



## PODIFORM CHROMITE

M03

by Chris Ash<sup>1</sup>

Modified for Yukon by A. Fonseca

Refer to preface for general references and formatting significance.

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### ***IDENTIFICATION***

SYNONYMS: Alpine type; ophiolite hosted chromite.

COMMODITIES (*BYPRODUCTS*): Chromite (may contain platinum group elements Os, Ir and Ru).

EXAMPLES: (British Columbia - *Canada/International*): Castle Mountain Nickel (082ESE091) and Scottie Creek (092INW001); *Guleman ore field (Turkey)*; *Kalimash - Kukes-Tropoje district, Bulquize and Todo Manco - Bater-Martanes district (Mirdita ophiolite, Albania)*; *Tiébaghi ophiolite and Massif du Sud (New Caledonia)*, *Acoje and Masinloc-Coto (Zambales range/ophiolite, Luzon, Phillipines)*; *Batamshinsk, Stepninsk, Tagashaisai and Main SE ore fields (Kempirsai massif, Southern Urals, Russia)*; *Xeraivado and Skoumtsa mines (Vourinos ophiolite, Greece)*; *Semail ophiolite (Oman)*; *Luobusa, Donqiao, Sartohay, Yushi, Solun, Wudu and Hegenshan deposits (China) all > 1.5 Mt.*

### ***GEOLOGICAL CHARACTERISTICS***

CAPSULE DESCRIPTION: Deposits of massive chromite occur as pods, lenses or layers within ophiolitic ultramafic rocks.

TECTONIC SETTING: Obducted fragments of oceanic, lower crustal and upper mantle ultramafic rocks within accreted oceanic terranes.

DEPOSITIONAL ENVIRONMENT / GEOLOGICAL SETTING: Formed as a primary magmatic differentiate during early olivine and chrome-spinel crystal fractionation of basaltic liquid at an oceanic spreading centre; (1) as massive to disseminated pods and lenses of chrome-spinel surrounded by a dunite envelope within depleted mantle harzburgite; or (2) as massive to disseminated cumulate layers in dunite at the base of the crustal plutonic section.

AGE OF MINERALIZATION: Mesozoic and younger.

HOST/ASSOCIATED ROCK TYPES: Variably serpentinized peridotite; residual mantle harzburgite; cumulate dunite.

DEPOSIT FORM: Podiform, tabular lenses, irregular masses, cumulate layers. Pods and lenses typically occur in clusters of variable size.

TEXTURE/STRUCTURE: Massive to disseminated, nodular (*syn.* leopard, grape, bean or shot ore), chromite net, occluded silicate, orbicular.

ORE MINERALOGY: Chromite.

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GANGUE MINERALOGY [Principal and *subordinate*]: Variably serpentinized olivine and orthopyroxene, magnetite, *iddingsite*.

WEATHERING: Black, no noticeable affects resulting from surface oxidation.

ORE CONTROLS: Proximity to the crust-mantle transition zone. Restricted to dunite bodies in tectonized harzburgite below this transition, or lower dunitic portions of ultramafic cumulate section above it.

GENETIC MODEL: Early fractional crystallization of chromite from a basaltic liquid either (1) just below the crust-mantle transition (syn. petrological MOHO) in small magma pockets or possibly conduits within the residual mantle harzburgite; or (2) immediately above the crust-mantle transition as cumulate layers within dunite at the base of the axial magma chamber. Pods and lenses in harzburgite obtain their diagnostic shape as a result subsolidus to hypersolidus ductile deformation due to mantle convection.

COMMENTS: Ophiolites of suprasubduction zone affinity with harzburgite mantle sections appear to be the only ophiolite type to host economic deposits of podiform chromite. A lack of any sizable chromite occurrence in British Columbia may reflect the fact that most ophiolitic complexes in the province are of mid-ocean ridge affinity. Occurrences of podiform chromite are found in ophiolitic ultramafic rocks in the Slide Mountain, Cache Creek and Bridge River terranes. Most of these known occurrences have been reviewed by Hancock (1990). **Yukon has no podiform chromite deposits. Prospects are located in Yukon-Tanana, Slide Mountain, Cache Creek, and Windy-McKinley terranes.**

### ***EXPLORATION GUIDES***

GEOCHEMICAL SIGNATURE: Cr

GEOPHYSICAL SIGNATURE: Gravity anomaly.

OTHER EXPLORATION GUIDES: Found in rocks formed near or within the ophiolitic crust-mantle transition zone.

### ***ECONOMIC FACTORS***

TYPICAL GRADE AND TONNAGE: Grades range from 20 to 60% Cr<sub>2</sub>O<sub>3</sub> and are a function of the texture of the chromite; *i.e.* amount of chromite relative to gangue serpentine. Tonnages are variable, ranging from several thousand tonnes to several million tonnes.

ECONOMIC LIMITATIONS: The complex structure and irregular distribution make exploration and development difficult.

END USES: Chromium has a wide range of uses in the iron and steel industry which accounts for over 75% of its use. Chromite is also used in making refractory bricks for furnace linings.

IMPORTANCE: An important source of metallurgical-type chromite ores (45-60% Cr<sub>2</sub>O<sub>3</sub>; Cr/Fe = 2.8-4.3). Podiform chromite is the only source of refractory-type ore (min. 25% Al<sub>2</sub>O<sub>3</sub>; min. 60% Cr<sub>2</sub>O<sub>3</sub> + Al<sub>2</sub>O<sub>3</sub>; max. 15% FeO). Historically podiform-type ore fields account for 57% of all chromite produced.

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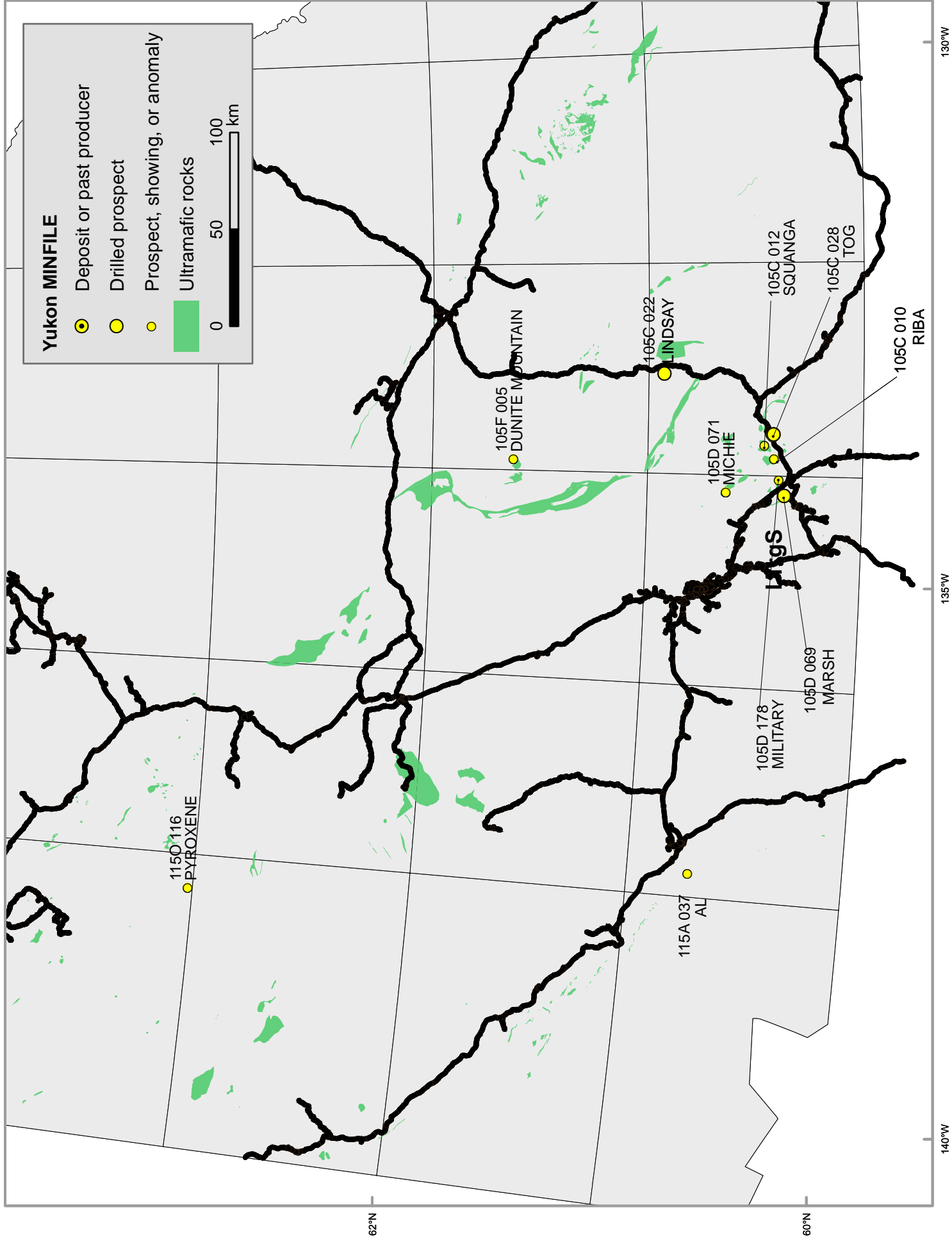
## M03 - Podiform chromite - World deposits

### Minor podiform chromite deposits

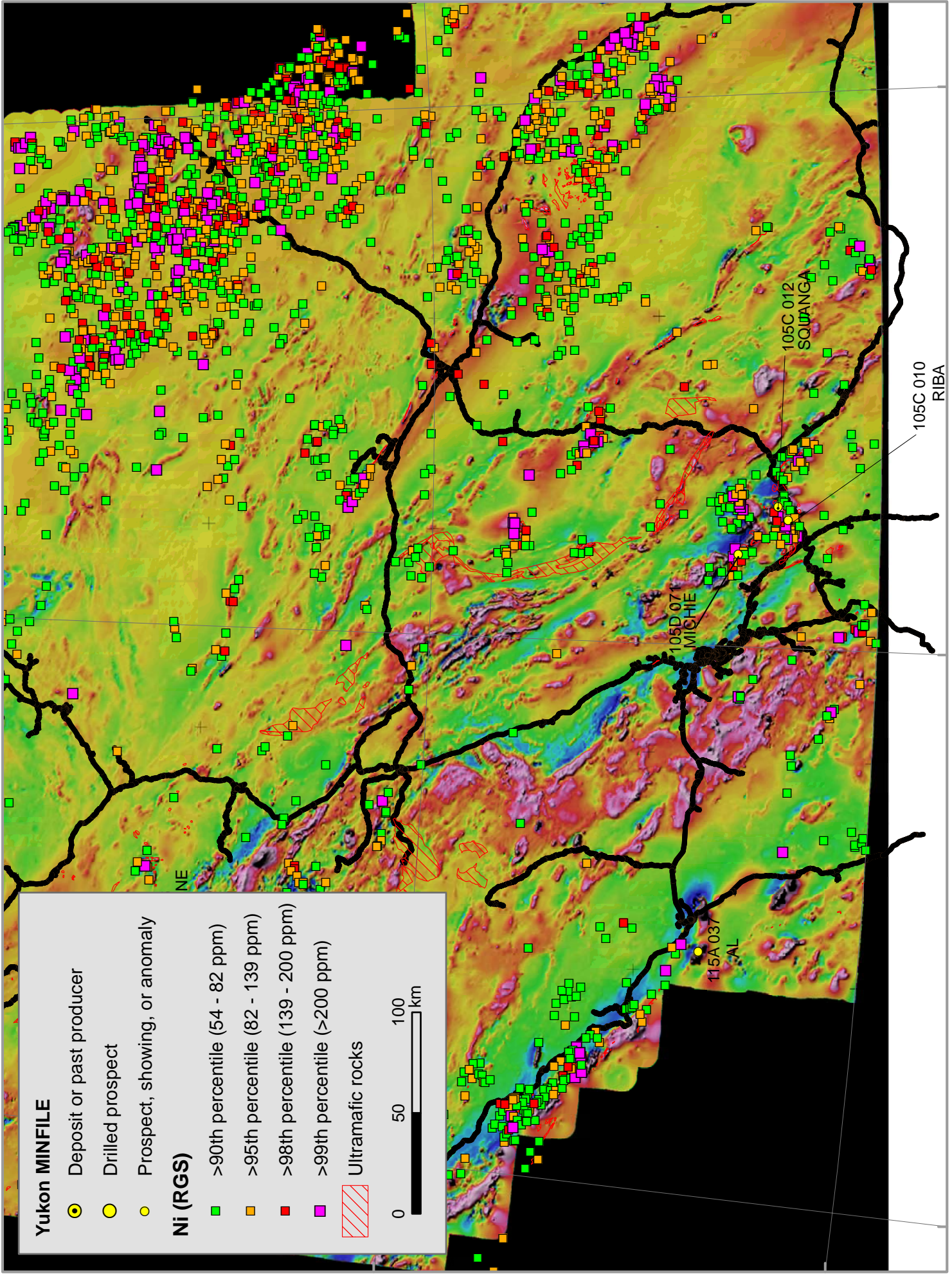
| Deposit          | country | tonnes | Cr %  |
|------------------|---------|--------|-------|
| Altindag         | TRKY    | 560    | 46.60 |
| Akarca           | TRKY    | 750    | 28.00 |
| Yayca Boyna      | TRKY    | 800    | 39.00 |
| Cenger-Adatepe   | TRKY    | 1 000  | 43.00 |
| Dogu Kef         | TRKY    | 1 000  | 41.00 |
| Akkoya           | TRKY    | 1 200  | 34.70 |
| Tilkim-Karanlik  | TRKY    | 1 300  | 42.00 |
| Karani           | TRKY    | 1 800  | 47.00 |
| Jose             | CUBA    | 2 000  | 31.00 |
| Sekioren         | TRKY    | 2 000  | 47.00 |
| Toparliar-Alacik | TRKY    | 2 000  | 39.00 |
| Eldirek          | TRKY    | 2 452  | 41.50 |
| Dagkuplu         | TRKY    | 2 500  | 41.10 |
| Koycegiz-Orta    | TRKY    | 2 700  | 42.00 |
| Findikli #301    | TRKY    | 2 750  | 48.00 |
| Kagit Octu       | TRKY    | 2 800  | 48.00 |
| Guillermina      | CUBA    | 3 000  | 25.00 |
| Catolsinir II    | TRKY    | 3 000  | 48.00 |
| Kuzkavak         | TRKY    | 3 000  | 50.00 |
| Musa Danisman    | TRKY    | 3 000  | 55.20 |
| Terlik           | TRKY    | 3 000  | 48.90 |
| Karaculha        | TRKY    | 4 000  | 31.00 |
| Yurtlak          | TRKY    | 4 000  | 46.30 |
| Tekneli          | TRKY    | 4 100  | 47.00 |
| Danacik          | TRKY    | 4 200  | 46.80 |
| Kuldoden         | TRKY    | 4 300  | 45.70 |
| Catak-Koraalan   | TRKY    | 4 500  | 47.40 |
| Yanikara         | TRKY    | 4 560  | 47.00 |
| Consolation      | NCAL    | 4 920  | 49.00 |
| Gunlik Basi      | TRKY    | 5 000  | 27.00 |
| Karatas-Kumocak  | TRKY    | 5 000  | 42.20 |
| Kartalkoyu       | TRKY    | 5 000  | 48.85 |
| Kemikli Inbasi   | TRKY    | 5 000  | 41.00 |
| Kurudere Basi    | TRKY    | 5 000  | 35.00 |
| Dcev 7           | NCAL    | 5 067  | 57.00 |
| Kavakdere        | TRKY    | 5 700  | 44.00 |
| Karaninar        | TRKY    | 5 750  | 42.00 |
| Child Harold     | NCAL    | 5 812  | 50.00 |
| El Cid           | CUBA    | 6 000  | 34.00 |
| Bagirsakdire     | TRKY    | 6 000  | 51.00 |
| Sarikaya         | TRKY    | 6 000  | 49.50 |
| Kavakcali        | TRKY    | 6 150  | 41.70 |
| Balcicakiri      | TRKY    | 6 500  | 48.80 |
| Yukari Zorkum    | TRKY    | 6 500  | 38.00 |
| La Victoria      | CUBA    | 7 000  | 25.00 |
| Suluyeh          | IRAN    | 7 000  | 56.00 |
| Stephane         | NCAL    | 7 350  | 47.00 |
| Bugugan          | TRKY    | 8 000  | 38.70 |
| Igdeli Payas     | TRKY    | 8 200  | 44.70 |
| Bellevue         | NCAL    | 8 428  | 49.50 |
| Ikisulu-Gercek   | TRKY    | 8 558  | 49.00 |
| P. B.            | NCAL    | 8 878  | 52.00 |
| Ofelia           | CUBA    | 9 000  | 35.50 |
| Domuzburnu II    | TRKY    | 9 500  | 36.40 |
| Morrachini       | NCAL    | 9 700  | 53.00 |
| Dovis            | IRAN    | 10 000 | 50.00 |
| Bereket          | TRKY    | 10 000 | 56.10 |
| Mirandag Koru    | TRKY    | 10 000 | 57.36 |
| Mirandag Mevki   | TRKY    | 10 000 | 37.40 |
| Yilmaz Ocagi     | TRKY    | 10 000 | 50.90 |
| Bozkonus         | TRKY    | 10 200 | 47.00 |
| Gorunur          | TRKY    | 10 700 | 47.20 |
| Yaprakli         | TRKY    | 10 700 | 47.20 |
| Findikli         | TRKY    | 11 000 | 47.00 |
| Sofulu           | TRKY    | 11 000 | 50.00 |
| Asagi Zorkum     | TRKY    | 12 000 | 40.00 |
| Findikli #326    | TRKY    | 12 000 | 50.00 |
| Bonsecours       | NCAL    | 12 257 | 53.00 |
| Karageban        | TRKY    | 13 000 | 39.50 |
| Catak            | TRKY    | 14 000 | 41.00 |
| Salur-Karacam    | TRKY    | 15 000 | 49.00 |
| Tuzlakaya        | TRKY    | 15 000 | 35.00 |
| Sutpinar         | TRKY    | 17 400 | 47.00 |

### Yukon MINFILE

| MINFILE  | NAMES                  | STATUS  |
|----------|------------------------|---------|
| 105C 012 | SQUANGA                | SHOWING |
| 105D 071 | MICHIE                 | SHOWING |
| 115A 037 | STRIDE, CHROMITE, MINK | SHOWING |
| 106D 004 | WHITTING, BAG          | SHOWING |
| 115O 116 | PYROXENE               | ANOMALY |



Map of Yukon showing podiform chromite occurrences and the distribution of ultramafic rocks



Map of Yukon showing podiform chromite occurrences, Ni regional geochemistry, and the distribution of ultramafic rocks