INTRODUCTION

A program of regional mapping and property examination in the East Okanagan area was carried out during the summers of 1976 and 1977 to help define the geological setting of known basal-type uranium deposits (Christopher and Kalnins, 1977) and to provide an improved geological base for rock, stream, and lake geochemical studies. In 1977 about 200 rock samples were collected for a lithogeochemical study of uranium in basement rocks by T.K. Sills at the University of Calgary. A geochemical orientation survey in the Dear Creek—Lassie Lake area is contained in a report by S.B. Ballantyne (1976) and regional stream sediment and water geochemical reconnaissance data is available as open file release 409 (1977).

LOCATION AND ACCESS

The East Okanagan uranium area extends from Vernon in the Okanagan Valley to Beaverdell in the Okanagan Highlands. The area includes parts of the Okanagan Highlands and Thompson Plateau subdivisions of the Interior Plateau and covers parts of NTS map sheets 82E/10, 82E/11, 82E/14, and 82E/15. Highway 33, the McCulloch road, the Big White Mountain road, and the Okanagan Falls logging road provide the main access and many secondary mining and logging roads provide access to other areas.

GENERAL GEOLOGY

Rocks considered to be 'basement' for Tertiary unconsolidated fluvial and lacustrine deposits that underlie 'olivine plateau basalt' are divided into nine units. In subdividing units an attempt was made to follow Little's (1957, 1961) terminology in the Kettle River map-area. Metamorphic rocks generally can be classified as Monashee Group (unit 1), Anarchist Group (unit 2), or Cache Creek Group (unit 3). With the exception of minor hypabyssal rocks, the intrusive rocks are classified as Nelson (unit 4), Valhalla (unit 5), or Coryell (unit 8) plutonic rocks. Tertiary volcanic rocks are subdivided into Kettle River Formation (unit 6), Kamloops Group (unit 7), and plateau basalt (unit 10) with underlying sediments (unit 10A).

METAMORPHIC ROCKS (UNITS 1, 2, 3)

Metamorphic rocks generally have low radioactive background and unless associated with granitic or volcanic rocks represent poor source or basement rocks for basal-type urnaium deposits. The Monashee Group (unit 1) of the Shuswap metamorphic terrain is mainly layered gneiss. The Anarchist Group (unit 2 — Wallace Formation in Beaverdell area, Reinecke, 1915) generally consists of fault-bounded pendants of metamorphosed sedimentary and volcanic rocks in younger plutonic rocks. The Cache Creek Group (unit 3) is mainly greenstone and has been mapped in one area along the McCulloch road.

NELSON PLUTONIC ROCKS (UNIT 4)

Nelson plutonic rocks are of hypidiomorphic granular texture and are biotite-hornblende quartz diorites or granodiorites that have a strong to moderate foliation. Younger Valhalla and Coryell plutonic rocks can generally be distinguished from Nelson rocks by more acidic and alkaline character, lack of foliation, porphyritic nature, and higher background radiation. Like the metamorphic rocks, the Nelson plutonic rocks are not considered to be favourable basement rocks unless associated with Valhalla or Coryell plutonic rocks (for example, Carmi molybdenum property, Kenyon and Morton, 1978).

VALHALLA PLUTONIC ROCKS (UNIT 5)

Valhalla plutonic rocks are generally porphyritic quartz monzonites and related pegmatitic and hypabyssal phases. Large pink feldspar phenocrysts, abundant pegmatite, smoky quartz, a cataclastic texture, and purple fluorite veins and fracture coatings are common features of these plutonic rocks and are considered to be indicative of high background uranium rocks. Biotite K/Ar ages from the Beaverdell area indicate an Eocene age for some phases of this unit.

KETTLE RIVER FORMATION (UNIT 6) AND KAMLOOPS GROUP (UNIT 7)

The Kettle River Formation may be an extrusive equivalent of Valhalla plutonic rocks, with abundant rhyolitic tuffs and flows. Strong geochemical response is obtained from fault-controlled stream valleys that cut this unit and some strong radioactive responses result from high thorium contents.

The main exposure of Kamloops Group rocks is east of Cup and State Lakes and near Dear Creek. Along Dear Creek south of the Beaverdell Creek road, the rocks are of alkaline character and may be correlatives of the Marron Formation (Church, 1973). Although phases of the Coryell plutonic rocks cut this unit, it appears to be partly an extrusive equivalent of Coryell rocks.

CORYELL PLUTONIC ROCKS (UNIT 8)

Coryell plutonic rocks are represented generally by syenitic or monzonitic phases except in the area of Dear Creek and along the western margin of Kamloops Group rocks where pyroxene or amphibole-bearing quartz syenite or quartz monzonite occurs. Syenitic Coryell plutonic rocks can generally be distinguished by reddish weathering and high to very high background radiation. A swarm of north 20 degrees west trending Coryell dykes cut pegmatitic Valhalla rocks in the area of the Beverly—Blizzard uranium prospect north of Lassie Lake.

MARAMA (?) FORMATION (UNIT 9)

Volcanic rocks of intermediate composition occur along Wilkinson Creek. Generally northerly trending feeder dykes (unit 9A) occur in the southern part of the area. Since they appear to be younger than Coryell or Marron Formation rocks they are correlated on the basis of age and composition with the Marama Formation (Church, 1973).

PLATEAU BASALT FORMATION (UNIT 10)

Plateau basalts, generally olivine bearing and flat lying, represent the main capping rocks for unconsolidated fluvial and lacustrine sediments (unit 10A) that host uranium deposits. Basalts show well-developed columnar jointing which is particularly well exhibited along the West Kettle River on the Okanagan Falls logging road, where this sequence overlies unconsolidated sediments. A mineralized exposure of gravels occurs below basalts along the Beaverdell Creek road at Dear Creek (Fuki outcrops). Mineralized sediments capped by plateau basalts or clay-rich sediments also occur east and north of Lassie Lake, along the McCulloch road northwest of Hydraulic Lake, and at the junction of Highway 33 and the McCulloch road (all shown as grid drill areas). Unconsolidated sediments also occur below plateau basalt between the forks of Klo Creek and north of the area between Wood and Kalamalka Lakes and Harris Creek.

MINERALIZATION

Uranium mineralization occurs in unconsolidated fluvial or lacustrine carbonaceous sediments that are capped by an impermeable horizon, either Pliocene or Miocene plateau basalt (4.7 Ma and 5.0 Ma K/Ar ages) or by sediments of low permeability. A capping or trapping of groundwater solutions is necessary to protect a reducing environment from normally oxidizing or leaching groundwater solutions. Uranium-bearing sediments unconformably overlie most of the map units but high radioactive background Coryell or Valhalla plutonic rocks or their extrusive equivalents are key basement rocks. Strong faulting that occurs in the area of mineral deposits controls the distribution of plateau basalts and underlying basal sediments and probably provides ground preparation for leaching solutions. When leaching solutions encounter reducing groundwater traps, uranium deposition occurs.

Secondary uranium minerals occur as films on pebbles and in the matrices of unconsolidated or poorly consolidated carbonaceous conglomerates and finer sediments that were deposited in paleostream channels or basins. Meta-autunite and saleeite are the only uranium minerals that have been identified but the presence of uraninite or pitchblende and coffinite is suspected. Authigenic iron sulphide is common in mineralized sediments and northwest of Hydraulic Lake massive iron sulphide cements uraniferous gravels at or near the unconformity with basement rocks.

Molybdenum is associated with minor brannerite near Carmi. Molybdenum and copper mineralization also occurs in a roof pendant on the ML claims between Dear and Beaverdell Creeks. Tungsten is reported to occur with molybdenum near Arlington Lakes (Reinecke, 1915). Purple fluorite occurs with the uranium and molybdenum mineralization at Carmi and has also been seen as fracture coatings in other areas underlain by Valhalla plutonic rocks.

ACKNOWLEDGMENTS

The cooperation and assistance of PNC (Power Reactor and Nuclear Fuel Development Corporation), Noranda Exploration Company, Limited, Kerr Addison Mines Ltd., Lacana Mining Corporation, Norcen Energy Resources Ltd., Teck Corporation Ltd., Tyee Lake Resources Ltd., and Union Carbide Exploration Coproration are appreciated.

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Province of British Columbia
Ministry of Mines and Petroleum Resources

PRELIMINARY MAP NO. 29

EAST OKANAGAN URANIUM AREA (KELOWNA TO BEAVERDELL) SOUTH—CENTRAL BRITISH COLUMBIA

(82E/10, 11, 14, 15)

By P. A. Christopher, July 1978

LEGEND

MIOCENE AND PLIOCENE

- 10 — BASALT; OLIVINE BASALT (PLATEAU BASALT); 10A — UNCONSOLIDATED SEDIMENTS

EOCENE

- 9 — DACITE (MARAMA FORMATION ?); 9A — FEEDER
- 8 — CORYELL, MAINLY SYENITE AND MONZONITE
- 7 — KAMLOOPS GROUP TUFFS AND FLOWS AND RELATED VOLCANICLASTIC SEDIMENTARY ROCKS
- 6 — KETTLE RIVER FORMATION

EARLY CENOZOIC (?) AND MESOZOIC

- 5 — VALHALLA PLUTONIC ROCKS
- 4 — NELSON PLUTONIC ROCKS; 4A — ALTERED NELSON

PALEOZOIC

- 3 — CACHE CREEK GROUP; GREENSTONE
- 2 — ANARCHIST GROUP OR WALLACE FORMATION (METASEDIMENTARY ROCKS)
- 1 — MONASHEE GROUP LAYERED GNEISS; 1A — ALTERED MONASHEE

SYMBOLS

- DRILL HOLE; GRID OR CLOSELY SPACED DRILLING
- K/Ar AGE DATE SAMPLE (BASALT WHOLE ROCK)
- DYKE
- OUTCROP AREA
- EDGE OF MAPPING
- CONTACT: KNOWN, ASSUMED
- FAULT OR STRONG LINEAR FROM AIR PHOTO
- SYNCLINE AXIS
- MINE
- HIGHWAY (LOOSE SURFACE)
- GRAVEL ROAD; LOGGING ROAD
- TRAIL

SCALE

Metres 1000 0 1000 2000 3000 4000 Metres

CONTOUR INTERVAL — 500 FEET