IV-9	CU	DNR

APPENDIX E. OCCURRENCES OF COPPER AND ZINC

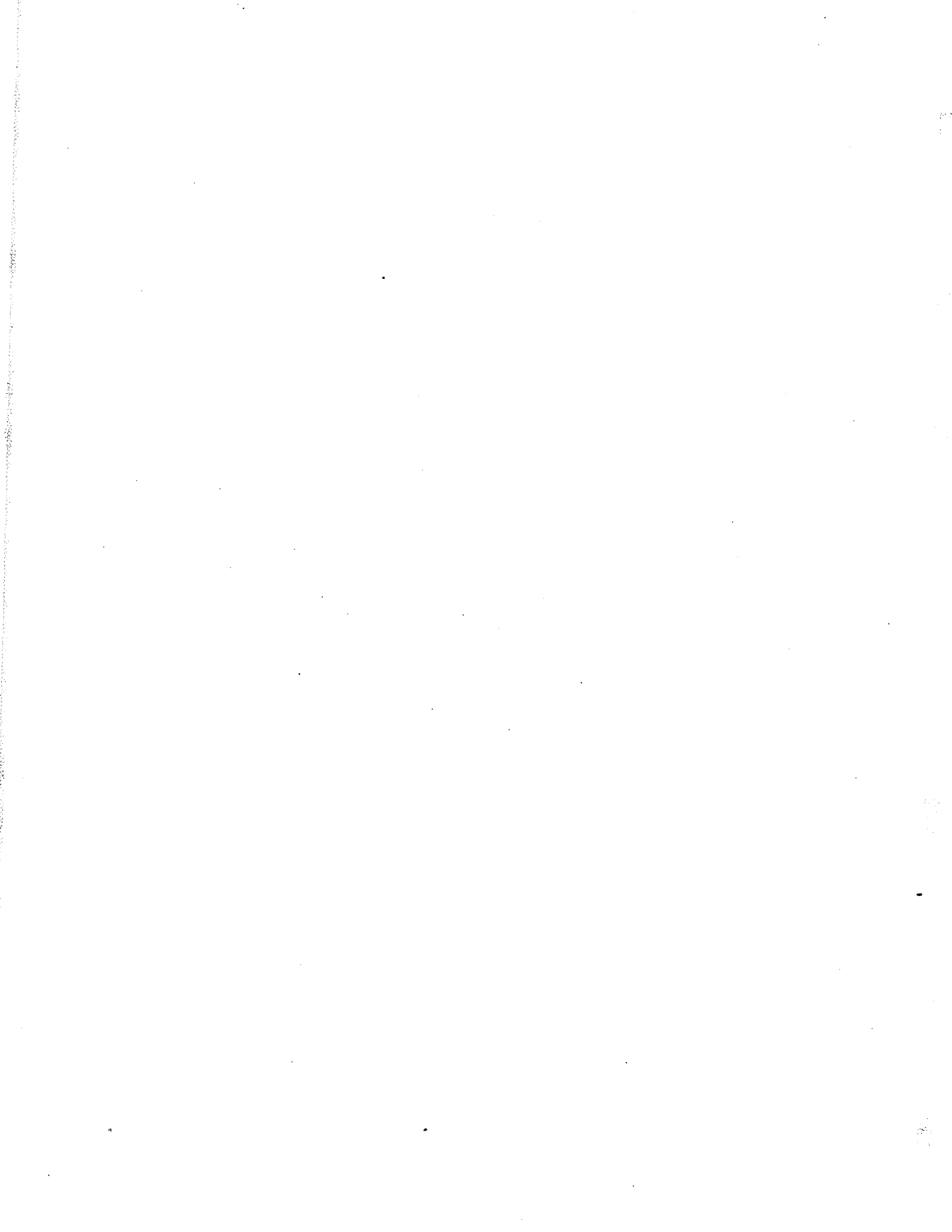
COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
ST. LOUIS	53-14-7	W	SW-NE	DRILL CORE	IV-7	CU, NI	DNR
ST. LOUIS	53-14-7	W	SE-NE	DRILL CORE	IV-6	CU, NI	DNR
ST. LOUIS	53-14-7	W	SE-NE	DRILL CORE	IV-8	CU, NI	DNR
ST. LOUIS	53-14-8	W	SW-NW	DRILL CORE	IV-1	CU	DNR
ST. LOUIS	53-15-25	W	NW-SE	DRILL CORE	V-2	CU	DNR
ST. LOUIS	54-14-9	W	SE-SE	DRILL CORE	I-6	CU	DNR
ST. LOUIS	54-14-10	W	SW-NW	DRILL CORE	I-1A	CU	DNR
ST. LOUIS	54-14-10	W	SE-NW	DRILL CORE	I-5A	CU	DNR
ST. LOUIS	54-14-16	W	NE-NE	DRILL CORE	I-7	CU	DNR
ST. LOUIS	54-14-16	W	SW-NE	DRILL CORE	I-12	CU	DNR
ST. LOUIS	54-14-16	W	SE-NE	DRILL CORE	I-9	CU	DNR
ST. LOUIS	54-14-16	W	SE-NW	DRILL CORE	I-3	CU	DNR
ST. LOUIS	54-14-16	W	NE-SW	DRILL CORE	I-10	CU	DNR
ST. LOUIS	54-14-16	W	NE-SW	DRILL CORE	I-2	CU	DNR
ST. LOUIS	54-14-16	W	SE-SW	DRILL CORE	I-8	CU	DNR
ST. LOUIS	54-14-16	W	NW-SE	DRILL CORE	I-13	CU	DNR
ST. LOUIS	54-14-16	W	NW-SE	DRILL CORE	I-4	CU	DNR
ST. LOUIS	54-14-23	W	NE-NW	DRILL CORE	VIII-2	CU	DNR
ST. LOUIS	55-14-9	W	NW-SE	DRILL CORE	CV-2	CU	DNR
ST. LOUIS	55-14-29	W	NW-SW	DRILL CORE	CV-1	CU	DNR
ST. LOUIS	57-14-16	W	NE-NE	DRILL CORE	II-3	CU	DNR
ST. LOUIS	57-14-16	W	SE-NE	DRILL CORE	II-1	CU	DNR
ST. LOUIS	57-14-16	W	SE-NE	DRILL CORE	II-4	CU	DNR
ST. LOUIS	57-14-16	W	SE-SW	DRILL CORE	II-2	CU	DNR
ST. LOUIS	57-14-16	W	NE-SE	DRILL CORE	II-6	CU	DNR
ST. LOUIS	57-14-16	W	NW-SE	DRILL CORE	II-5	CU	DNR
ST. LOUIS	58-17-29	W	NW-SE	OUTCROP		CU, PYR, ZN	
ST. LOUIS	58-18-1	W	NW-SE	FLOAT		ZN	
ST. LOUIS	61-14-8	W	SW-NW	DRILL CORE	SL-1	AG, CU, ZN	DNR
ST. LOUIS	61-14-8	W	SW-NW	DRILL CORE	SL-2	AG, AU, CU, HG, S, ZN	DNR
ST. LOUIS	61-14-8	W	SW-NW	DRILL CORE	SL-3	AG, AU, CO, CU, NI	DNR
ST. LOUIS	61-15-4	W	NW-SE	TESTPIT		AG, AU, CAR, CU, FE, PYR	
ST. LOUIS	61-15-5	W	SW-SW	DRILL CORE	T-5	ZN	DNR
ST. LOUIS	61-15-6	W	SE-SE	DRILL CORE	T-6	ZN	DNR
ST. LOUIS	62-12-4	W	SW-SW	DRILL CORE	M-1	ZN	DNR
ST. LOUIS	62-12-7	W	SE-NE	DRILL CORE	M-2	AG, CU, ZN	DNR
ST. LOUIS	62-12-16	W	NW-SE	OUTCROP		CU, PYO, ZN	
ST. LOUIS	62-13-1	W	NW-SE	OUTCROP		CU, PYO, ZN	
ST. LOUIS	62-13-3	W	NW-SE	OUTCROP		CU, PYO, ZN	
ST. LOUIS	62-13-4	W	NW-NE	OUTCROP		CU, PYO, ZN	
ST. LOUIS	62-13-12	W	NW-SE	DRILL CORE	TL-8	AG, CU, GRF, ZN	DNR
ST. LOUIS	62-13-14	W	NW-SE	DRILL CORE	TL-9	AG, CU, ZN	DNR
ST. LOUIS	62-13-18	W	NW-SE	OUTCROP		AG, AU, CU, NI, ZN	
ST. LOUIS	62-14-3	W	SW-NW	TESTPIT		CAR, CU, PYR	
ST. LOUIS	62-14-4	W	NW-NW	OUTCROP		CU	
ST. LOUIS	62-15-2	W	NW-NE	DRILL CORE	RL-10	AG, CU, ZN	DNR
ST. LOUIS	62-15-6	W	SW-NW	DRILL CORE	P-1	AS, CU, HG, ZN	DNR
ST. LOUIS	62-15-15	W	NW-SE	OUTCROP		CU	
ST. LOUIS	62-15-16	W	NW-SE	OUTCROP		CU	
ST. LOUIS	62-15-17	W	NW-SE	OUTCROP		CU	
ST. LOUIS	62-15-27	W	NW-SE	OUTCROP		CU, KAO, PYR	
ST. LOUIS	62-15-27	W	NW-SE	TESTPIT		CU, FE	
ST. LOUIS	62-15-28	W	NW-SE	TESTPIT		CU, KAO, PYR	
ST. LOUIS	62-15-32	W	NW-SE	TESTPIT		CU	
ST. LOUIS	62-16-9	W	NW-SE	OUTCROP		ANK, AU, CU, PYR, TOU	
ST. LOUIS	62-16-10	W	NW-NW	TESTPIT		AU, CU, PYR	
ST. LOUIS	63-12-16	W	NE-SW	DRILL CORE	LL-2	ZN	DNR
ST. LOUIS	63-12-16	W	NE-SW	DRILL CORE	LL-3	CU	DNR
ST. LOUIS	63-12-16	W	SW-SW	DRILL CORE	LL-1	ZN	DNR
ST. LOUIS	63-12-27	W	NW-SE	OUTCROP		CAR, CU, F, KAO, P, PYO	
ST. LOUIS	63-12-27	W	NW-SE	OUTCROP		CU, PYO, PYR	
ST. LOUIS	63-12-30	W	SW-SW	OUTCROP		AG, AU, CU, PB, PYR, SB, ZN	
ST. LOUIS	63-12-33	W	NW-SE	OUTCROP		CU, PYO, ZN	
ST. LOUIS	63-12-35	W	SE-SE	DRILL CORE	WW-1	CU, ZN	DNR
ST. LOUIS	63-16-10	W	NE-NW	OUTCROP		CU, PYR	
ST. LOUIS	63-16-31	W	NW-SE	OUTCROP		CU	
ST. LOUIS	63-17-16	W	NW-SE	OUTCROP		ANK, AU, CU, PYR, TOU	
ST. LOUIS	63-20-16	W	NW-SE	OUTCROP		AG, AU, CU, PB	
ST. LOUIS	64-20-16	W	NW-SE	OUTCROP		CU, PYR	
ST. LOUIS	64-20-31	W	NW-SE	OUTCROP		AG, AU, CAR, CU, PB, SUL	
ST. LOUIS	64-21-25	W	NW-SE	OUTCROP		AG, AU, CU, PB	
ST. LOUIS	66-17-33	W	NE-NE	TESTPIT		ZN	

APPENDIX E. OCCURRENCES OF COPPER AND ZINC

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
ST. LOUIS	66-17-33	W	NW-SE	OUTCROP		CU, PYO	
ST. LOUIS	67-18-36	W	NW-SE	TESTPIT		AU, CU, PYO, PYR	
STEARNS	123-30-16	W	NW-SE	OUTCROP		CU, PYR	
STEARNS	124-30-16	W	NW-SE	OUTCROP		CU	
WASHINGTON	27-20-15	W	NW-SE	FLOAT		CU	
WASHINGTON	29-20-22	W	NW-SE	FLOAT		CU	
WASHINGTON	29-20-27	W	NW-SE	FLOAT		CU	
YELLOW MEDICINE	115-39-10	W	NW-SE	OUTCROP		CU	

APPENDIX F. OCCURRENCES OF ARSENIC, FLUORINE, MERCURY AND MOLYBDENUM

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
BELTRAMI	151-32-36	W	NW-NW	DRILL CORE	RL-25	AS, AU	DNR
BELTRAMI	158-36- 7	W	NE-NE	DRILL CORE	FT-10	AS, AU, HG	DNR
BELTRAMI	158-36- 7	W	SE-NE	DRILL CORE	FT-21	AS, AU	DNR
BELTRAMI	158-36- 7	W	NE-SE	DRILL CORE	FT-12	AS, AU, HG	DNR
BELTRAMI	158-36-13	W	NW-SE	DRILL CORE	FT-14	AG, AS, AU, B, HG	DNR
BELTRAMI	158-36-26	W	SE-NW	DRILL CORE	FT-4	AG, AU, AS, HG, ZN	DNR
BENTON	37-31-16	W	NW-SE	OUTCROP		BE, F	
CARLTON	46-19-19	W	NE-SE	DRILL CORE	AW-2	CU, GRF, MO, U, V	DNR
CARLTON	46-20- 7	W	SW-SE	DRILL CORE	MG-5	CU, MO, TH, ZN	DNR
CARLTON	46-20- 8	W	SW-SW	DRILL CORE	MG-7	AG, MO, P, TH, ZN	DNR
CLAY	142-44-29	W	SW-NE	DRILL CORE	SL-1	AS, ZN	DNR
COOK	65- 3-34	W	NW-SE	TESTPIT		AS, AU, CO, CU, PYO, PYR	
COOK	66- 4-14	W	NW-SE	OUTCROP		AU, F	
COOK	66- 5-14	W	SE-NW	OUTCROP		AG, AU, F	
COOK	66- 5-14	W	NW-SE	OUTCROP		AU, CAR, F	
CROW WING	47-29-30	W	NW-SE	OUTCROP		AS, CU	
KANABEC	42-23- 4	W	NW-SE	OUTCROP		MO, GAR	
KOOCHICHING	159-28-10	W	SW-NE	DRILL CORE	R. R. 12-1	AG, AS	DNR
LAKE	63-11-13	W	NW-SE	OUTCROP		CAR, F, SUL	
LAKE OF THE WOODS	157-34- 5	W	SE-NW	DRILL CORE	B31-1	AG, AS, CU, MO, PYO, PYR, ZN, AU	DNR
LAKE OF THE WOODS	158-33-30	W	NE-NE	DRILL CORE	B24-1	AS, CO, PYO, PYR	DNR
LAKE OF THE WOODS	158-33-30	W	NE-NE	DRILL CORE	B24-2	AS, PB, PYO, PYR, ZN	DNR
LAKE OF THE WOODS	159-33-34	W	SE-SE	DRILL CORE	B21-1	AG, AS, CO, ZN	DNR
NORMAN	145-44-15	W	SW-NE	DRILL CORE	ST-2	AS, AU, CU	DNR
NORMAN	145-44-15	W	NW-SE	DRILL CORE	ST-1	AG, AS, CU	DNR
PINE	44-21-19	W	NW-SE	OUTCROP		F	
PINE	44-21-20	W	NW-SE	OUTCROP		F	
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-56C	CU, GRF, MO, P, U	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-45C	CU, AG, AS, F, MO, P, PB, SE, TH, U, V	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-49C	AG, CU, MO	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-53C	AG, CU, MO, ZN	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	MLCH-6	F	DNR
PINE	45-20-29	W	NE-NE	DRILL CORE	ML-43C	CAR, CRF, MO, S, U, V, CU	DNR
RENVILLE	113-35-32	W	NW-SE	OUTCROP		AS	
ST. LOUIS	50-14-16	W	NW-SE	OUTCROP		CAR, CU, F	
ST. LOUIS	61-14- 8	W	SW-NW	DRILL CORE	SL-2	AG, AU, CU, HG, S, ZN	DNR
ST. LOUIS	62-15- 6	W	SW-NW	DRILL CORE	P-1	AS, CU, HG, ZN	DNR
ST. LOUIS	62-21- 4	W	NW-SW	DRILL CORE	LF-4	F	DNR
ST. LOUIS	62-21-10	W	SW-SW	DRILL CORE	LF-5	F	DNR
ST. LOUIS	63-12-27	W	NW-SE	OUTCROP		CAR, CU, F, KAO, P, PYO	
ST. LOUIS	63-21-21	W	NW-SW	DRILL CORE	LF-1	F	DNR
ST. LOUIS	63-21-28	W	SW-NW	DRILL CORE	LF-2	F	DNR
ST. LOUIS	63-21-32	W	SE-NE	DRILL CORE	LF-3	F	DNR
ST. LOUIS	67-17-16	W	NW-SE	TESTPIT		AG, AU, MO	



APPENDIX G. ALL TEST PITS

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
AITKIN	46-25-35	W	NW-SE	TESTPIT			
BELTRAMI	152-30-31	W	NW-SW	TESTPIT		AU, GAR, CAR, PYR	
CARLTON	46-20-16	W	NW-SE	TESTPIT		AU	
CARLTON	46-20-16	W	NW-SE	TESTPIT			
CARLTON	46-20-28	W	NE-NW	TESTPIT			
CARLTON	46-20-28	W	NW-SE	TESTPIT		AU	
CARLTON	46-20-32	W	SW-NE	TESTPIT			
CARLTON	47-18- 4	W	NE-NW	TESTPIT		P, U	
CARLTON	47-18- 4	W	NW-SE	TESTPIT			
CARLTON	47-18- 5	W	SW-SE	TESTPIT		GRF, PYR	
CARLTON	47-18- 6	W	NW-SE	TESTPIT		PYR	
CARLTON	47-18- 8	W	NW-SE	TESTPIT			
CARLTON	48-16- 2	W	NW-SE	TESTPIT			
CARLTON	48-16- 5	W	NW-SE	TESTPIT			
CARLTON	48-16- 6	W	NW-SE	TESTPIT		AU	
CARLTON	48-16-10	W	NW-SE	TESTPIT			
CARLTON	48-16-16	W	NW-SE	TESTPIT			
CARLTON	48-18-32	W	SW-NW	TESTPIT		AU, TH, U, GRF, P	
CARLTON	49-16-31	W	NE-NE	TESTPIT			
CHISAGO	34-19-25	W	NW-SE	TESTPIT		AG, CU	
COOK	59- 4-14	W	NW-SE	TESTPIT			
COOK	59- 4-16	W	NW-SE	TESTPIT			
COOK	59- 4-17	W	NW-SE	TESTPIT			
COOK	59- 4-20	W	NW-SE	TESTPIT			
COOK	59- 4-28	W	NW-SE	TESTPIT			
COOK	59- 4-29	W	NW-SE	TESTPIT			
COOK	59- 4-31	W	NW-SE	TESTPIT			
COOK	60- 2-18	W	NW-SE	TESTPIT			
COOK	60- 3-20	W	NW-SE	TESTPIT			
COOK	60- 3-27	W	NW-SE	TESTPIT			
COOK	60- 3-31	W	NW-SE	TESTPIT		CU	
COOK	60- 3-33	W	NW-SE	TESTPIT			
COOK	60- 3-34	W	NW-SE	TESTPIT			
COOK	61- 1- 6	E	NW-SE	TESTPIT			
COOK	61- 1-12	E	NW-SE	TESTPIT			
COOK	61- 1-12	E	NW-SE	TESTPIT			
COOK	61- 1-12	E	NW-SE	TESTPIT			
COOK	61- 1-19	E	NW-SE	TESTPIT			
COOK	61- 1-21	E	NW-SE	TESTPIT			
COOK	61- 1-26	W	NW-SE	TESTPIT			
COOK	61- 1-34	W	NW-SE	TESTPIT			
COOK	61- 2-10	E	NW-SE	TESTPIT			
COOK	61- 2-32	W	SE-NW	TESTPIT			
COOK	62- 2-32	E	SW-SW	TESTPIT			
COOK	62- 3-14	E	NW-SE	TESTPIT			
COOK	62- 3-26	E	NW-SE	TESTPIT			
COOK	62- 3-27	E	NW-SE	TESTPIT			
COOK	62- 3-31	E	NW-SE	TESTPIT			
COOK	62- 3-33	E	NW-SE	TESTPIT			
COOK	62- 3-34	E	NW-SE	TESTPIT			
COOK	62- 4-12	E	NW-SE	TESTPIT			
COOK	62- 4-16	E	NW-SE	TESTPIT			
COOK	62- 4-20	E	NW-SE	TESTPIT			
COOK	62- 4- 4	W	NW-SW	TESTPIT		MAG, TI	
COOK	62- 4- 4	W	NW-SE	TESTPIT		MAG, TI	
COOK	62- 4- 9	W	NW-SE	TESTPIT		MAG, TI	
COOK	62- 5- 6	E	NE-NE	TESTPIT			
COOK	63- 4-27	W	NW-SE	TESTPIT		MAG, TI	
COOK	63- 4-28	W	NW-SE	TESTPIT		MAG, TI	
COOK	63- 4-35	W	NW-SE	TESTPIT		MAG, TI	
COOK	63- 5-14	E	NW-SE	TESTPIT			
COOK	63- 5-22	E	NW-SE	TESTPIT			
COOK	63- 5-24	E	NW-SE	TESTPIT			
COOK	63- 7- 4	E	NW-SE	TESTPIT			
COOK	64- 2- 5	E	NW-SE	TESTPIT			
COOK	64- 2- 5	E	SE-SE	TESTPIT		AG, CAR, PYR	
COOK	64- 2- 5	E	SE-SE	TESTPIT			
COOK	64- 2-26	W	SW-NW	TESTPIT		MAG, OLV	
COOK	64- 3- 5	E	NW-NW	TESTPIT			

APPENDIX G. ALL TEST PITS

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
COOK	64- 3- 5	E	NW-SE	TESTPIT		AG, CAR, PB, PYR	
COOK	64- 3-12	E	NE-SE	TESTPIT		CAR	
COOK	64- 3-12	E	NW-SE	TESTPIT		CAR	
COOK	64- 3- 1	W	NE-NE	TESTPIT		CR, MAG	
COOK	64- 5-35	E	SW-NW	TESTPIT		CAR	
COOK	64- 5-35	E	SE-NW	TESTPIT		PYR	
COOK	64- 5-35	E	NE-SW	TESTPIT		CAR, SUL	
COOK	64- 5-35	E	NW-SE	TESTPIT		AU	
COOK	64- 5-35	E	NW-SE	TESTPIT		CU, NI, PYO	
COOK	64- 5-35	E	SW-SE	TESTPIT		SUL	
COOK	64- 5-35	E	SE-SE	TESTPIT		SUL	
COOK	64- 5-36	E	NE-SE	TESTPIT			
COOK	64- 5-36	E	NE-SE	TESTPIT		CU, PYO	
COOK	64- 6-19	E	SE-NE	TESTPIT		CAR, SUL	
COOK	64- 6-19	E	SW-SW	TESTPIT		SUL	
COOK	64- 6-29	E	NW-SE	TESTPIT		CU, PYR, SUL	
COOK	64- 6-29	E	NW-SE	TESTPIT			
COOK	64- 6-29	E	SE-SE	TESTPIT			
COOK	64- 6-30	E	SE-SE	TESTPIT			
COOK	64- 6-31	E	NW-NE	TESTPIT		GDS, SUL	
COOK	64- 7-27	E	NE-NE	TESTPIT		BA	
COOK	64- 7-27	E	NW-SE	TESTPIT			
COOK	64- 7-28	E	NW-SE	TESTPIT		BA, CU, PYR, ZN	
COOK	64- 7-32	E	NW-SW	TESTPIT		AU	
COOK	64- 7-32	E	NW-SW	TESTPIT		BA	
COOK	64- 7-32	E	NW-SW	TESTPIT		CAR	
COOK	64- 7-32	E	NW-SW	TESTPIT		CU, GRF	
COOK	64- 7-32	E	NW-SW	TESTPIT		PB	
COOK	64- 7-32	E	NW-SW	TESTPIT		PYR	
COOK	64- 7-32	E	NW-SE	TESTPIT		BA	
COOK	64- 7-32	E	NW-SE	TESTPIT		CAR	
COOK	64- 7-32	E	NW-SE	TESTPIT		CU	
COOK	64- 7-32	E	NW-SE	TESTPIT		PB	
COOK	64- 7-32	E	NW-SE	TESTPIT		PYR	
COOK	64- 7-32	E	NW-SE	TESTPIT		ZN	
COOK	64- 7-32	E	NW-SE	TESTPIT			
COOK	64- 7-32	E	NW-SE	TESTPIT		BA, CAR, CU, GRF	
COOK	64- 7-32	E	NW-SE	TESTPIT			
COOK	64- 7-32	E	NW-SE	TESTPIT		BA, SUL	
COOK	65- 1-33	W	SW-SW	TESTPIT		CAR	
COOK	65- 1-33	W	SW-SW	TESTPIT		AG, CAR	
COOK	65- 1-33	W	SW-SW	TESTPIT			
COOK	65- 2-31	E	NW-SE	TESTPIT		AU, CAR, CU, PB, PYR, ZN	
COOK	65- 2-31	E	NW-SE	TESTPIT			
COOK	65- 2-31	E	SE-SE	TESTPIT		CAR, SUL	
COOK	65- 2-32	E	SW-SW	TESTPIT		CAR, SUL	
COOK	65- 2-32	E	NW-SE	TESTPIT		CAR, CU, PB, PYR, ZN	
COOK	65- 3-25	W	NW-SE	TESTPIT		PYO	
COOK	65- 3-28	W	NW-SE	TESTPIT		PYO	
COOK	65- 3-29	W	NW-SE	TESTPIT		PYO	
COOK	65- 3-30	W	NW-SE	TESTPIT		CU, PYO	
COOK	65- 3-33	W	NW-SE	TESTPIT		CU	
COOK	65- 3-34	W	NW-SE	TESTPIT		AS, AU, CO, CU, PYO, PYR	
COOK	65- 3-34	W	NW-SE	TESTPIT			
COOK	65- 3-36	W	NW-SE	TESTPIT		FE, OLV, TI	
COOK	65- 5-13	W	NW-SE	TESTPIT		AU, CAR	
COOK	66- 5-14	W	SW-NW	TESTPIT			
CROW WING	46-29- 3	W	NW-SE	TESTPIT		MN	
CROW WING	46-29-10	W	NE-NW	TESTPIT		BA	
KOOCHICHING	66-24- 4	W	NW-SE	TESTPIT			
KOOCHICHING	66-26-24	W	NW-SE	TESTPIT			
KOOCHICHING	67-24-33	W	NW-SE	TESTPIT			
KOOCHICHING	67-25-23	W	NW-SE	TESTPIT		AU	
KOOCHICHING	67-26- 3	W	NW-SE	TESTPIT			
KOOCHICHING	68-23- 2	W	NW-SW	TESTPIT		FE	
KOOCHICHING	68-23-14	W	NW-SE	TESTPIT			
KOOCHICHING	71-22-23	W	NW-SE	TESTPIT		AU, CAR, PYR, TOU	
KOOCHICHING	71-22-23	W	SE-SE	TESTPIT		AU, PYR	
KOOCHICHING	71-22-25	W	SW-SW	TESTPIT		AU	

APPENDIX G. ALL TEST PITS

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
KOOCHICHING	71-22-26	W	SW-SW	TESTPIT		AU	
KOOCHICHING	71-22-26	W	NW-SE	TESTPIT		AU, ANK, PYR, TOU	
KOOCHICHING	71-22-27	W	NW-SE	TESTPIT		AU	
KOOCHICHING	71-22-33	W	NW-SE	TESTPIT		AU, ANK, CU, PYR, TOU	
KOOCHICHING	71-23-30	W	NW-SE	TESTPIT		AU, PYR, TOU	
KOOCHICHING	159-25-16	W	SW-NW	TESTPIT			
KOOCHICHING	159-25-16	W	NW-SE	TESTPIT			
KOOCHICHING	160-26-36	W	NW-SE	TESTPIT			
LAKE	52-11-16	W	NE-NW	TESTPIT		CU	
LAKE	55- 8- 2	W	NW-SE	TESTPIT		CU	
LAKE	55- 8- 9	W	NE-SE	TESTPIT			
LAKE	55- 8-11	W	NE-SE	TESTPIT			
LAKE	55- 8-12	W	NW-NW	TESTPIT			
LAKE	55- 8-12	W	NW-SW	TESTPIT			
LAKE	63- 9-14	W	NW-SE	TESTPIT		MAG, TI	
LAKE	63-10- 8	W	NW-SE	TESTPIT		CAR, GRF	
LAKE	63-10-36	W	NW-SE	TESTPIT		FE, TI	
LAKE	64- 7-14	W	NW-SE	TESTPIT		FE, OLV	
LAKE	64-10-34	W	NW-SE	TESTPIT		CAR, PYR	
LAKE OF THE WOODS	167-33- 6	W	SW-NE	TESTPIT		GAR, MUS, W	
LAKE OF THE WOODS	168-34-32	W	NE-SE	TESTPIT		K, U	
MORRISON	40-29- 8	W	NW-NE	TESTPIT		AU, PYR	
OLMSTED	107-14-25	W	NW-SE	TESTPIT		PB	
PINE	38-21-16	W	NW-SE	TESTPIT		CU	
PINE	39-21-25	W	NW-SE	TESTPIT		CU	
PINE	39-21-34	W	NW-SE	TESTPIT		CU	
PINE	40-19-33	W	SW-SW	TESTPIT		CAR, CU	
PINE	40-19-33	W	NW-SE	TESTPIT			
PINE	41-20-26	W	NW-NW	TESTPIT		CU	
PINE	41-20-26	W	NW-SE	TESTPIT			
PINE	45-20- 4	W	NW-SE	TESTPIT		AU	
PINE	45-21-25	W	NW-SE	TESTPIT			
PINE	45-21-33	W	NW-NE	TESTPIT		CU, MAG	
ST. LOUIS	50-14- 7	W	NW-SW	TESTPIT		MAG, TI	
ST. LOUIS	50-14-16	W	NW-SE	TESTPIT		AG, CU, SUL	
ST. LOUIS	50-15-25	W	NW-SE	TESTPIT		FE	
ST. LOUIS	51-12-16	W	NW-SE	TESTPIT		CU, PRE	
ST. LOUIS	51-12-17	W	NW-SE	TESTPIT		CU	
ST. LOUIS	52-12-26	W	SE-NE	TESTPIT		CU	
ST. LOUIS	52-12-26	W	SW-SE	TESTPIT		CAR, CU, PRE, ZEO	
ST. LOUIS	59-13-16	W	NW-SE	TESTPIT		MAG, TI	
ST. LOUIS	59-13-30	W	NW-SE	TESTPIT			
ST. LOUIS	60-13-29	W	NW-SE	TESTPIT		AU	
ST. LOUIS	60-13-29	W	NW-SE	TESTPIT		PYR	
ST. LOUIS	61-15- 4	W	NW-SE	TESTPIT			
ST. LOUIS	61-15- 4	W	NW-SE	TESTPIT		AG, AU, CAR, CU, FE, PYR	
ST. LOUIS	61-15-12	W	NW-SE	TESTPIT			
ST. LOUIS	61-19-25	W	NW-SW	TESTPIT		PYR	
ST. LOUIS	62-12- 2	W	NW-SE	TESTPIT			
ST. LOUIS	62-14- 3	W	SW-NW	TESTPIT		CAR, CU, PYR	
ST. LOUIS	62-14- 3	W	NW-SE	TESTPIT			
ST. LOUIS	62-14- 4	W	NW-SE	TESTPIT			
ST. LOUIS	62-14- 5	W	NW-SE	TESTPIT		FE	
ST. LOUIS	62-14- 7	W	NW-SE	TESTPIT			
ST. LOUIS	62-14- 8	W	NW-SE	TESTPIT			
ST. LOUIS	62-14-13	W	NW-SE	TESTPIT		FE	
ST. LOUIS	62-14-14	W	NW-SE	TESTPIT		FE, AU	
ST. LOUIS	62-14-16	W	NW-SE	TESTPIT		AU	
ST. LOUIS	62-14-16	W	NW-SE	TESTPIT			
ST. LOUIS	62-14-21	W	NW-SE	TESTPIT			
ST. LOUIS	62-14-36	W	NW-SE	TESTPIT		AU	
ST. LOUIS	62-15-27	W	NW-SE	TESTPIT		CU, FE	
ST. LOUIS	62-15-28	W	NW-SE	TESTPIT		CU, KAO, PYR	
ST. LOUIS	62-15-32	W	NW-SE	TESTPIT		CU	
ST. LOUIS	62-15-34	W	NW-SE	TESTPIT			
ST. LOUIS	62-16- 6	W	NW-SE	TESTPIT		AU	
ST. LOUIS	62-16- 9	W	SE-NW	TESTPIT		AU	
ST. LOUIS	62-16- 9	W	NW-SE	TESTPIT		AU	
ST. LOUIS	62-16-10	W	NW-NW	TESTPIT		AU, CU, PYR	

APPENDIX G. ALL TEST PITS

COUNTY	TOWNSHIP -RANGE -SECTION	RANGE EAST=E WEST=W	40 ACRE LOCATION	TYPE OF OCCURRENCE	DRILL HOLE NUMBER	OCCURRENCE ELEMENT OR MINERAL CODE	CORE STORAGE LOCATION
ST. LOUIS	62-16-10	W	NW-SE	TESTPIT		PYR, AU	
ST. LOUIS	62-16-16	W	NW-SE	TESTPIT			
ST. LOUIS	62-16-26	W	NW-SE	TESTPIT			
ST. LOUIS	62-16-27	W	NW-SE	TESTPIT		FE	
ST. LOUIS	62-17-16	W	NW-SE	TESTPIT			
ST. LOUIS	62-18-3	W	NW-SE	TESTPIT		FE	
ST. LOUIS	62-20-7	W	NW-SE	TESTPIT			
ST. LOUIS	62-20-11	W	SW-SW	TESTPIT		ASB	
ST. LOUIS	63-12-4	W	SW-NW	TESTPIT		FE	
ST. LOUIS	63-12-4	W	NW-SE	TESTPIT			
ST. LOUIS	63-12-30	W	SW-SW	TESTPIT			
ST. LOUIS	63-13-25	W	NW-SE	TESTPIT			
ST. LOUIS	63-13-35	W	NW-SE	TESTPIT			
ST. LOUIS	63-14-16	W	NW-SE	TESTPIT		FE	
ST. LOUIS	63-15-36	W	NW-SE	TESTPIT			
ST. LOUIS	63-16-16	W	NW-SE	TESTPIT		AU	
ST. LOUIS	63-16-31	W	NW-SE	TESTPIT			
ST. LOUIS	66-17-3	W	NE-SW	TESTPIT		FE	
ST. LOUIS	66-17-33	W	NE-NE	TESTPIT		ANK	
ST. LOUIS	66-17-33	W	NE-NE	TESTPIT		AG	
ST. LOUIS	66-17-33	W	NE-NE	TESTPIT		PYD, CAR, FE, GAR, MN, PY	
ST. LOUIS	66-17-33	W	NE-NE	TESTPIT		ZN	
ST. LOUIS	66-17-33	W	NW-SE	TESTPIT		AU	
ST. LOUIS	66-17-33	W	NW-SE	TESTPIT		SUL	
ST. LOUIS	67-17-16	W	NW-SE	TESTPIT		AG, AU, MO	
ST. LOUIS	67-18-34	W	NW-SE	TESTPIT			
ST. LOUIS	67-18-35	W	NW-SE	TESTPIT			
ST. LOUIS	67-18-36	W	NW-SE	TESTPIT		AU, CU, PYD, PYR	
ST. LOUIS	67-18-36	W	NW-SE	TESTPIT			
ST. LOUIS	69-18-6	W	NW-SE	TESTPIT		GAR	
ST. LOUIS	71-21-28	W	NW-SE	TESTPIT		AU	
STEARNS	123-31-22	W	NW-SE	TESTPIT			
STEARNS	123-31-23	W	NW-SE	TESTPIT			
WASHINGTON	28-20-16	W	NW-SE	TESTPIT		AU, FE	
WINONA	105-4-18	W	NW-SE	TESTPIT		PB	
WINONA	105-4-18	W	NW-SE	TESTPIT		PB, PYR	
WINONA	105-4-18	W	NW-SE	TESTPIT			
YELLOW MEDICINE	115-39-4	W	NW-SE	TESTPIT		AU, PYR	

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- No. 246, p. 829 No. 64A, p. 154
- No. 200, 200A, & 201, pp. 252-255 No. 80, p. 163
- No. 377, p. 340 No. 18 & 18A, pp. 119-120
- No. 2127, p. 842 No. 272, p. 295
- No. 318, p. 315 No. 2272, p. 882
- No. 281, p. 297 No. 270, p. 294
- No. 288, 288A, 288B, 289, p. 300 No. 1549, p. 742
- No. 2278, p. 885-886 No. 1681, p. 758
- No. 1369, p. 707 No. 760, p. 533
- No. 349, p. 328 No. 708, p. 505
- No. 1449, p. 703 No. 64A, p. 153
- No. 267A, p. 293 No. 695, p. 495
- No. 701, p. 500 No. 449, p. 370
- No. 849, p. 568 No. 1670, p. 756
- No. 1895, p. 805 No. 401, p. 352
- No. 413, p. 356 No. 417, p. 357
- No. 881, p. 588 No. 2189, p. 854
- No. 270 and 271, p. 294 No. 552, p. 417
- No. 1452, p. 731 No. 395, p. 350
- No. 473, p. 379 No. 737, p. 519
- No. 773, p. 538 No. 1525A, p. 736
- No. 2162, p. 848 No. 352, p. 330
- No. 993, p. 624 No. 2237, pp. 867-868
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