KWADACHA BARITE DEPOSIT

(94F/10W)

By D. MacIntyre and L. Diakow

INTRODUCTION

During the 1981 field season the Kwadacha barite deposit, which is located immediately north of the confluence of the Kwadacha and North Kwadacha Rivers within Kwadacha Wilderness Park, was the subject of detailed regional and property scale mapping. This work was done over a 10-day period in late June and involved three two-person field crews. The deposit, which is well exposed in a series of fault and fold repeats along the crest of a north-trending ridge, is accessible only by helicopter.

REGIONAL GEOLOGY

The geology in the vicinity of the Kwadacha barite deposit is shown on Figure 1. This part of the Rocky Mountain Fold and Thrust Belt is underlain by Cambrian to Late Devonian clastic and carbonate rocks (MacIntyre, 1981). Northeast of the deposit, shelf carbonates of the MacDonald Platform predominate and these grade westward into time equivalent clastic facies. The rocks have been folded into a series of northwest-trending asymmetric, overturned antiforms and synforms that have both southwest and northeast-dipping axial surfaces. The latter are somewhat enigmatic in that structural transport is generally to the northeast with most of the thrust movement occurring along the southwest-dipping axial surfaces of major fold structures. Folds with northeast-dipping axial surfaces are interpreted to result from gravity back-sliding of an incompetent thrust plate as it moved upward along a southwest-dipping fault surface rooted in competent shale units. Some of the high-angle normal faults, which typically have downthrown blocks to the west, may also be related to back-sliding and break up of the overthrust plate.

STRATIGRAPHIC SETTING

The stratigraphic setting of the Kwadacha barite deposit is similar to that of other barite-sulphide deposits in the Driftpile Creek-Akie River District (see MacIntyre, 1981). In general, the baritic zone occurs near the top of a resistant unit of rhythmically bedded black chert, siliceous argillite, silty shale and minor limestone. This unit is overlain by a thick section of monotonous black shale and underlain by shallow water medium to thin-bedded grey fossiliferous limestones and calcarenites. Several beds within this limestone unit are rich in crinoid ossicles,

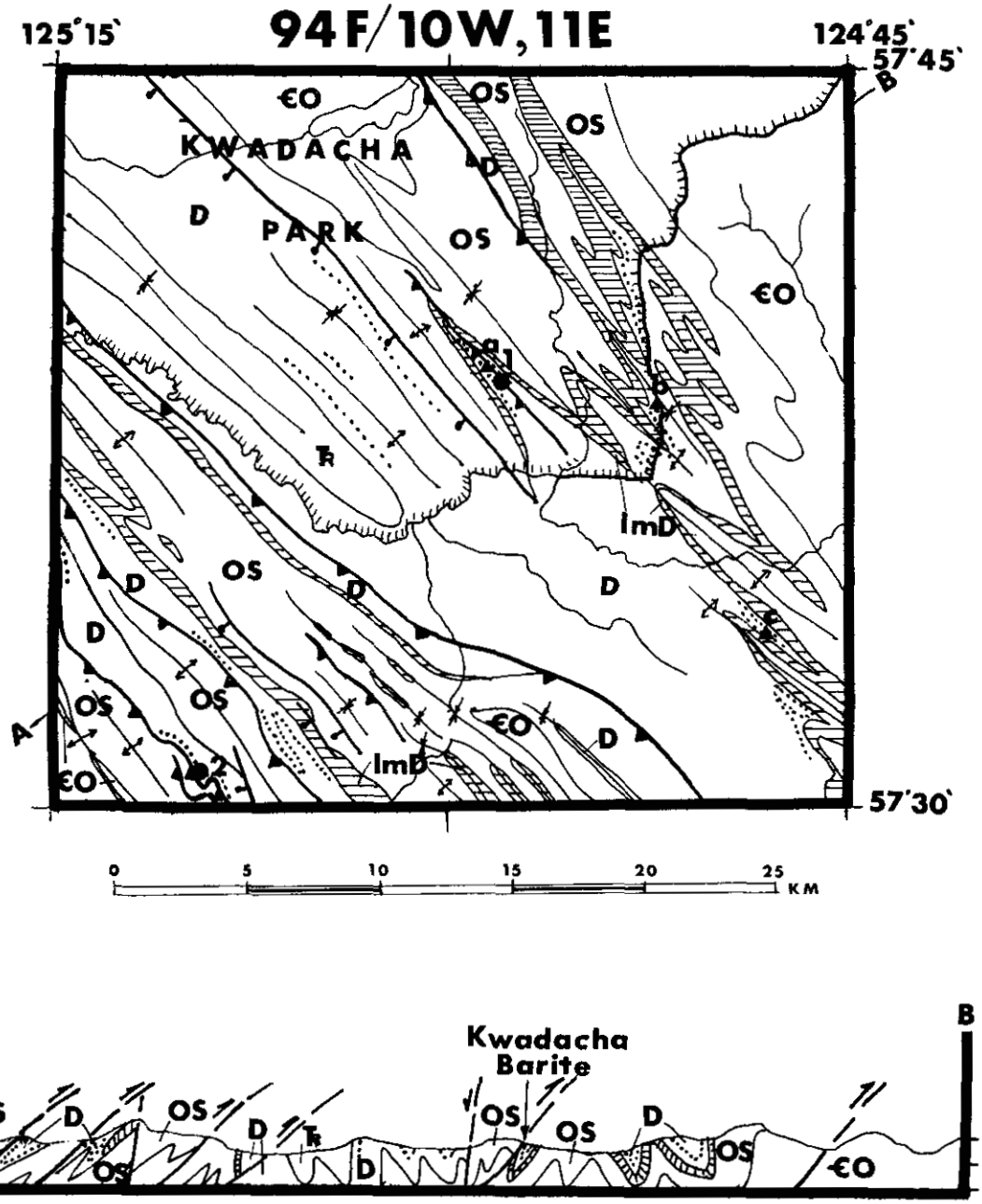


Figure 1. Generalized geology in the vicinity of the Kwadacha barite deposit.

LEGEND

DEVONIAN

D Shale, siltstone, chert, siliceous argillite; minor limestone

LOWER TO MIDDLE DEVONIAN

lmD Fossiliferous limestone, calcarenite; quartz sandstone, quartz siltstone, conglomerate; minor shale.

ORDOVICIAN TO SILURIAN

OS Dolomitic siltstone, graptolitic black shale, calcareous siltstone, limestone, dolostone; minor chert, mafic volcanic rocks

CAMBRIAN TO ORDOVICIAN

CO Nodular phyllitic mudstone, calcareous siltstone; minor shale, limestone, calcarenite

Symbols

Geologic contact .....

Thrust fault .....

Normal fault (ball on downthrown side) .....

Anticline; syncline .....

Known surface trace of baritic and/or pyritic exhalite horizon .....

Stratigraphic section location ..... ▲

Barite-sulphide deposit, 1 - Kwadacha; 2 - Cirque ..... ●

Boundary of Kwadacha Wilderness Park .....

some with double axial canals ('2 holers') indicating a probable Middle Devonian age (Taylor and MacKenzie, 1969).

The basal part of the Devonian succession consists of graded beds of quartz sandstone and siltstone which are locally crosslaminated and contain angular shale rip-up clasts. These quartz-rich rocks unconformably overlie a unit of pink, grey, and red platy weathering laminated siltstone with minor limestone and chert intercalations that is apparently the uppermost part of the Silurian section. The quartzose unit is less than 10 metres thick in the vicinity of the Kwadacha barite deposit (section a, Figure 2) but is more than 50 metres thick on the ridge immediately east of the deposit (section b, Figure 2). A similar westward thinning is noted for the limestone unit; overlying siliceous rocks, on the other hand, apparently thicken westward. Westward thinning and fining are characteristic of most of the Lower Devonian units that occur along the shelf margin, suggesting these sediments were deposited by turbidity currents moving down a westward dipping slope. Basinward thickening of the siliceous unit, on the other hand, suggests accumulation of silica-rich sediments was favoured in the deeper water, more euxinic environment. Some of the silica may have been introduced by submarine exhalitive activity that preceded and accompanied formation of

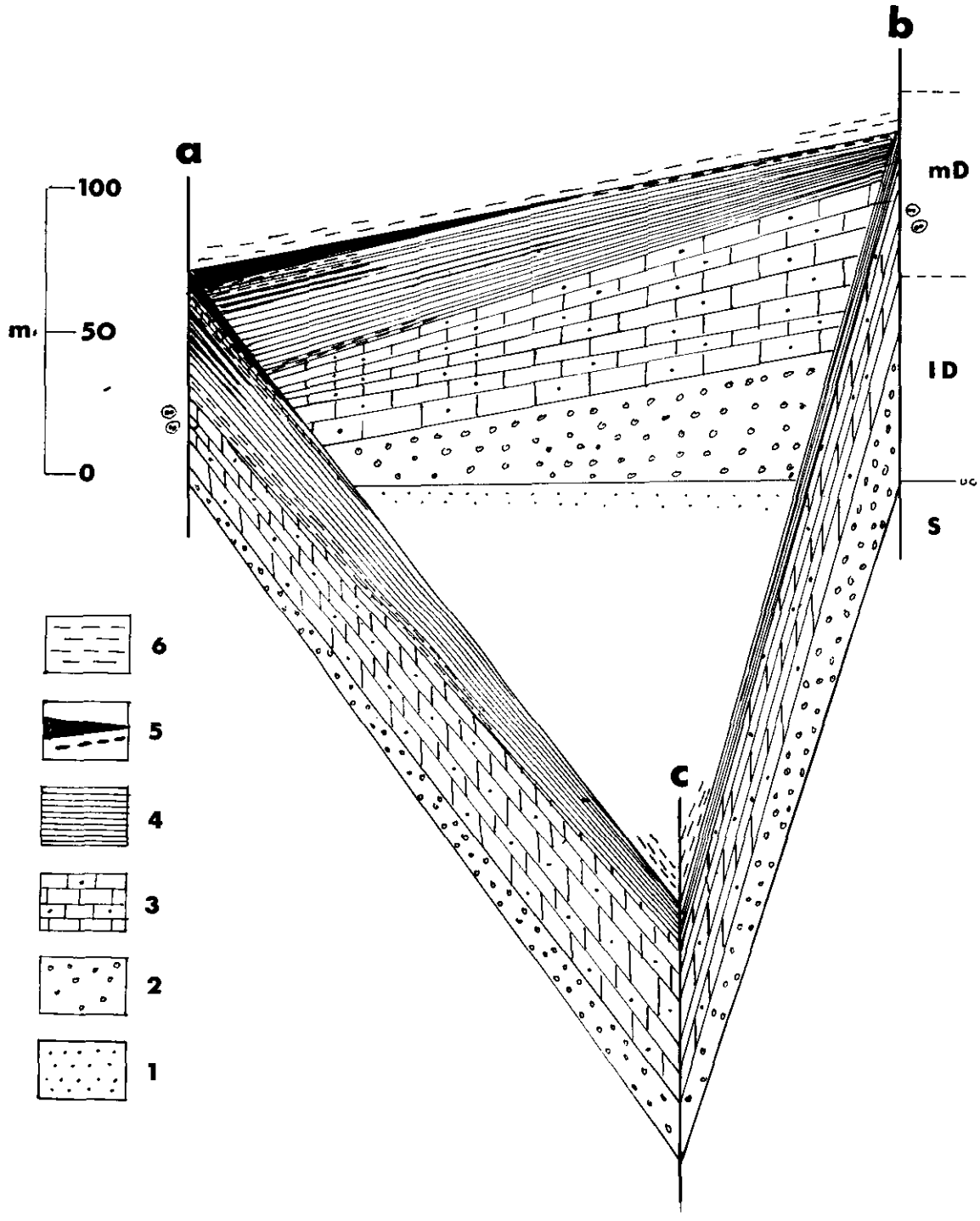


Figure 2. Stratigraphic fence diagrams showing thickness variations in Devonian units and stratigraphic position of the Kwadacha barite deposit: 1- dolomitic siltstone, minor chert, and limestone; 2 - quartz sandstone, siltstone, and conglomerate; 3 - thin-bedded limestone, calcarenite, and calcareous siltstone; 4 - interbedded black chert, siliceous argillite, and shale; 5 - massive bedded barite, nodular barite; 6 - black shale (see Figure 1 for location of sections).

the Kwadacha barite deposit. Overall, the vertical stratigraphic succession from near shore high energy quartz-rich sandstones upward into reduced black shale and progressive onlapping of these units eastward with time are evidence for a major marine transgression that began in Early Devonian time. This transgression was probably the result of eastward advancing crustal subsidence.

BARITE MINERALIZATION

Bedded barite is repeated by imbricate thrust faults and folding along the crest of a north-trending ridge (Figure 3). The barite is resistant and outcrops as a series of jagged, low-amplitude, southwest-dipping hog backs. Two barite zones are present separated by a 10 to 15-metre-thick interval of recessive black shale with a thin grey weathering limestone interbed. The lower zone consists of several 10 to 15-centimetre-thick intervals of laminated and nodular barite that occur in the upper 10 to 15 metres of the interbedded chert, siliceous argillite and shale unit. The upper zone, which varies from 1 to 10 metres in thickness, consists of massive, finely laminated barite with thin argillaceous partings. A colour gradation from light grey-white barite at the base to dark grey barite at the top of the zone was noted and is attributed to an increase in admixed argillaceous material up-section.

The upper barite zone contains no visible sulphide mineralization but thin laminae of very finely disseminated pyrite were found in the underlying siliceous shale unit. Outcrops of barite were sampled along the entire length of the ridge from stratigraphic bottom to stratigraphic top and are being analysed to determine variations in major and trace element content throughout the unit. Results will be published when the analytical work is completed.

Thin, discontinuous beds of discrete and coalescing barite nodules in a black shale host occur close to the base of the siliceous unit and in black shales immediately overlying the upper massive barite zone. These beds probably originated from the precipitation of $BaSO_4$ from meteoric solutions liberated during diagenesis.

DEFORMATION

Deformation related to northeast-directed supracrustal shortening is readily apparent in the vicinity of the Kwadacha barite deposit. Silurian and Lower Devonian fine clastic and chemical sedimentary rocks have been folded into major upright and overturned southeast-plunging anticline-syncline pairs. In contrast, the less competent shale-rich Middle and Upper Devonian units are characterized by tightly appressed or isoclinal folds with a penetrative axial planar cleavage. The upper massive barite unit, which is underlain and overlain by shale, behaved plastically during deformation and internal folding and thickening in the hinge area of folds is commonplace.

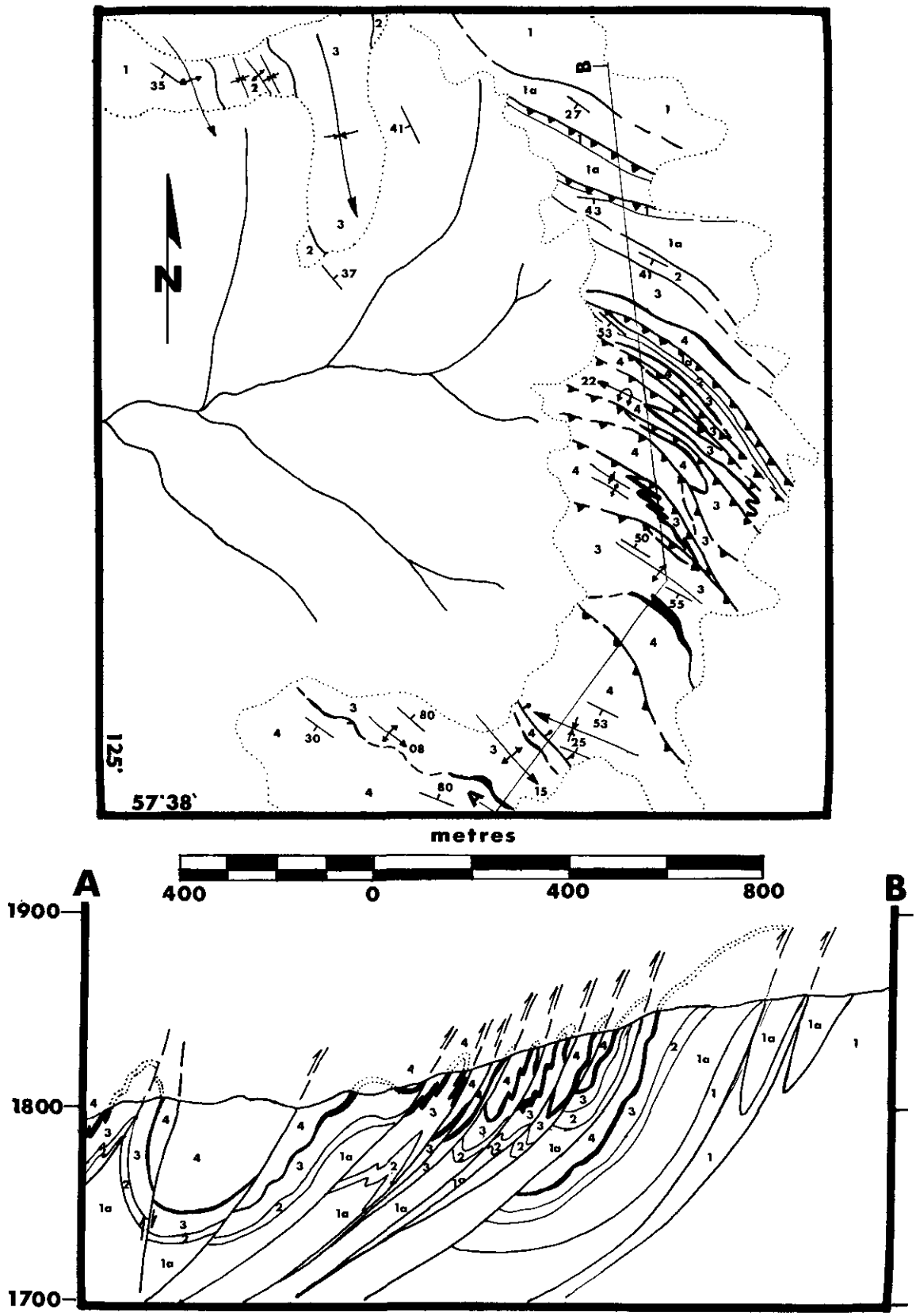


Figure 3. Geology of the Kwadacha barite deposit (mapping by L. Diakow).

LEGEND

MIDDLE TO UPPER DEVONIAN

4 Black silty shale; minor limestone, chert

3 Interbedded black-banded chert, siliceous argillite, and black carbonaceous shale; minor limestone

LOWER MIDDLE DEVONIAN

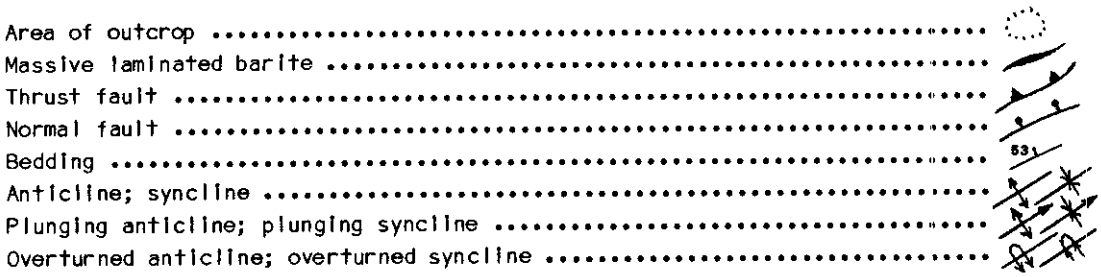
2 Thin-bedded fossiliferous limestone, calcarenite; minor shale; includes thin basal quartz sandstone and siltstone unit

SILURIAN

1a Platy banded siltstone and laminated silty shale; minor limestone and chert

1 Medium to thick flaser-bedded dolomitic siltstone; minor limestone

Symbols



Numerous subparallel, southwest-dipping thrust faults along the hinges of shear folds produced a stacked succession of single-limb half folds. The frequency of faulting is greatest in the shale-rich sections and at the base of a thin limestone bed underlying the upper massive barite unit. In this stress regime, limestone acts rigid and detaches easily from the underlying shales.

Structural thickening of incompetent shale sections and dragging of beds adjacent to fault planes is widespread.

ACKNOWLEDGMENTS

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