LEGEND, TWO LAKES (83L/5), KAKWA FALLS (83L/4) AND DRY CANYON (83E/13) MAP AREAS, ROCKY MOUNTAINS, EAST-CENTRAL ALBERTA

QUATERNARY

Q_{LS} Landslide: large coherent blocks of nearby bedrock.

Q_{MR} Neoglacial moraines

Q_{VF} Alluvium, colluvium, till: gravel, sand silt (only shown where bedrock is extensively covered).

CRETACEOUS
UPPER CRETACEOUS

uK_W **WAPITI FORMATION** (approx. 1800 m)
Sandstone: grey, fine to very coarse-grained, argillaceous, carbonaceous, locally conglomeratic.
Mudstone: green, brown, grey, silty and carbonaceous
Ribbed weathering unit easily distinguished by greenish color of sandstones. —.rs.— base of local resistant mappable units.

PUSKWASKAU FORMATION (approx. 260 to 315 m)

uK_{Pn} **Nomad Member**
Siltstone: medium grey, argillaceous; interbedded with shale: dark grey, rusty weathering.
Relatively recessive weathering unit.

uK_{Pc} **Chungo Member**
Sandstone: grey, fine- to medium-grained, quartz and chert rich, laminated, well cemented, brown weathering.
Resistant marker unit.

uK_{Pcn} **Chungo and Nomad Members:** undivided.

uK_{PZ} **Dowling, Thistle and Hanson Members**
Shale and calcareous shale: dark grey to black, commonly silty, grey to rusty weathering, sideritic concretions.
Recessive, rusty grey weathering unit.

uK_{BH} **BADHEART FORMATION** (approx. 25 m)
Sandstone: grey, fine grained, quartz and chert rich, well cemented, brown weathering, (lower part).
Interbedded mudstone, siltstone, sandstone and minor coal (upper part).
Lower part forms a resistant weathering unit.

uK_M **MUSKIKI FORMATION** (approx. 70 to 100 m)
Shale: dark grey, silty, rusty weathering with thin interbeds of grey argillaceous siltstone near top.
Recessive weathering unit.

uK_C **CARDIUM FORMATION** (approx. 50 to 60 m)
Sandstone: grey, fine-grained, quartz and chert rich, well sorted and cemented, rusty brown weathering.
Shale: grey, carbonaceous with argillaceous siltstone to coarse grained sandstone interbeds. Local chert pebble conglomerate.
Resistant weathering marker unit.

uK_K **KASKAPAU FORMATION** (approx. 600 to 750 m)
Shale: dark grey to black, commonly silty, rusty weathering; with sideritic concretions and variable amounts of very thinly interbedded grey, brown weathering siltstone.
Calcareous shale: dark grey, silver-grey weathering.
Recessive poorly exposed unit. Commonly faulted and folded.

uK_D **DUNVEGAN FORMATION** (approx. 100 to 165 m)
Sandstone: grey, very fine- to medium-grained, argillaceous, brown weathering, micaceous bedding planes.
Mudstone: grey, brown, silty, brown weathering, commonly carbonaceous, laminated, micaceous bedding planes. Rare lenticular coal seams (<20cm).
Sandstone: grey, medium- to coarse-grained, quartzose, crossbedded, grey weathering.
Pebble conglomerate: quartzite and chert pebbles in sandy matrix, clast to matrix supported. Common in western exposures, rare elsewhere.
Relatively resistant marker unit with good topographic expression but commonly poor exposure. Sandstone-shale cycles from approxiametly 2 to 20m thick.

FORT ST. JOHN GROUP ($K_M - K_{AC}$)

UPPER AND LOWER CRETACEOUS

K_S **SHAFTESBURY FORMATION** (approx. 250 to 300 m)
Shale: dark grey, grey or rusty weathering, with red-brown weathering, laminated siltstone interbeds more common near top. —.s.— denotes base of local, relatively resistant sandstone intervals.
Recessive, dark grey weathering unit.

LOWER CRETACEOUS

K_{BC} **BOULDER CREEK FORMATION** (approx. 50 to 90 m)
Sandstone: medium- to coarse-grained, crossbedded, well sorted, grey weathering.
Conglomerate: granule to pebble, clast supported or condensed, grey weathering.
Carbonaceous siltstone and shale.
Resistant, light grey or black lichen covered marker unit.

K_H **HULCROSS FORMATION** (approx. 13 to 30 m)
Shale: dark grey, ironstone concretions.
Siltstone: grey, laminated, brown weathering, micaceous and carbonaceous on splitting surfaces.
Recessive, dark weathering unit.

K_G **GATES FORMATION** (approx. 325 to 425 m)
Sandstone: fine- to coarse-grained, carbonaceous, crossbedded, tan or red-brown weathering interlayered with:
Carbonaceous shale: grey, brown; carbonaceous siltstone: grey, crosslaminated; coal: beds commonly over 1 m thick; and sandy pebble conglomerate: clast supported, in beds up to 5 m thick.
Sandstone: fine grained, well sorted, resistant, brown weathering unit 0 to 20 m thick forms base of succession in many areas.
Ribbed weathering with lower part of unit more massive and resistant than upper part.

K_M **MOOSEBAR FORMATION** (approx. 40 to 65 m)
Shale: dark grey with ironstone concretions.
Sandstone: grey, very fine grained, laminated, very thin- to thin-bedded, brown weathering, absent in lower part of unit, more common near top.
Recessive, dark weathering marker unit.

BULLHEAD GROUP ($K_C - K_{GE}$)

K_{GE} **GETHING FORMATION** (approx. 60 to 150 m)
Sandstone: fine- to coarse-grained, carbonaceous, crossbedded, orange-brown weathering and local sandy pebble conglomerate; interlayered with
Carbonaceous siltstone, carbonaceous shale and coal.
Plant remains abundant throughout.
Arbitrary nomenclature cutoff with Gladstone Formation.
Ribbed weatherimg unit.

K_{GL} **GLADSTONE FORMATION** (approx. 90 to 100 m)
Sandstone: fine- to coarse-grained, carbonaceous, crossbedded, orange-brown weathering and local sandy pebble conglomerate; interlayered with
Carbonaceous siltstone, carbonaceous shale and coal
Plant remains abundant throughout.
Arbitrary nomenclature cutoff with Gething Formation.
Ribbed weathering unit.

K_C **CADOMIN FORMATION** (approx. 10 to 50 m)
Conglomerate: pebble to cobble, clast supported in red-brown weathering sandy matrix, with local interbeds of sandstone, siltstone and minor coal.
Resistant, light grey or black lichen covered marker unit. Locally consists of two massive conglomerate ribs separated by relatively recessive sandstone and siltstone unit.

MINNES GROUP ($J_{KMT} - K_{GC}$)

K_{GC} **GORMAN CREEK FORMATION** (approx. 650 to 1000 m)
Interlayered sandstone, siltstone, mudstone, carbonaceous shale or coal in repetitive fining upward cycles generally 1 to 5 m thick.
Sandstone: fine- to coarse-grained, carbonaceous, ripple crosslaminated or crossbedded, commonly rich in dark chert, locally conglomeratic, orange or brown weathering.
Siltstone: grey, carbonaceous, orange or grey weathering.
Shale: silty, carbonaceous, grey weathering commonly grading to coal.
An orange-brown weathering succession with few marker units, commonly complexly folded with minor faults. Rare lenses of sandy pebble conglomerate up to 10 m thick occur in western exposures.

JURASSIC AND CRETACEOUS
UPPER JURASSIC AND LOWER CRETACEOUS

JK_{MT} **MONTEITH FORMATION** (approx. 225 to 550 m)

JK_{MTm} **Marine Sandstone Facies**
Sandstone: very fine grained, light brown-grey, laminated, pinkish or light grey weathering with minor grey shale interbeds.
Resistant weathering marker unit.

JK_{MTs} **Mixed Facies**
Sandstone: very fine- to medium-grained, dark chert rich, ripple crosslaminated, locally carbonaceous, brown weathering.
Shale and siltstone: grey, interlaminated, micaceous and carbonaceous splitting surfaces, brown weathering, carbonate concretions locally.
Conglomerate: pebble, clast supported, characterized by presence of volcanic, metamorphic and fine crystalline intrusive clasts (<10%), lenses up to 30 m thick, local epsilon crossbeds. Thicker conglomerates labelled
Brown weathering unit. May include 10 to 20 m of very fine grained sandstone typical of marine facies at base, where marine sandstone facies not mapped separately.

JURASSIC

J_F **FERNIE FORMATION** (approx. 250 to 900 m)

J_{F2} **Upper part**
Siltstone and silty sandstone: brown-grey, very thin- to thin-bedded, red-brown weathering, micaceous splitting surfaces, large orange-brown weathering concretions locally; interbedded with shale: grey, silty, brown weathering.
Brown, relatively recessive weathering unit with locally mappable resistant intervals 20 to 80 m thick dominated by silty sandstone: —.us.— base of uppermost unit: —.s.— base of other units with uncertain stratigraphic position and interrelationship.

J_{F1} **Lower Part**
Shale: dark grey, locally rusty weathering, ironstone concretions; and locally, minor sandstone: quartz, very fine grained or glauconitic with wood fragments.
Recessive poorly exposed unit. May include a few metres of interbedded black limestone and shale at base (Nordegg Member). A major disconformity occurs within the unit beneath the glauconitic sandstones (Oxfordian)

TRIASSIC

SPRAY RIVER GROUP ($T_{SM} - T_W$)

T_W **WHITEHORSE FORMATION** (approx. 130 to 305 m; three members are recognizable in well exposed sections but were not mapped seperately, described in descending order)
Winnifred Member
Dolomite and limestone: thin bedded, yellow-grey weathering, local dark chert lenses in upper part. Minor sandstone siltstone, intraformational breccia.
Brewster Limestone Member
Limestone with minor dolomite and intraformational conglomerate.
Prominent light grey weathering cliff-former.
Starlight Evaporite Member
Interbedded silty dolomite, sandstone, siltstone, sandy limestone, intraformational conglomerate and solution breccia, yellow-brown to grey weathering.

T_{SM} **SULPHUR MOUNTAIN FORMATION** (approx. 350 to 450 m)
Siltstone, silty limestone, thin- to medium-bedded siltstones often platy to flaggy weathering, minor interbedded shale, dolomite and fine grained quartz sandstone, fossils commonly phosphatic.
Distinctive, red-brown, moderately resistant weathering unit.

PERMIAN

P_U **BELCOURT, RANGER CANYON AND MOWICH FORMATIONS**
Mowich Formation (15 to 17 m; Upper Permian)
Sandstone: fine- to medium-grained with siliceous and calcareous cement, locally phosphatic; occasional chert and carbonate lenses.
Chert pebble conglomerate: may be present at base.

Ranger Canyon Formation (approx. 15 m; Upper Permian)
Chert: light to medium grey, commonly fractured.
Resistant weathering dark lichen covered unit.

Belcourt Formation (15 to 25 m: Lower Permian)
Limestone: skeletal, fine- to coarse-grained, and fine crystalline dolomite.
Chert and carbonate pebble conglomerate at base.
Resistant white weathering unit.

CARBONIFEROUS
LOWER CARBONIFEROUS

C_R **RUNDLE GROUP** (approx. 375 to 400 m; individual formations are recognizable in well exposed sections but were not mapped separately, described in descending order)

Mount Head Formation
Dolomite: grainstone to finely crystalline, subordinate lime skeletal packstone and wackestone, and shale, chert nodules locally abundant.
Ribbed weathering unit.

Turner Valley Formation
Limestone or dolomite: skeletal grainstone with subordinate packstone and wackestone.
Resistant, light grey or if dolomitized grey-orange weathering unit.

Shunda Formation
Limestone: fenestrate algal boundstone, skeletal wackestone, medium bedded, with minor interbedded shale and dolomite.
Moderately resistant, brown-grey weathering unit.

Pekisko Formation
Limestone: skeletal grainstone with subordinate packstone or wackestone.
Resistant light grey weathering unit.

DEVONIAN AND CARBONIFEROUS
UPPER DEVONIAN AND LOWER CARBONIFEROUS

DC_S **EXSHAW AND BANFF FORMATIONS**
Banff Formation (approx. 200 m; Lower Carboniferous)
(Upper Part)
Shale: black, brown weathering and lime grainstone: skeletal, thin bedded, crossbedded. In coarsening upward cycles.
(Lower Part)
Shale: black, brown weathering and lime wackestones, in thin rythmic interbeds, planar to nodular.

Exshaw Formation (15 m; Upper Devonian to Lower Carboniferous)
Black shale with minor sandstone and limestone.

Recessive, brown weathering marker unit.

DEVONIAN
UPPER DEVONIAN

D_P **PALLISER FORMATION** (approx. 350 m)
(Upper Part)
Limestone: brown-grey, mottled, medium- to thick-bedded, grey weathering, may contain black chert nodules; commonly crinoidal near top.
Resistant, light grey weathering unit. Locally 10 m of dark recessive weathering black limestone and shale occurs at the base denoted by —.b.— on map.
(Lower Part)
Limestone: brown-grey, wavy bedded to nodular, light grey weathering with ledges of grainstone seperated by more recessive mudstone units.
Lime packstone, silty limestone and flat pebble conglomerate form a relatively recessive and yellowish grey weathering unit at the base.
Resistant weathering unit.

D_S **SIMLA FORMATION** (approx. 70 m)
Limestone: biostromal, grainstone, algal laminated, crosslaminated, thick bedded, with local chert bands and nodules.
Light grey weathering unit that forms prominent cliff beneath slightly more recessive weathering strata at the base of the Palliser Formation.

D_{MH} **MOUNT HAWK FORMATION** (approx. 140 m)
Limestone: biomudstone, wackestone, thin bedded, nodular.
Limestone: biowackestone and grainstone, thick bedded, forms resistant ledges, more common in upper part.
Calcareous shale.
Ribbed weathering unit.

CAMBRIAN

LOWER CAMBRIAN

Emn_L **McNAUGHTON FORMATION** (approx. 1250 m)
Upper part
Quartzite: white, very fine- to very coarse-grained, thin bedded to massive, light grey or tan weathering, common crossbeds; minor argillite partings in upper part; minor pebbly quartzite near base.
Resistant white or black lichen covered unit.
Upper part not exposed in map area.

Emn_U **Lower part**
Quartzite to pebble conglomerate: thin- to thick-bedded, light grey weathering, feldspathic, locally crossbedded; interlayered with grey, rusty weathering, laminated argillite in units several metres thick; bioturbation locally prominent.
Ribbed weathering unit.

UPPER PROTEROZOIC

MIETTE GROUP ($\mathcal{E}mm_g - \mathcal{E}mu$)

UPPER MIETTE

$\mathcal{E}mu$ **ARGILLITE UNIT** (approx. 1500 m)
Argillite: medium to dark grey, rusty weathering, with light grey and greenish grey siltite laminae to very thin graded interbeds, more common in upper part; minor interbedded fine grained argillaceous, grey quartzite near top.
Recessive, rusty weathering unit. Only upper part exposed in map area.

MIDDLE MIETTE

$\mathcal{E}mm_{GS}$ **UPPER GRITTY SANDSTONE UNIT** (approx. 250 to 500 m)
Sandstone; fine sand to pebble conglomerate, feldspathic, argillaceous, commonly graded, thin bedded to massive, light grey or orange-brown weathering, in intervals up to 30 m thick
Argillite: medium grey, rusty weathering with light grey siltite laminae; and minor interbeds of grey argillaceous siltite and rare silty limestone; in intervals up to 25 m thick.
Ribbed weathering unit. Not exposed in map area.

$\mathcal{E}mm_A$ **ARGILLITE UNIT** (approx. 300 m)
Argillite: medium and dark grey, rusty weathering, minor green and purple-grey, with thin siltite laminae; rare olistostromal carbonate blocks occur in unit outside map area.
Dark, recessive weathering unit.

SYMBOLS

Geological boundary (defined, approximate, assumed, projected under cover)

Bedding, top known (inclined, vertical, overturned)

Bedding, top unknown

Fault, thrust or reverse, teeth on upthrust side (defined, approximate, assumed, projected under cover)

Fault, extension or normal, solid circle on downdropped side (defined, approximate, assumed)

Anticline, trace of axial plane (upright, overturned; defined, approximate, projected under cover)

Monocline, trace of axial plane (approximate)

Syncline, trace of axial plane (upright, overturned; defined, approximate)

Diagrammatic profiles of sets of minor folds (5 to 30 m wavelength) viewed to the northwest. Dotted axial trace indicates observed extent of structures.

Minor folds: axis, trend and plunge

Limit of mappable unit denoted by dotted line

Glacial Moraine; limit of more extensive morainal material

Well

LIST OF WELLS

1. Mobil et al. Chinook 11-17-63-13W6
2. CS et al. Narraway 7-16-63-11W6
3. Union Nose Creek 14-7-63-11W6
4. CS et al. Narraway 14-7-63-11W6
5. CS et al. Narraway 5-3-63-11W6
6. CS et al. Narraway 6-24CA-62-11W6
7. Calstan Baysel Two Lakes 1-18-62-12W6
8. CS et al. Sherman 11-3-62-12W6
9. Cdn. Oxy. Jerd 14-32-61-13W6
10. LCM Allarco et al. Jerd 15-26-61-13W6
11. Jerd #1 13-14-61-13W6
12. Mich Wis Lri Torrens 6-21-60-13W6
13. Dome Cutbank 6-19-63-10W6

Scale 1:50,000

Geological compilation by M.E. McMechan based on ground and air observations by M.E. McMechan (1981 - 1983, 1985) and G.S.C. Preliminary Map 55-14 of Two Lakes Sheet (Greiner, 1955).