Maine Geological Survey
DEPARTMENT OF CONSERVATION
Walter A. Anderson, State Geologist

OPEN-FILE NO. 80-14d

Title: Evaluation of the Mineral Potential, Upper St. John River Valley, Aroostook County, Maine -- Appendix C: Geophysics.

Author: North American Exploration, Inc.

Date: 1980

Financial Support: Preparation of this report was supported by funds furnished by the U. S. Army Corps of Engineers, Contract No. DACW 33-79-C-0085.

This report is preliminary and has not been edited or reviewed for conformity with Maine Geological Survey standards.

Contents: 3 page report and 4 plates

APPENDIX C

GEOPHYSICAL SURVEY

Under the terms of the MGS/NAE contract, NAE personnel conducted a series of magnetometer traverses throughout the study area as shown on Plate A-1. In addition, the Rocky Mountain grid was run with VLF-EM as well as a magnetometer. The total line miles of geophysical surveying is 36.6.

Instruments used in these surveys were a McPhar Model GP-70 proton magnetometer, reading total field, and a Geonics Model EM-16 very-low frequency electromagnetic unit (VLF-EM). Standard diurnal and day-to-day corrections were applied to magnetic data. No corrections were necessary for VLF-EM data.

Toward the close of the field season, none of the geochemical anomalies, except the Rocky Mountain grid area, had been sufficiently well defined geologically or geochemically, to justify establishing a grid for geophysical surveying. In light of this restriction, representatives of COE, MGS, and NAE elected to use the major part of available geophysical surveying time to provide data to assist in geological mapping. The general location, orientation, and length of the magnetometer traverses were selected by the geologic mapping team. It should be kept in mind, when viewing the magnetic profiles, that it is the magnetic susceptibility of near-surface rocks that has the greatest effect on the magnetometer response. Thus, a magnetometer traverse may cross diverse rock types (sandstone, shale, limestone) and there may not be any magnetic variation over the various rock types. Volcanic rocks in a sedimentary terrane are generally recognizable by a magnetic signature.

AREA "A", MAGNETOMETER TRAVERSE -1 (MT-1): There are no obviously significant magnetic variations on this profile (Plate C-1).

AREA "A", MAGNETOMETER TRAVERSE -2 (MT-2): As with MT-1, there do not appear to be any significant magnetic variations on this profile, although the noise level is somewhat higher. A three-point rolling average of individual readings would smooth the curve considerably (Plate C-1).

AREA "A", MAGNETOMETER TRAVERSE -9 (MT-9): This profile is immediately north of the Rocky Mountain grid and appears to have been designed to confirm the presence of volcanic rocks (quartz latite lava) in this area. The dipolar anomaly between 40W and 50W appears to confirm this assumption. The magnetic body apparently dips eastward at a moderate angle (Plate C-1).

AREA "A", MAGNETOMETER TRAVERSE -8 (MT-8): This profile, south and east of MT-9, also indicates the presence of the quartz latite volcanics (155W - 165W), with very similar magnetic expression. The cause of the positive anomaly between 125W and 140W is not known (Plate C-1).

AREA "B", MAGNETOMETER TRAVERSE -3 (MT-3): This traverse was designed to provide information on the northern limits of the greenstone belt. The profile clearly shows that the greenstone does not extend into this area (Plate C-2).

AREA "B", MAGNETOMETER TRAVERSE -5 (MT-5): This traverse apparently crossed the greenstone belt at or near its maximum width; approximately 6,000 feet of igneous rock are indicated. The greenstone belt is magnetically inhomogeneous, suggesting the possiblity of layering (Plate C-2).

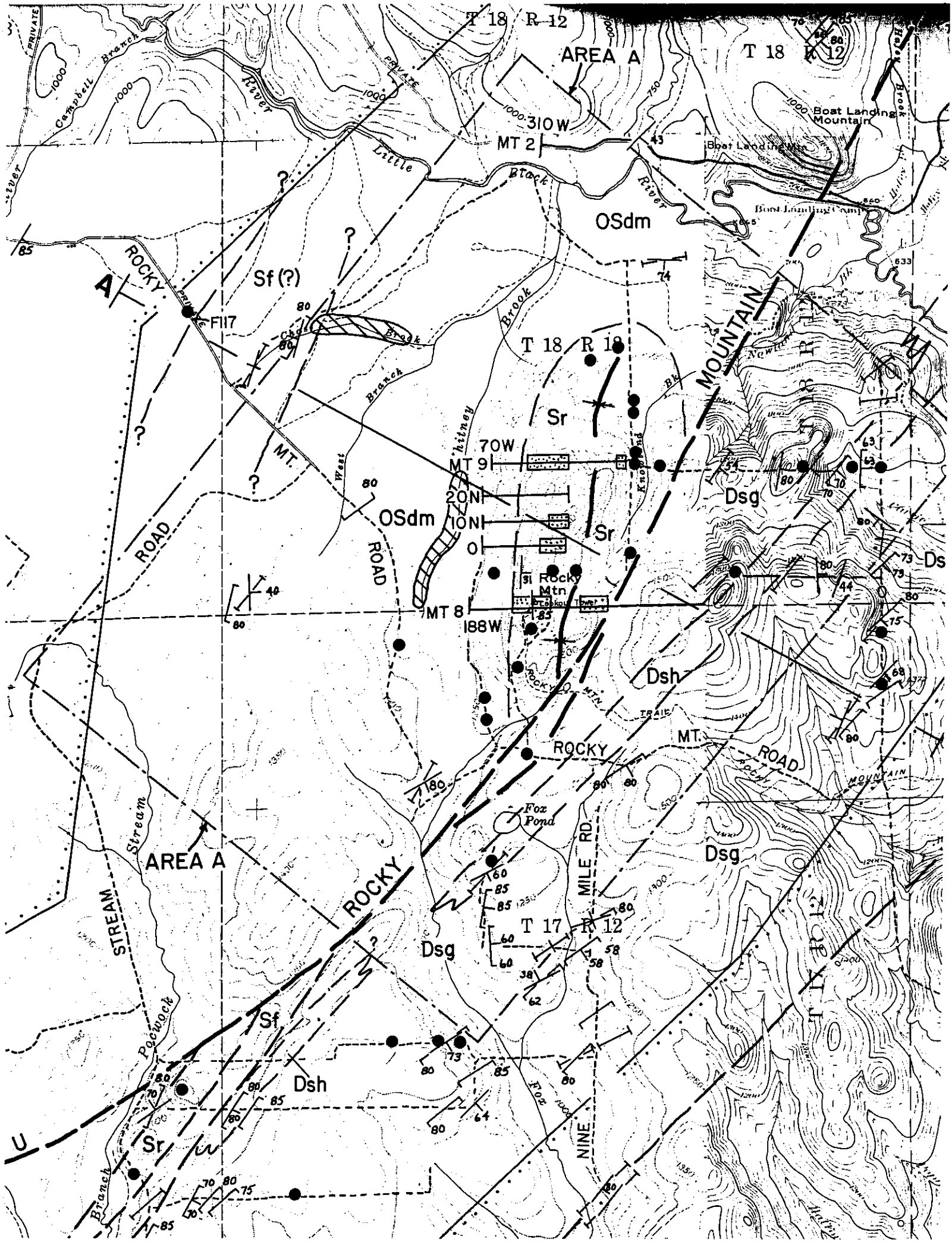
AREA "B", MAGNETOMETER TRAVERSE -4 (MT-4): Although it is too far distant from MT-5, about four miles, to demonstrate physical continuity, the MT-4 profile suggests that the greenstone belt extends to this longitude, with a width of less than 3,000 feet. The strongly dipolar magnetic signature persists (Plate C-2).

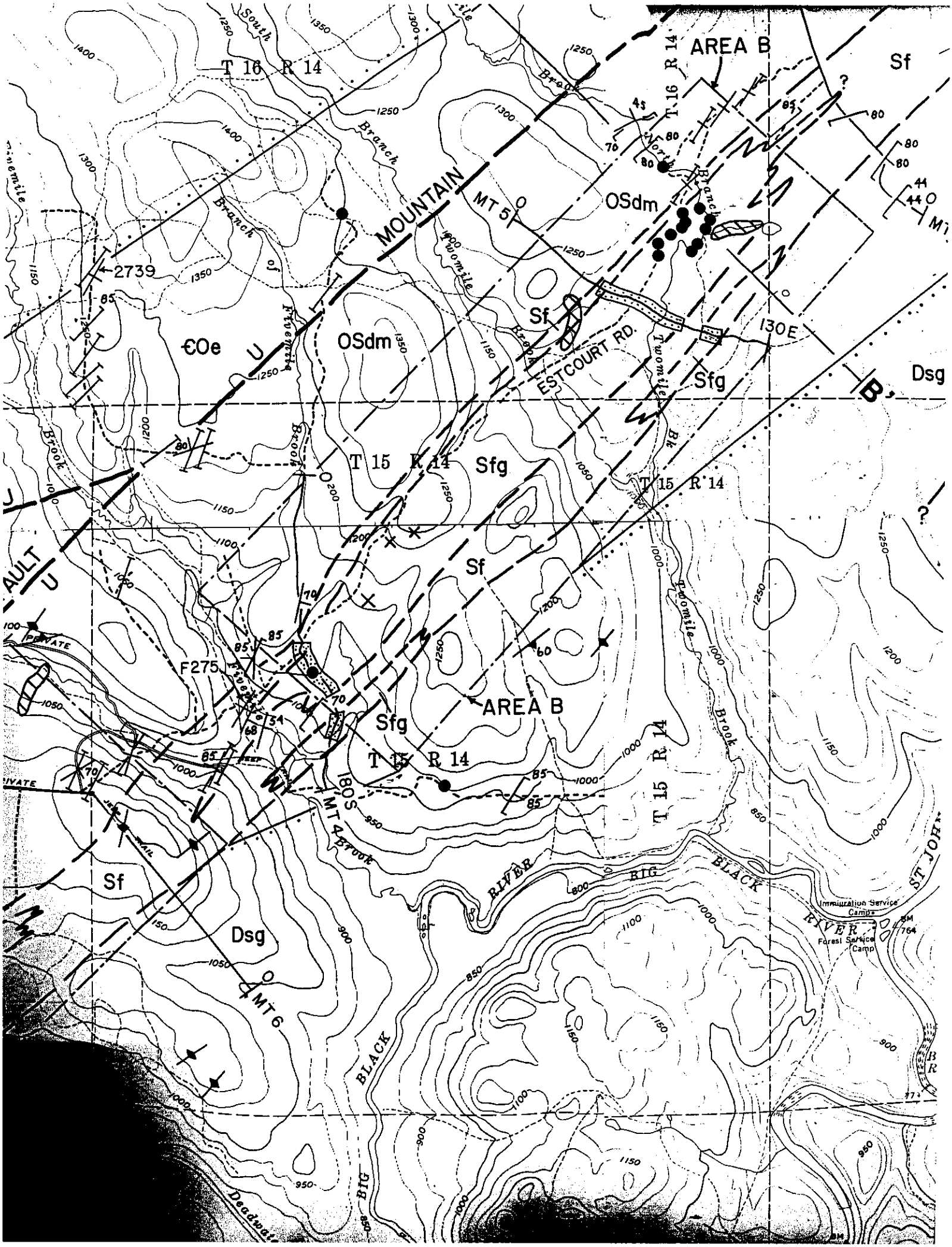
AREA "C", MAGNETOMETER TRAVERSE -6 (MT-6): This magnetic variation profile is basically featureless, indicating that the greenstone belt terminates between traverses MT-4 and MT-6 (Plate C-3).

AREA "C", MAGNETOMETER TRAVERSE -7 (MT-7): Available geologic maps do not show any igneous bodies in the area of the two magnetic anomalies on this traverse (145W and 200W). It appears, from the magnetic signatures, that the eastern anomaly is related to an andesite body and the western anomaly to a felsic volcanic bed (Plate C-3).

The magnetometer is an effective tool in delineating igneous rock masses within the overall study area, both the quartz latite lavas in the northern area and the greenstone in the central area. In such delineation, the magnetometer survey also outlines environments within which sulfide bodies might be expected to occur.

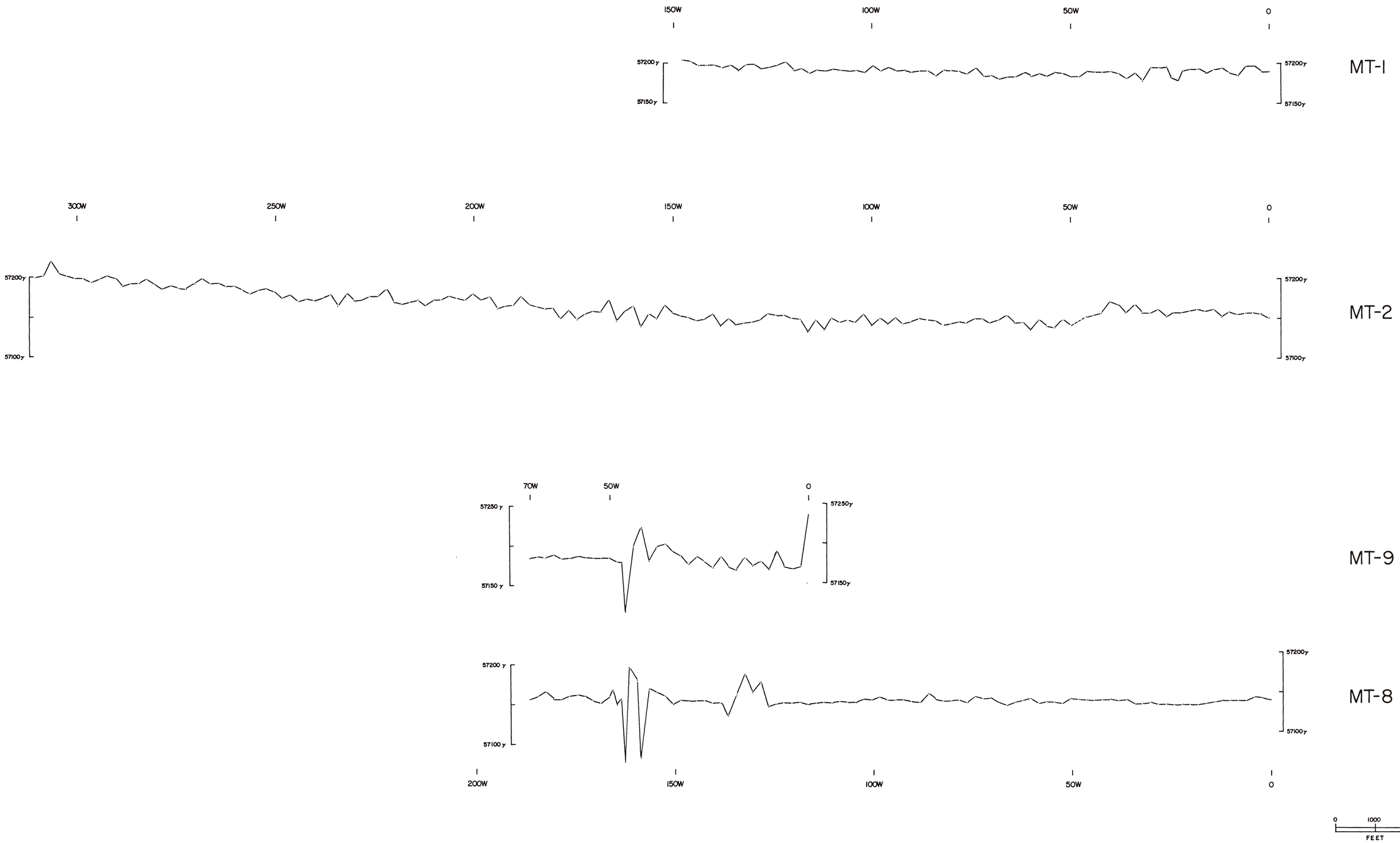
The Rocky Mountain grid was surveyed with magnetometer and VLF-EM, and the results are graphically depicted on Plate C-4. The magnetic variation profiles show that the southernmost line (Line "0") crossed into the volcanic rocks at about 22E, and the intermediate line (Line 10N) closely approached the volcanic belt. Other than these departures, the profiles are featureless. In the VLF-EM survey, both east coast stations, NAA-Cutler and NSS-Annapolis, were utilized. With the existing geographic-geologic relations, NSS provides the better electromagnetic coupling. The NSS-oriented survey mapped a weak, normal, in-phase crossover near the eastern end of each traverse line, and a better defined, reverse, out-of-phase crossover 200-400 feet to the west. The data from the NAA-oriented survey are very close, in all respects, to those of the NSS-oriented survey. In both cases, very slight, gradational changes in conductivity contrast are indicated, possibly due to an increase in carbon (graphite) or iron sulfide content toward the east end of each traverse. The data suggest that the EM anomaly is, perhaps, best classified as "stratigraphic". However, the fact that the out-of-phase crossover is verified by a valid cxHM anomaly, on all three traverses, cannot be ignored.


T 18 R 12
AREA A
T 18 R 12
Boat Landing Mountain
310W
MT 2
Little
Black
River
OSdm
Sf (?)
ROCKY
F117
T 18 R 18
Sr
MOUNTAIN
70W
MT 9
20N
10N
0
Dsg
OSdm
Sr
ROAD
Rocky Mtn
MT 8
188W
Dsh
ROCKY
MT.
ROAD
Fox Pond
AREA A
STREAM
ROCKY
MILE RD.
T 17 R 12
Dsg
Sf
Dsh
Sr
NINE



AREA B
T 16 R 14
Sf
MOUNTAIN
MT 5
OSdm
2739
€Oe
OSdm
Sf
ESTCOURT RD.
130E
Sfg
Dsg
B'
T 15 R 14
Sfg
T 15 R 14
Sf
AULT
U
F275
AREA B
Sfg
T 15 R 14
180S
MT 4
T 15 R 14
Sf
Dsg
MT 6
BIG BLACK RIVER
Immigration Service Camp
Forest Service Camp
ST JOHN
Deadwater

AREA C
T 15 R 15
Dss
FAULT
U
2798
262 W
PRIVATE
F275
€Oe
Shields
T 15 R 15
BRANCH
ESTCOURT RD.
ROCKY
Dss
Branch
OSdm
Sf
Dsg
OSdm
SHIELDS
U
Sfg
MT 6
Forest Service Airfield
PRIVATE
PRIESTLY
Bruleau Pond
Charles Pond
2843
Sf
Ninemile
Deadwater
OSdm
Sfg
BRIDGE
Dsg
AREA C
OSdm
OSdma
St Amants
Brook
RIVER
BIG
BLACK
T 14 R 15
RD.
MT 7
R 16
T 14 R 16
RIVER
Blood Lake
Stream
Connors



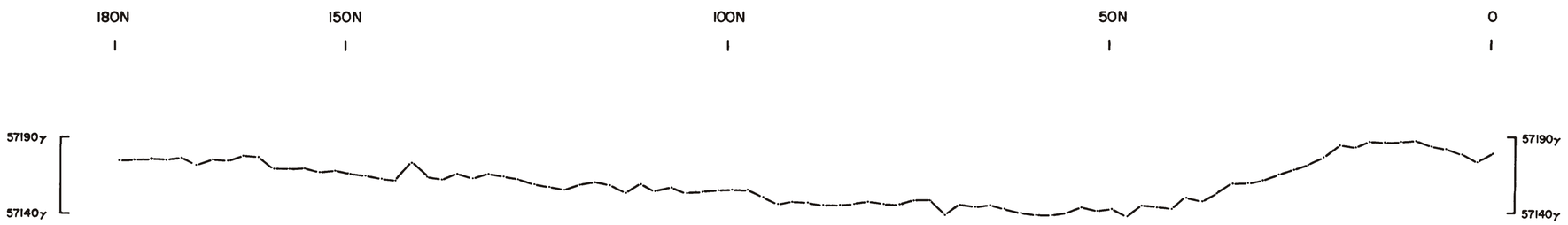
NOTE:

SEE INDEX MAP FOR LINE LOCATION AND ORIENTATION

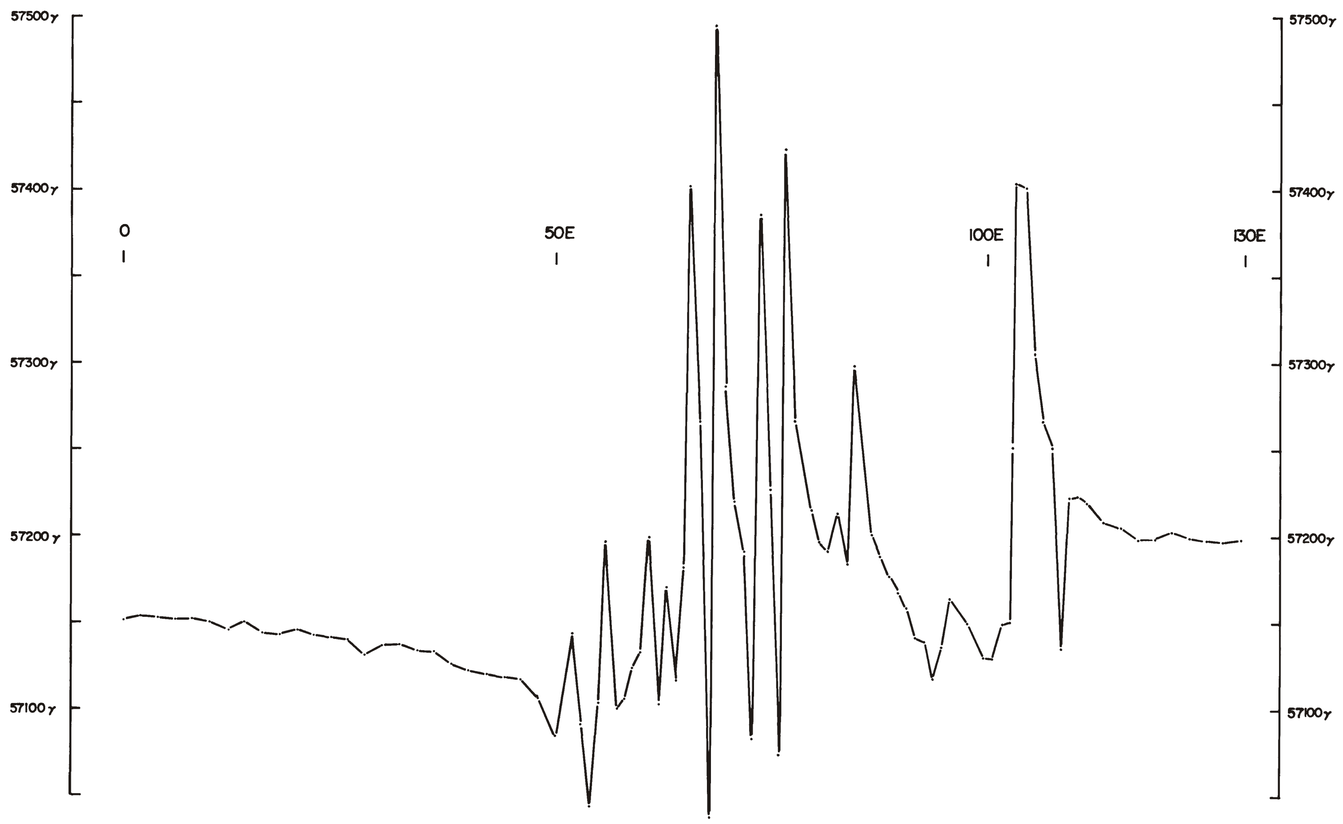
REVISIONS		
BASE	OTHER	NAE NORTH AMERICAN EXPLORATION, INC P.O. BOX 7594 CHARLOTTESVILLE, VIRGINIA 22906 (804) 973-4528
		CLIENT: MAINE GEOLOGICAL SURVEY
		MAGNETIC VARIATIONS RECON LINES, AREA "A"
		ST. JOHN RIVER PROJECT AROOSTOOK CO., MAINE
		OPEN-FILE NO. 80-14d

AREA	SCALE	DATE	DR. BY: DEP TR. BY: CH. BY: RSY	MAP NO.
9-SJR	1"=1000'	OCT 79		9-SJR-AMT-001

PLATE C-1



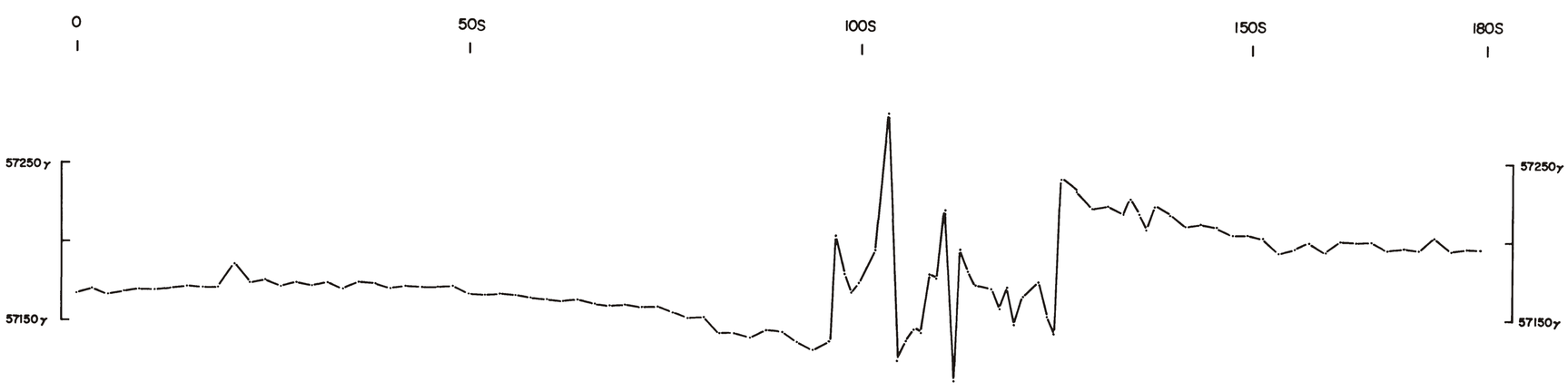
MT-3



MT-5

NOTE:

SEE INDEX MAP FOR LINE LOCATION AND ORIENTATION



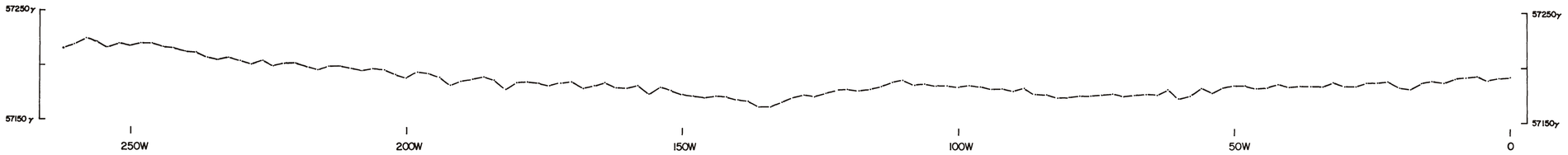
MT-4

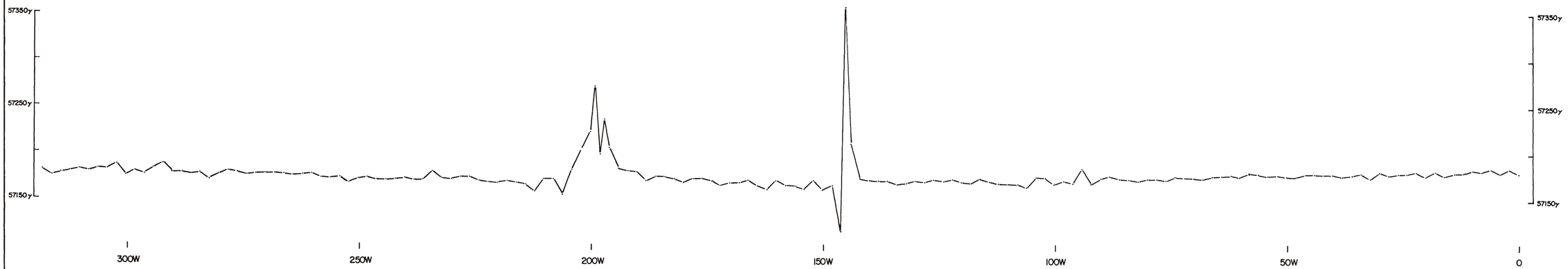
0 1000 2000
FEET

REVISIONS		
BASE	OTHER	
		NAE NORTH AMERICAN EXPLORATION, INC. P.O. BOX 7594 CHARLOTTESVILLE, VIRGINIA 22906 (804) 973-4338
		CLIENT: MAINE GEOLOGICAL SURVEY
		MAGNETIC VARIATIONS RECON LINES, AREA "B"
		ST. JOHN RIVER PROJECT AROOSTOOK CO., MAINE
		OPEN-FILE NO. 80-14d

AREA	SCALE	DATE		MAP NO.
9-SJR	1"=1000'	OCT.79	DR. BY: DEP TR. BY: CH. BY: RSY	9-SJR-BMT-001

PLATE C-2



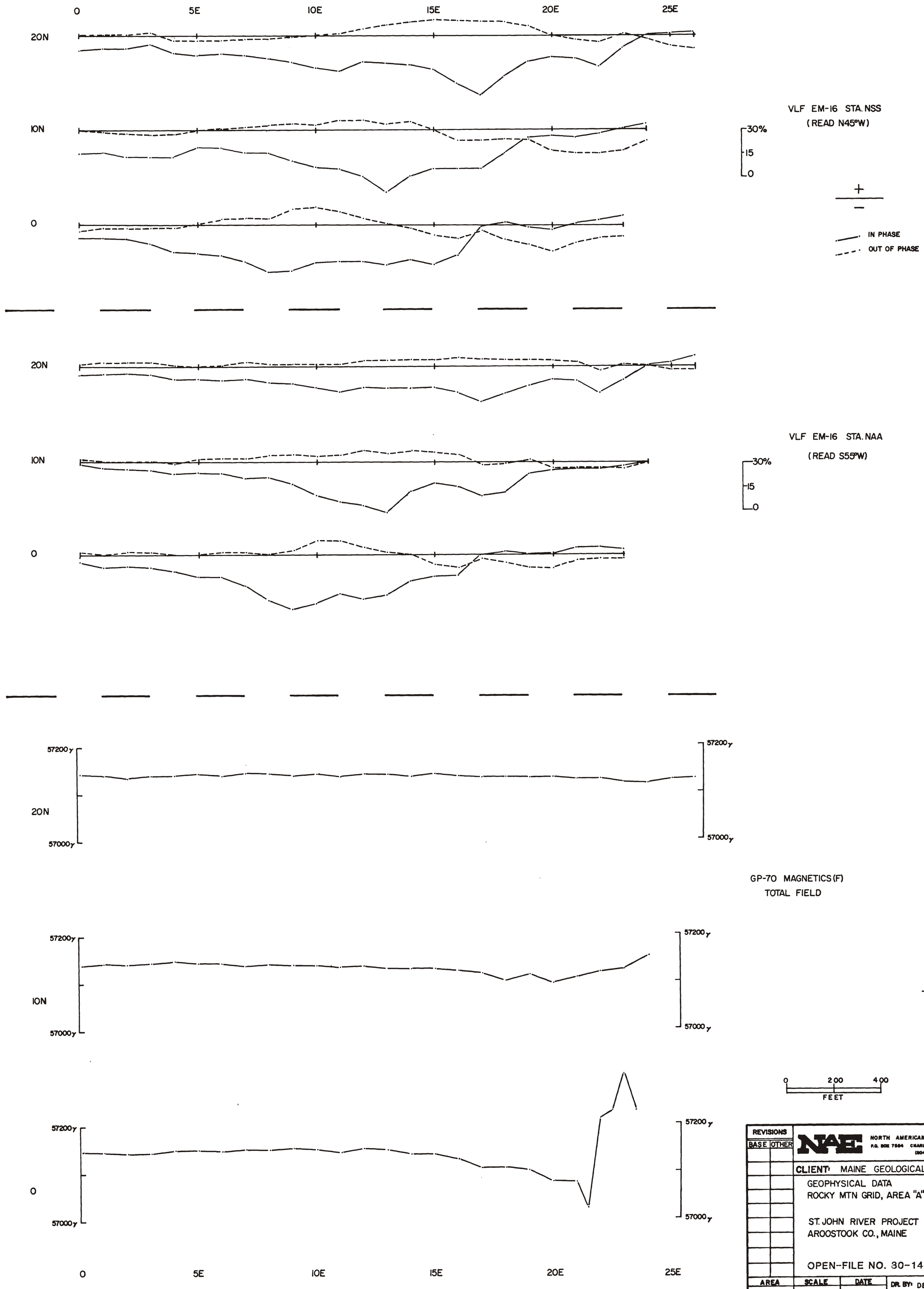


0 1000 2000
FEET

NOTE:
SEE INDEX MAP FOR LINE
LOCATION AND ORIENTATION

REVISIONS		
BASE	OTHER	NAE NORTH AMERICAN EXPLORATION, INC. P.O. BOX 7594 CHARLOTTESVILLE, VIRGINIA 22906 (804) 973-4526
		CLIENT: MAINE GEOLOGICAL SURVEY
		MAGNETIC VARIATIONS RECON LINES, AREA "C" ST. JOHN RIVER PROJECT AROOSTOOK CO., MAINE OPEN-FILE NO. 80-14d

AREA	SCALE	DATE	DR. BY: DEP TR. BY: CH. BY: RSY	MAP NO.
9-SJR	1"=1000'	OCT 79		9-SJR-CMT-001



REVISIONS		NAE NORTH AMERICAN EXPLORATION, INC. P.O. BOX 7504 CHARLOTTESVILLE, VIRGINIA 22906 (804) 973-4328			
BASE	OTHER				
		CLIENT: MAINE GEOLOGICAL SURVEY			
		GEOPHYSICAL DATA ROCKY MTN GRID, AREA "A" ST. JOHN RIVER PROJECT AROOSTOOK CO., MAINE OPEN-FILE NO. 30-14d			
AREA		SCALE	DATE	DR. BY: DEP TR. BY: CH. BY: RSY	MAP NO.
9-SJR		1"=200'	OCT 79		9-SJR-RMG-G-01

TP-2024

PLATE C-4