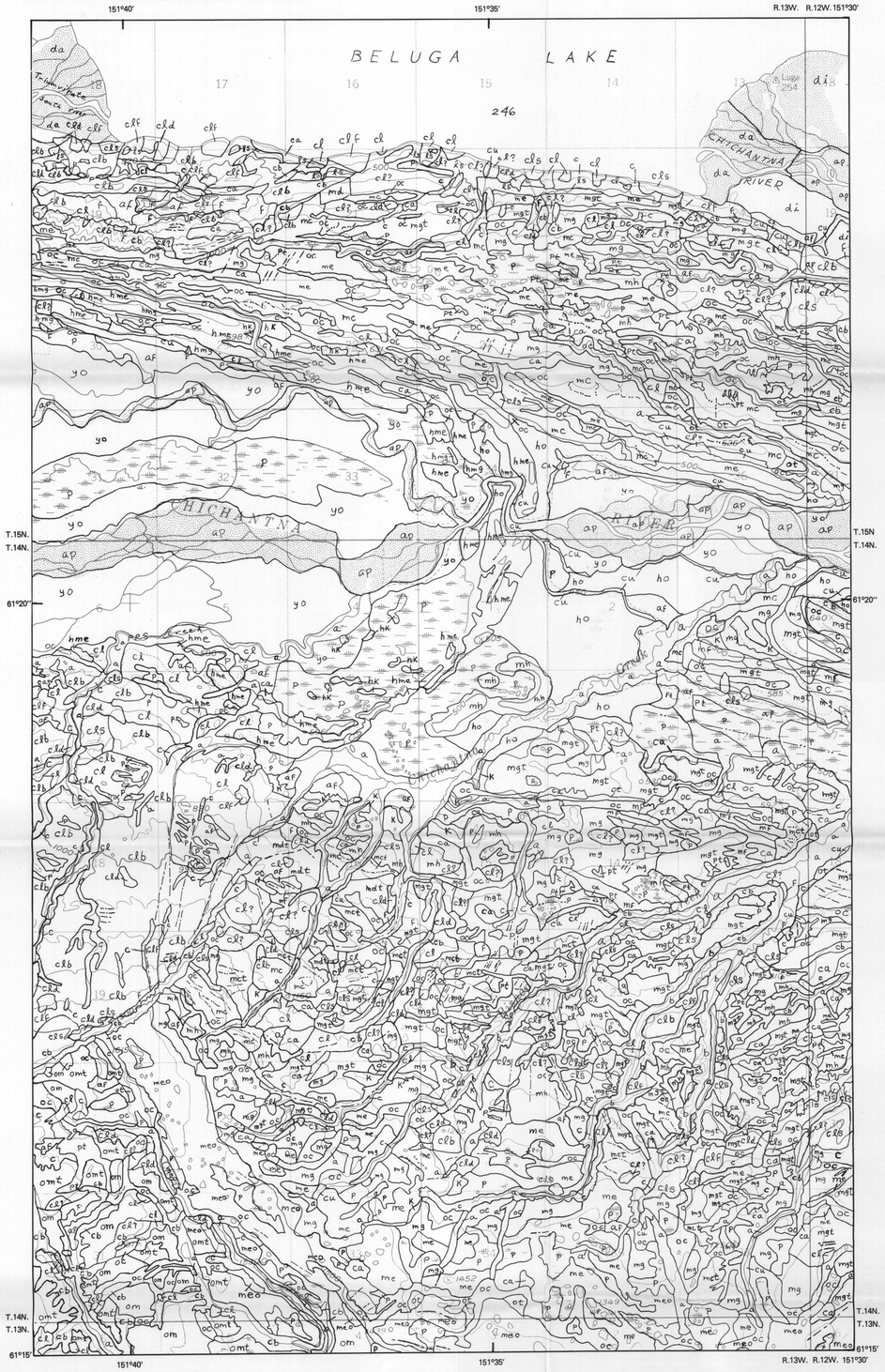
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1661-C



Base from U.S. Geological Survey 1:63,360, 1958
Topography by photogrammetric methods from aerial photographs taken in 1952

SCALE 1:31 680

CONTOUR INTERVAL 100 FEET;
DOTTED LINES REPRESENT 50-FOOT CONTOURS

Surficial geology mapped chiefly by L. A. Yehle using year 1952 airphotos. Field checked by L. A. Yehle, H. R. Schmoll, and A. F. Chleborad, 1978, 1979, and 1980; assisted by J. M. Core, 1978, and C. A. Gardner and A. D. Pasch, 1979 and 1980.

MAP LOCATION

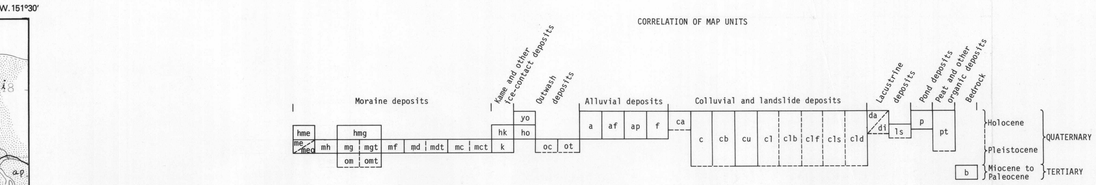
PRELIMINARY SURFICIAL GEOLOGIC MAP OF THE SOUTHEASTERN PART OF THE TYONEK B-5 QUADRANGLE, SOUTH-CENTRAL ALASKA

By

Lynn A. Yehle, Henry R. Schmoll, and Alan F. Chleborad

1983

CORRELATION OF MAP UNITS



INTRODUCTION

The Tyonek B-5 quadrangle lies about midway between Cook Inlet and the Tordrillo Mountains (index map) whose southerly peak is the active volcano, Mount Spurr, 3,375 m high. For presentation of our surficial geologic information, we divided the map into three parts; the southwestern and northern parts are described respectively on companion maps (Yehle, Schmoll, and Chleborad, 1983; Yehle, Schmoll, and Gardner, 1983). In the southeastern part, wholly within the Kenai Peninsula Borough, the broad flood plain of the Chichantna River bisects the area and is dominated by meltwater from retreating Capps Glacier whose estimated 1983 terminus is about 2.8 km west of the west boundary of the map area. Other major physiographic elements include the gently sloping flanks of the Chichantna valley and a north-facing escarpment near the south shore of Beluga Lake (fig. 1). A variably thick mantle of organic material and interbedded volcanic ash forms an irregular cover over most of the land surface and is generally less than 1 m in thickness. Only on very steep slopes and on flood plains of active streams is the mantle not present. The ash originated from Mount Spurr as well as from other volcanoes in the region (Yehle, 1983). Significant glacial features and deposits include the Denslow Lake lateral moraine of late Pleistocene age and the Chichantna end and lateral moraines of early(?) Holocene age; the relationship of these moraines to regional glacial geology is outlined in Schmoll and Yehle (1983). Landslides, including a major complex of massive slides along the south flank of the Chichantna valley, are very common and many of them formed in claystone and siltstone of the Tertiary Tyonek Formation. Bedrock of the Tyonek Formation probably underlies much of the northern part of the map area where bedrock is too poorly exposed to show on the generalized map of published bedrock data (fig. 2). Other bedrock types include pebbly sandstone and pebble conglomerate of the Tertiary West Foreland Formation; both of these rock types are well exposed locally in the southeastern part of the area (fig. 2).

DESCRIPTION OF MAP UNITS

The map delineates deposits considered to be about 1 m or more in thickness. Thicknesses given for deposits generally are estimates based on field observations. Grain sizes of unconsolidated particles described follow the classification of Wentworth (1922). Standard age symbols are omitted from map symbols because all units except bedrock and volcaniclastic strata are entirely of Quaternary age.

MORAINE DEPOSITS

Till, primarily diamicton, consisting of gravelly, sandy silt and variable amounts of clay; clasts as large as boulders. Chiefly unsorted, but locally moderately well sorted as discontinuous lenses of sand to sandy pebble gravel. Variably compact. Formed into ridges, hummocky ground, and some relatively smooth plains. As mapped, includes scattered bedrock exposures too small to show at 1:31,680 scale

END- AND LATERAL-MORAINE DEPOSITS--Chiefly diamicton formed into heterogeneous assemblage of moderate-relief landforms some of which are steep-sided ridges and shown on map as lineaments. Diamicton may contain a high percentage of coarse clasts. As mapped, includes some ground-moraine, ice-contact, outwash, pond, alluvial, and organic deposits. Thickness probably less than 25 m

hme End- and lateral-moraine deposits looping across Chichantna River (early? Holocene)--Area where this unit is mapped is here informally named the Chichantna moraine. Fully vegetated and well formed, and has many sharp-crested ridges. Only some minor modification by erosion. Bogs partly fill some ponds. About 7.7 km downvalley from next younger end moraine which in turn averages 0.3 km downvalley from the 1952 front of Capps Glacier. Age assignment is tentative and based on preliminary interpretation of (1) position in Chichantna River valley, (2) morphologic characteristics, and (3) a ^{14}C date of 7,750±200 yr B.P. (W-4056, Meyer Rubin, written commun., 1978) as a minimum for ice retreat from a presumably contemporaneous lateral moraine, nearly continuously traceable to area off this map. (Dated material is from base of a bog which overlies diamicton of the lateral moraine. Sample site: NW1/4NE1/4 sec. 28, T. 15 N., R. 14 W., altitude 378 m (1,240 ft); 11.5 km west-northwest of the moraine loop). For the end moraine, a minimum age is provided by peat obtained from an augered hole in a bog on the moraine loop which has a ^{14}C date of 3,540±60 yr B.P. (W-4956, Meyer Rubin, written commun., 1982). Sample site: NW1/4NE1/4 sec. 3, T. 14 N., R. 13 W., letter A on map and on figure 1

meo Outer lateral-moraine deposits of the Denslow Lake moraine (late Pleistocene)--In well-marked belt of moraines outermost from the Chichantna River valley. Best portrayed directly northeast of Chuit Creek. Traceable east-southeast from mapped area to Denslow Lake (index map) and beyond. This moraine, informally named the Denslow Lake moraine, was previously termed the Carlson Lake moraine (Schmoll and others, 1981). Age assignment is tentative and based on similarity with morphology of the Elmendorf Moraine at Anchorage, Alaska, which is age bracketed by ^{14}C dated geologic materials as younger than about 14,000 and older than about 12,000 yr B.P. (Schmoll and others, 1972)

me Chiefly lateral- and medial-moraine deposits related to the Denslow Lake moraine (late Pleistocene)--Deposits mostly in positions recessional to outer lateral-moraine deposits (meo). In single and multiple landforms as belts and discontinuous segments northeast of Chuit Creek and on broad ridge north of floor of Chichantna River valley. Moraines are fully vegetated and most have gentle crests and are only moderately modified by erosion. Bogs partly fill many small ponds

mh HUMMOCKY MORAINE DEPOSITS (LATE PLEISTOCENE)--Diamicton forming landforms having uneven surface topography and very little or no linear continuity. Diamicton may contain a high percentage of coarse clasts. Deposits scattered throughout most of mapped area. Thickness probably as much as 10 m

GROUND-MORAINE DEPOSITS--Form mostly low, rolling mounds on gentle to moderate regional slopes or on plains of low relief

hmg Ground-moraine deposits near or within moraine looping across Chichantna River (early? Holocene)--Thickness probably less than 7 m

Deposits consisting of ground moraine or mostly ground moraine and related to the Denslow Lake moraine

mg Ground-moraine deposits northeast of Chuit Creek and on broad ridge north of the floor of Chichantna River valley (late Pleistocene)--Thickness probably less than 7 m

mgt Thin ground-moraine deposits.--Thickness probably averages 2 m. As mapped, includes locally common bedrock exposures. Widely distributed northeast of Chuit Creek and north of Chichantna River valley

mf Moraine deposits in drumlin and fluted landforms (late Pleistocene)--Composed mostly of ground-moraine deposits molded by glacier ice. Located chiefly in central eastern part of area. Thickness probably less than 10 m

md Extensively dissected moraine deposits (late Pleistocene)--In areas where deposits are extensively cut by very numerous narrow, shallow gullies; gullies probably range in depth from 1 to 4 m. Some gullies expose bedrock along their margins; most streams in the gullies are intermittent. Thickness probably less than 5 m. Located south of Beluga Lake. Includes some alluvial and colluvial deposits too small to show at 1:31,680 scale

mdt Thin extensively dissected moraine deposits.--Probably average 2 m in thickness. As mapped, includes locally common bedrock exposures. Located chiefly in headwaters of Chichantna Creek

mc Channeled moraine deposits (late Pleistocene)--Areas of chiefly ground moraine containing so many abandoned glacial-meltwater channels that they are too numerous or small to show individually at 1:31,680 scale. Most channels approximately parallel to topographic contours and range in depth from 2 to 10 m; some channels exhibit bedrock along their margins. Selected channels shown on map. Located principally on broad ridge between Beluga Lake and the floor of Chichantna River valley. Includes some outwash-channel and overlying organic deposits. Thickness probably less than 5 m

mct Thin channeled moraine deposits.--Probably average 2 m in thickness. As mapped, includes locally common bedrock exposures. Located chiefly near headwaters of Chichantna and Bishop Creeks

om OLD MORAINE DEPOSITS (PLEISTOCENE)--Consists mostly of ground moraine. Generally thinner than other ground moraine, probably averaging 3 m, and locally covered by as much as 1 m of organic material and volcanic ash. Widely distributed southwest of Chuit Creek

omt Thin old moraine deposits--Thickness probably averages 2 m. As mapped, includes locally common bedrock exposures. Widely distributed southwest of Chuit Creek

KAME AND OTHER ICE-CONTACT DEPOSITS

Mostly gravelly sand and some gravelly, silty sand and diamicton in landforms ranging from irregularly shaped kames to narrow and sinuous eskers. Most deposits loose, some relatively compact. Thickness probably less than 15 m

hk DEPOSITS RELATED TO THE CHICHANTNA MORAINE (EARLY? HOLOCENE)--Most deposits on or adjacent to floor of valley

k DEPOSITS RELATED TO DENSLOW LAKE MORAINE (LATE PLEISTOCENE)--Scattered distribution northeast of Chuit Creek. Good examples of deposits in secs. 27 and 28, T. 14 N., R. 13 W.

OUTWASH DEPOSITS

Mostly bedded sandy gravel and sand formed by glacial meltwaters on wide, low-gradient plains or in small, generally narrow, diamicton- or bedrock-bounded valleys most of which are approximately parallel to topographic contours. Most deposits loose and moderately well sorted; commonly more gravelly at depth. Active modern outwash distal to glacier is mapped as flood-plain alluvial deposits (ap)

yo DEPOSITS OF THE LOWERMOST VEGETATED OUTWASH PLAIN OF THE CHICHANTNA RIVER VALLEY (LATE HOLOCENE)--Deposited by meltwater from young advance of Capps Glacier; represented by a moraine directly west of mapped area. Thickness possibly as much as 20 m

ho DEPOSITS DOWNVALLEY FROM THE CHICHANTNA MORAINE (EARLY? HOLOCENE)--Thickness possibly as much as 25 m

oc OUTWASH-CHANNEL DEPOSITS RELATED TO THE DENSLOW LAKE MORAINE (LATE PLEISTOCENE)--Distributed throughout area except in central and central western parts. Commonly overlain by pond or organic deposits. Thickness possibly as much as 5 m

ot OUTWASH-TERRACE DEPOSITS RELATED TO THE DENSLOW LAKE MORAINE (LATE PLEISTOCENE)--Remnants of former outwash plains which presently are at least several meters higher than adjacent outwash or other fluvial deposits. Mainly in central eastern part of area. Thickness probably less than 5 m

ALLUVIAL DEPOSITS

a ALLUVIAL DEPOSITS, UNDIVIDED (HOLOCENE)--Mostly pebbly sand to cobble gravel deposited by small, medium, and some large streams of low to moderate gradient; includes deposits in low terraces. Bedded and moderately well sorted within beds. Distributed throughout area. Thickness possibly as much as 15 m

af FINE-GRAINED ALLUVIAL DEPOSITS (HOLOCENE)--Chiefly sand and some small pebbles, silt, and organic materials deposited by small, generally low gradient streams. Commonly uniformly bedded. Present at and near base of many short slopes throughout area. Thickness probably less than 5 m

ap FLOOD-PLAIN ALLUVIAL DEPOSITS (HOLOCENE)--Mostly pebble to cobble gravel and sand forming most of the presently active flood plain and lowest generally unvegetated terraces of the large Chichantna River. Well bedded and commonly well sorted within beds. Within the terraces, coarsest material generally at depth. Higher terraces herein mapped as outwash deposits related to young advance of Capps Glacier (yo). Originates chiefly from sediment-laden meltwater from Capps Glacier directly west of mapped area. Thickness possibly as much as 20 m

f ALLUVIAL-FAN DEPOSITS (HOLOCENE)--Mostly gravel and gravelly sand deposited by active, generally steep gradient streams. Commonly irregularly bedded; poorly to moderately well sorted within beds. Several deposits near south shore of Beluga Lake and south of floor of Chichantna River valley. Thickness possibly as much as 15 m

COLLUVIAL AND LANDSLIDE DEPOSITS

Colluvial deposits consist of irregularly mixed fragments of various sizes and types derived from weathering and chiefly gravity processes acting on older geologic materials. Chiefly diamicton consisting of gravelly silt and sand and, locally, some organic material. Generally unsorted and loose to compact. Landslide deposits consist of numerous types of unconsolidated geologic materials and bedrock in simple to complex landslides that in part grade into one another. Surface varies from very irregular and hummocky to almost smooth. Landslides very extensive along and near Capps Creek (fig. 1) and extending several kilometers west of mapped area

ca MIXED DEPOSITS OF COLLUVIUM AND MOSTLY FINE-GRAINED ALLUVIUM (HOLOCENE)--In areas where colluvial deposits are crossed by so many small watercourses and their alluvial deposits that the alluvial deposits are too numerous to map separately at 1:31,680 scale. Slopes generally moderate. Scattered throughout mapped area except on floor of Chichantna River valley, although several deposits adjacent to the floor. Probably includes some small solifluction deposits. Thickness probably as much as 5 m

c COLLUVIAL DEPOSITS, UNDIVIDED (HOLOCENE AND PLEISTOCENE)--Sources of deposits are both bedrock and unconsolidated materials. Mostly on relatively steep to moderate slopes, notably along present or abandoned stream courses throughout mapped area except in central and west-central parts. Thickness probably less than 5 m

cb COLLUVIAL DEPOSITS DERIVED CHIEFLY FROM BEDROCK (HOLOCENE AND PLEISTOCENE)--In steep to moderately steep bluffs adjacent to present or abandoned stream courses. As mapped, locally includes numerous bedrock outcrops. Loose to compact. Thickness probably less than 2 m

cu COLLUVIAL DEPOSITS DERIVED CHIEFLY FROM UNCONSOLIDATED MATERIALS (HOLOCENE AND PLEISTOCENE)--Mostly on moderate to relatively steep slopes near the Chichantna River. Thickness probably less than 5 m

cl LANDSLIDE DEPOSITS, UNDIVIDED (HOLOCENE AND PLEISTOCENE)--Deposits scattered throughout area except on floor of Chichantna River. Thickness possibly as much as 100 m. Queried where identity is somewhat uncertain

clb BLOCK-SLIDE DEPOSITS (HOLOCENE AND PLEISTOCENE)--Deposits showing very slight to moderate spreading of original ground surface. The present surface gives appearance of no more than a moderate amount of disruption between blocks; some blocks are of very large size, a few having surface dimensions of about 0.5 by 0.5 km. Well exhibited near Capps Creek and southwest of Beluga Lake. Thickness of most blocks probably less than 60 m but some possibly as much as 100 m

clf Fragmented block-slide deposits (Holocene and Pleistocene)--Most deposits consist of blocks that formerly were much larger but now are broken apart and spread out because of continued movement. Deposits scattered throughout area but principally near Capps Creek. Thickness probably less than 15 m

cls SLUMP DEPOSITS (HOLOCENE AND PLEISTOCENE)--Deposits that appear to have rotated at least several degrees from a vertical plane, slid downslope, and then variably spread out. Deposits scattered throughout area except on floor of Chichantna River valley. Thickness probably less than 60 m

cld DEBRIS-FLOW, MUDFLOW, AND DEBRIS-AVALANCHE DEPOSITS (HOLOCENE AND PLEISTOCENE)--Landslide deposits that probably formed by flowage of parent material. Found throughout area except on floor of Chichantna River valley. Probably less than 5 m in thickness

LACUSTRINE DEPOSITS

DELTA DEPOSITS--Mostly pebble gravel and sand. Deposited in Beluga Lake by Triumvirate south river and by Chichantna River whose delta forms a dam that controls the lake level. Deposits probably finer grained at depth. Thickness possibly as much as 50 m

da Active delta deposits (Holocene)--Deposited by presently active distributaries of the two deltas

dl Mostly inactive delta deposits (Holocene)--Deposited chiefly by distributaries of former streams. Some delta remnants are as much as 30 m above present lake level

ls EMERGED-SHORE DEPOSITS (HOLOCENE)--Pebbly sand and sand and locally some silt deposited at margin of ancestral Beluga Lake as much as 80 m above present lake level. In some places, beach berms and small deltas are well developed. Thickness probably less than 3 m

p POND DEPOSITS (HOLOCENE)

Chiefly organic silt and organic very fine sand adjacent to modern ponds and lakes. In many places includes organic deposits too small or numerous to show at 1:31,680 scale. Underlying deposits are similar to those mapped adjacent to this unit. Widespread throughout area. Thickness possibly as much as 3 m

pt PEAT AND OTHER ORGANIC DEPOSITS (HOLOCENE AND LATE PLEISTOCENE)

Organic materials, chiefly mosses, sedges, and some wood fragments, in varying states of decomposition. Includes some silt, very fine sand, and numerous, commonly thin layers of volcanic ash, some of which are conspicuous. Soft and moist. As mapped, unit in many places includes pond deposits too small to show at 1:31,680 scale. Adjacent mapped deposits extend beneath the peat deposits. Widespread throughout mapped area. Thickness probably less than 4 m

b BEDROCK (MIOCENE TO PALEOCENE)

In steep to moderately steep bluffs adjacent to stream courses. Some scattered bedrock exposures are present within areas underlain by the colluvial deposits, undivided (c) and colluvial deposits derived chiefly from bedrock (cb). Data from Barnes (1966) and Magoon and others (1976) (fig. 2) indicate that rock types include, in order of probable abundance: pebbly sandstone, pebble conglomerate, siltstone, claystone, and some coal beds. The sandstone and conglomerate are within the West Foreland Formation of latest Paleocene age; the Tyonek Formation is early Oligocene through middle Miocene in age (Wolfe and Tanai, 1980) and consists of predominantly siltstone, claystone, and some coal beds. Semi-indurated to indurated

———— CONTACT--Approximate, Inferred, or Indefinite

–·–·–·– ABANDONED GLACIAL OUTWASH CHANNEL--Channels either too small to show separately at 1:31,680 scale or covered by younger deposits. Shown in general location only

———— LINEAMENT--Straight or curvilinear; narrow ridge or narrow topographic depression having possible depositional, ground-stability, or tectonic significance

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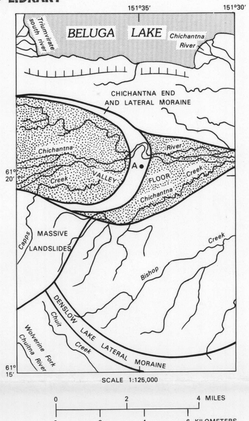

Figure 1.--Selected physiographic and hydrographic features. A, site of sample providing date for Chichantna end- and lateral-moraine deposits; ⊥⊥⊥, major escarpment.

Figure 2.--Generalized bedrock geology from Barnes (1966) and Magoon and others (1976).

INDEX MAP SHOWING LOCATION OF TYONEK B-5 QUADRANGLE (SHADED)

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1983

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