

ALASKA DIVISION OF MINING AND GEOLOGICAL AND  
GEOPHYSICAL SURVEYS

Public Data File 86-86e

PRELIMINARY DETAILED STRATIGRAPHIC SECTIONS AND BEDROCK  
MAPS OF THE LISBURNE GROUP, MT. MICHELSON C-3, AND C-4  
QUADRANGLES, WESTERN SADLEROGCHIT MOUNTAINS AND  
NORTHWEST SHUBLIK MOUNTAINS, NORTHEASTERN ALASKA

By

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A brief synopsis of a study of the stratigraphy, structure, and sedimentology of the Carboniferous Lisburne Group in the western Sadlerochit and Shublik Mountains northeastern Alaska is presented. The study was undertaken during the summer of 1986 in conjunction with the Alaska Division of Mining and Geological and Geophysical Surveys and the University of Alaska as part of their ongoing program of geological mapping and stratigraphic studies in the Arctic National Wildlife Range. The data and samples collected from the study are part of my M.S. thesis research in geology at the University of Alaska.

### OBJECTIVES

The purpose of this study is to address seven major questions regarding the stratigraphy and structure of the Carboniferous Lisburne Group in the Sadlerochit and Shublik Mountains:

- 1) What were the depositional environment of the Lisburne carbonates?
- 2) What are the age of the rocks? Can biostratigraphic correlation resolve age problems associated with the Lisburne Group?
- 3) What are vertical and lateral facies relationships?
- 4) What is the diagenetic history of the carbonates? Are there any well-developed porosity trends with reservoir potential?
- 5) What types of structural features can be determined within the Lisburne Group and adjacent rocks? Is bedding-plane slip present? Has recrystallization and/or pressure solution of the carbonate fabric occurred? If so, at what stratigraphic positions are they evident?
- 6) What is the nature of the contact between the Lisburne Group and the underlying Kayak Shale? Is it depositional and intact or has it acted as a surface of detachment?
- 7) The two study areas are separated by a major thrust fault which bounds the northern Shublik Mountains. Can facies relationships in the Lisburne Group be used to constrain estimates of fault displacement?

## ACCOMPLISHMENTS

Exposures of the Endicott Group and Lisburne Group west of the Katakaturuk River in the Sadlerochit Mountains and the northeast portion of the Shublik Mountains were mapped (figure 1). Lithofacies and structures within the Lisburne Group were mapped along the predominant east-west trend in both areas. Map units defined in ADGGS Public Data Files 86-1B, 86-1C, and 86-1D, were used with additional subdivision of the Wahoo Limestone.

## DESCRIPTION OF MAP UNITS

The Lisburne Group of the Sadlerochit and Shublik Mountains is composed of the Mississippian Alapah Formation and the Pennsylvanian Wahoo Limestone (figure 2). The two formations were divided into the following lithologic units:

- Pwu    Upper Cliff-former (Wahoo Limestone)  
-ranges in composition from mudstones to grainstones. It is rich in crinoid, bryozoans, and brachiopods. Bedding thickness range from very thin (2 cms) to 5 meters thick. The unit can be easily distinguished by its buff coloration, due to the presence of dolomitic beds, and its ledge and slope-forming character. It is unconformably overlain by the Echooka Formation.
- Pwl    Lower Cliff-former (Wahoo Limestone)  
-is composed of skeletal packstones to grainstones. It is characterized by three massive gray cliffs which range in thickness from 10-15 meters. It forms a high cliff above the slope-forming Alapah Formation.
- Mau    Talus Forming Unit (upper Alapah Formation)  
-is predominantly lime mudstone which weathers into irregular shard-like pieces. It is gray to brown in color. The unit forms prominent talus slopes and is poorly exposed. The upper contact is conformable with the overlying Wahoo Limestone.
- Mal    Lower Cliff-former (lower Alapah Formation)  
-is characterized by massive light gray cliffs consisting of predominantly peloidal grainstone. In most areas the top of the cliffs have a red hematitic staining derived from interbeds of sandstone and/or shale. The contact with the upper Alapah unit appears to be gradational.

The lower Mississippian Endicott Group disconformably underlies the Lisburne Group. Locally these rocks are poorly exposed and very thin (less than 15 meters in the western Sadlerochit Mountains to approximately 25 meters in the Shublik Mountains). The Endicott Group is subdivided into the following map units:

- Me      Endicott Group (undifferentiated)  
         -dark grey to black shales and siltstones of the Kayak Shale and sandstones and quartzite of the Kekiktuk Formation. Stratigraphically occurring between the Lisburne Group and the underlying Katakturuk Dolomite.
- Mky      Kayak Shale  
         -black siltstone and shale.
- Mk        Kekiktuk Formation  
         -quartzose sandstone.

Detailed stratigraphic sections were measured in various localities in both ranges (see maps for locations). A composite, complete Lisburne Group section (sections I, J, K, and L) was measured in the Katakturuk River area. Another complete section (section M) was measured in the western Sadlerochit Mountains to determine lateral facies variations. Midway between these complete sections, section N was measured to document smaller scale facies changes and to allow more precise reconstructions of the depositional environment within the Wahoo Limestone. In the northwest Shublik Mountains a composite of the entire Lisburne Group (sections O, and P) was measured. The approximate thickness of the Lisburne Group for the Katakturuk River is 370 meters, for the western Sadlerochit Mountains it is 385 meters, and in the northwest Shublik Mountains it is 340 meters (figure 3).

The sections in the Sadlerochit Mountains are structurally intact and have maintained their relative spatial relationships. Rocks of the Shublik Mountains have been displaced an unknown distance northward. Detailed microfacies analysis (presently underway) together with biostratigraphic and field data will allow determination of the mosaic of depositional environments which comprise the Lisburne Group. Analysis of this information may help define displacement along the Shublik Mountain front fault relative to the Sadlerochit Mountains.

The sampling interval varied for each unit. The upper Wahoo (Pwu) unit was sampled at 0.5 meter intervals in the Katakturuk River section (section L) and in the northwest Shublik Mountains section (section O). The lower Wahoo (Pwl) unit was sampled at 1.0 meter intervals in the reference section localities. Supplementary sections M and N were not systematically sampled. All the sections of the lower Alapah (Mal) and the upper Alapah (Mau) were randomly sampled. Section samples are referenced by the position, in meters, above the base of the unit.

### FIELD OBSERVATIONS/INTERPRETATIONS

Stratigraphic measurements indicate a regional thinning trend to the west-southwest. Lithologies and stratigraphic sedimentologic relationships indicate the following general depositional environments:

lower Alapah Formation- open platform with periodic emergence.  
upper Alapah Formation- lagoonal.  
lower Wahoo Limestone- open platform.  
upper Wahoo Limestone- near shoaling.

Apparent cyclicity occurs throughout the Lisburne Group limestones. The lower Alapah unit shows cycles of thick intervals of cliff-forming limestone alternating with slope-forming terrigenous sandstone and shale. Three cycles probably record shallowing upward from marine limestone into sands deposited on an emergent platform. Cliffs of the lower Wahoo unit may be cyclic but determination of the nature of the cycles requires petrographic analysis. The upper Wahoo unit records a number of apparent shallowing upward cycles. These cycles are composed of mudstone to wackestone intervals alternating with packstone to grainstone intervals. Silicification has altered the rocks so the ledge and slope-forming topography and profile of the upper Wahoo unit does not precisely match cycles. These interpretations are based on field observations, no petrographic analysis has yet been performed.

The overlying Permian Echooka Formation locally channels into the upper Wahoo Limestones. Channeling has caused an erosional thinning of the upper Wahoo unit towards the west-southwest. Microfossil samples were taken from the contact between the upper Wahoo and the overlying basal Echooka Formation for age control needed to determine the duration of the erosional interval.

The Endicott Group in the western Sadlerochit Mountains outcrops discontinuously along strike. Although actual outcrop is scarce, there is a zone of Endicott Group rubble which is easily distinguished from the Lisburne Group and the pre-Mississippian Katakturuk Dolomite. Distinction is based on coloration and the presence of Kekiktuk Formation and scattered patches of Kayak Shale found in float. This zone appears to become thinner in the Katakturuk River area. Based on reconnaissance mapping, the Endicott Group in the northwest Shublik Mountains is thicker than in the Sadlerochit Mountains suggesting a thickening trend towards the south. Thickening may be depositional, based on minor amounts of Kayak Shale observed in the Sadlerochit Mountains, or structural because Kayak Shale thickens in anticlinal cores in the Shublik Mountains.

The most significant result of field mapping has been the documentation of thrust faults which lose displacement in the lower Alapah Formation. The thrust faults originate in the Katakturuk Dolomite, cut across the Endicott Group, and flatten out in the lower Alapah Formation. This small-scale folding and faulting

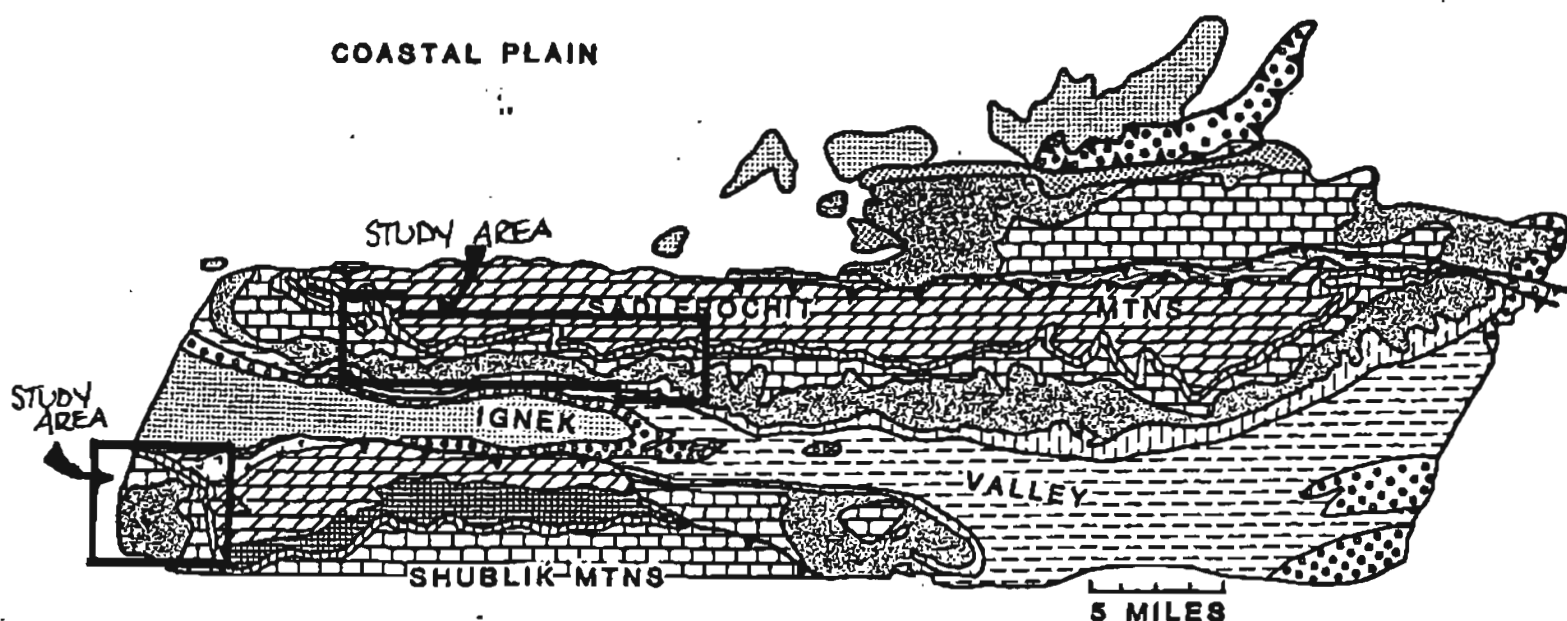
can be traced along strike in the western Sadlerochit Mountains and seems to reflect the regional structure of the area. Though the apparent displacement is small this faulting is significant because it cross-cuts the Endicott Group. Consequentially, the Kayak Shale is not acting as a detachment surface in the region.

#### CONTINUING STUDIES

A more detailed understanding of the Lisburne Group and its significance requires microfacies analysis. Several hundred samples were collected and are presently being prepared for petrographic study. These analyses, together with the data presented in this report, will allow determination of depositional environments, resolve causes of small-scale cyclicity in the upper Wahoo Limestone, and help define the extent of erosion and paleotopography of the carbonate platform prior to the deposition of the Echooka Formation.

#### REFERENCES

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- Robinson, M.S., et al, 1986, Preliminary bedrock geologic map of part of the Mt. Michelson Quadrangle, Sadlerochit Mountains, Northeastern Alaska: ADGGS PDF86-1B, 1C, and 1D.



**GENERALIZED GEOLOGIC MAP OF THE  
SADLEROCHIT AND NORTHERN SHUBLIK MOUNTAINS  
(MODIFIED FROM REISER, 1970)**

#### EXPLANATION

Kc		Tertiary to Upper Cretaceous Colville Group
KpK		Lower Cretaceous Pebble Shale Unit and Kemik Sandstone
KpKt		Lower Cretaceous Pebble Shale Unit and Thin Kemik Sandstone Unconformably over Sadlerochit Group (NE Sadlerochit Mtns.)
KJk		Lower Cretaceous to Jurassic Kingak Shale
Trs		Triassic Shublik Formation
TrPs		Lower Triassic to Permian Sadlerochit Group
IPMI		Pennsylvanian to Mississippian Lisburne Group
Mk		Mississippian Kayak Shale and Kekiktuk Conglomerate
Dcn		Devonian to Cambrian Nanook Limestone
pck		Precambrian (?) Katakturuk Dolomite
pCu		Precambrian (?) Phyllite, Quartzite, and Calcilutite
pMv		Pre-Mississippian Mafic Extrusive and Intrusive Rocks

# GENERALIZED STRATIGRAPHY OF THE LISBURNE AND ENDICOTT GROUPS

(no scale implied)  
by Teresa A. Imm

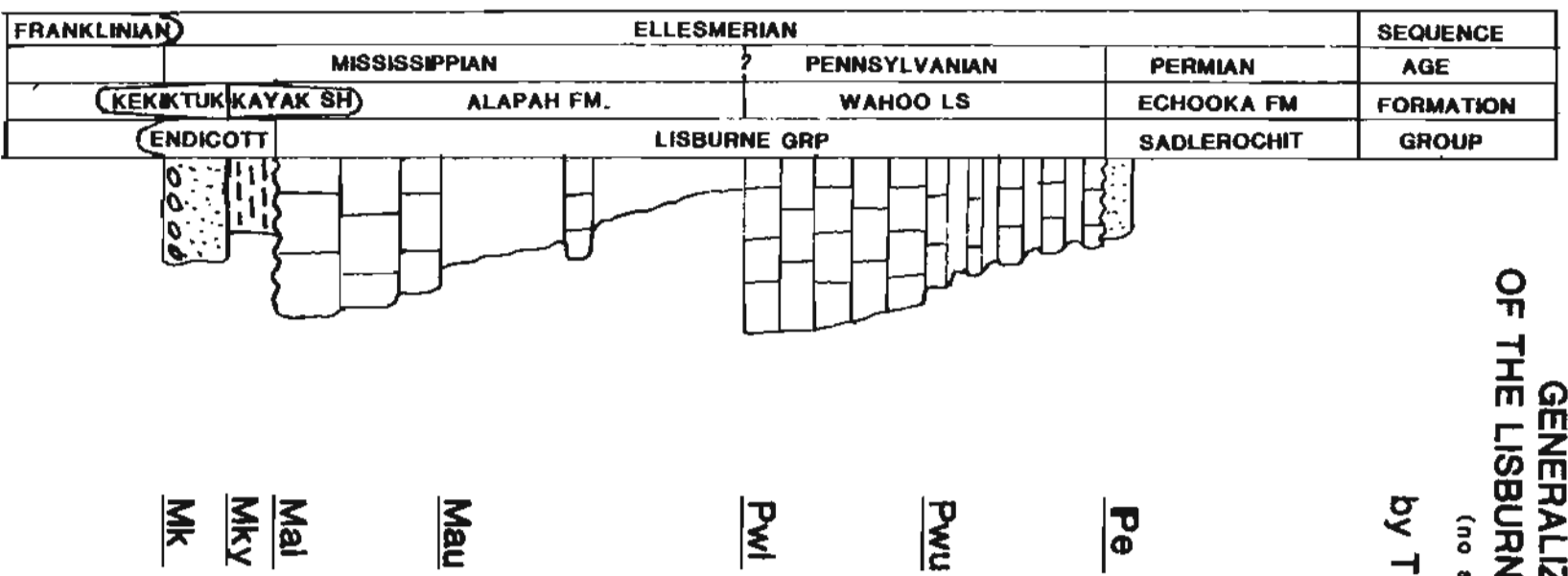


FIGURE 2



# CORRELATION DIAGRAM FOR STRATIGRAPHIC SECTIONS

(all sections are generalized; datum is the base of the Echooka Formation)

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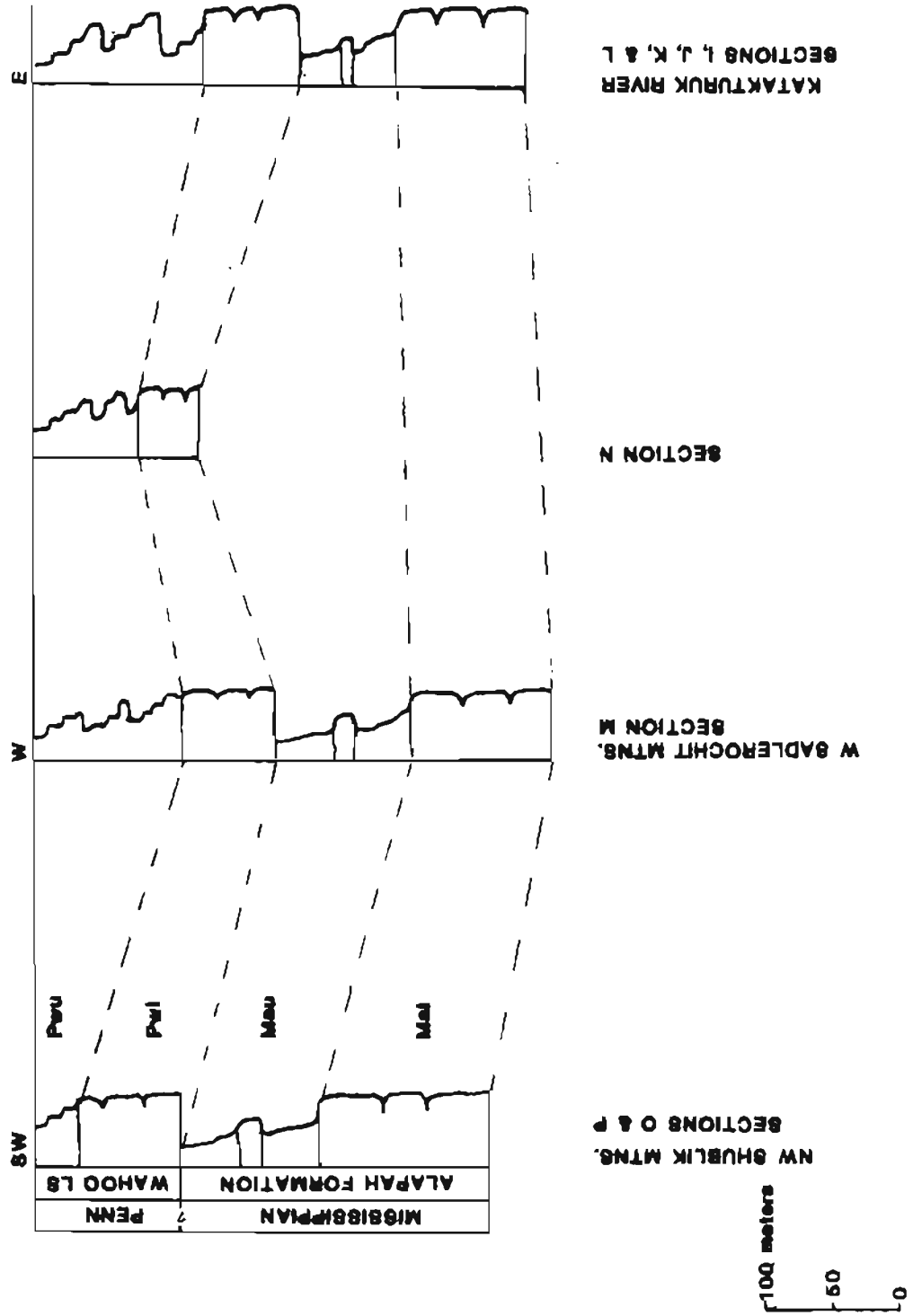


FIGURE 3

APPENDIX I

Stratigraphic Sections of the Lisburne Group

## KEY FOR STRATIGRAPHIC SECTIONS

### ROCK TYPES

M - Micrite/Mudstone  
 W - Wackestone  
 P - Packstone  
 G - Grainstone  
 B - Boundstone  
 X - Crystalline limestone

### DIAGENETIC FEATURES

● - Chert nodules  
 ~ - Chert stringers  
 ○ - Calcite nodules  
 ♣ - Petroliferous  
 d - Dolomitic  
 g - Glauconitic  
 ▲ - Pyritic  
 \* - Silicified skeletal grains


### SEDIMENTARY STRUCTURES

↘ fu - fining up  
 ↗ cu - coarsening up  
 === - parallel laminae  
 ~~~ - wavy laminae  
 ~~~ - current ripple laminae  
 \\\ - low-angle cross-laminae  
 ~~~ - basal scour

### BEDDING

≡ - Very thin bedded  
 (less than 5 cm)  
 ≡ - Thin bedded  
 (5 - 20 cm)  
 ≡ - Medium bedded  
 (20 - 50 cm)  
 ≡ - Thick bedded  
 (50 - 100 cm)  
 ≡ - Massive  
 (greater than 1 m)

### EXPOSURE QUALITY

 Cover  
 Rubble  
 Good  
 Excellent

### GRAIN TYPE

#### Skeletal Grains

★ - Crinoid  
 人 - Bryozoan (undifferentiated)  
 # - Fenestrate  
 ∞ - Ostracod  
 ⊙ - Coral (solitary)  
 ⊙ - Coral (colonial)  
 ♡ - Bivalve  
 ∩ - Brachiopod  
 ∞ - Gastropod  
 ⊙ - Algal coated grain  
 ☉ - Algal mound

#### Non-skeletal Grains

( - Skeletal fragments  
 ∅ - Ooid (single coat)  
 ⊙ - Ooid (multiple coat)  
 • - Peloid

#### OTHER

!! - Abundant  
 () - Rare/minor  
 ? - Questionable

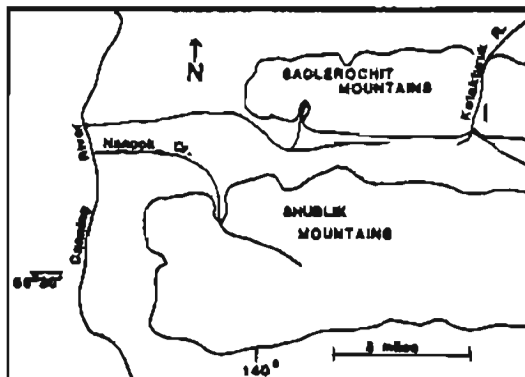
# STRATIGRAPHIC SECTION 'I'

## LISBURNE GROUP

T3N SEC19 R27E

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1 of 1



| AGE           | FORMATION        | UNIT | THICKNESS (m) | DIAGENETIC FEATURES | BEDIMENTARY STRUCTURES | GRAIN TYPE | GRAPHIC COLUMN | ROCK TYPE | DESCRIPTION |
|---------------|------------------|------|---------------|---------------------|------------------------|------------|----------------|-----------|-------------|
| MISSISSIPPIAN | ALAPAH FORMATION | Mal  | 0             |                     |                        |            |                |           |             |
|               |                  |      | 5             |                     |                        |            |                |           |             |
|               |                  |      | 10            |                     |                        |            |                |           |             |
|               |                  |      | 15            |                     |                        |            |                |           |             |
|               |                  |      | 20            |                     |                        |            |                |           |             |
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|               |                  |      | 830           |                     |                        |            |                |           |             |
|               |                  |      | 835           |                     |                        |            |                |           |             |
|               |                  |      | 840           |                     |                        |            |                |           |             |
|               |                  |      | 845           |                     |                        |            |                |           |             |
|               |                  |      | 850           |                     |                        |            |                |           |             |
|               |                  |      | 855           |                     |                        |            |                |           |             |
|               |                  |      | 860           |                     |                        |            |                |           |             |
|               |                  |      | 865           |                     |                        |            |                |           |             |
|               |                  |      | 870           |                     |                        |            |                |           |             |
|               |                  |      | 875           |                     |                        |            |                |           |             |
|               |                  |      | 880           |                     |                        |            |                |           |             |
|               |                  |      | 885           |                     |                        |            |                |           |             |
|               |                  |      | 890           |                     |                        |            |                |           |             |
|               |                  |      | 895           |                     |                        |            |                |           |             |
|               |                  |      | 900           |                     |                        |            |                |           |             |
|               |                  |      | 905           |                     |                        |            |                |           |             |
|               |                  |      | 910           |                     |                        |            |                |           |             |
|               |                  |      | 915           |                     |                        |            |                |           |             |
|               |                  |      | 920           |                     |                        |            |                |           |             |
|               |                  |      | 925           |                     |                        |            |                |           |             |
|               |                  |      | 930           |                     |                        |            |                |           |             |
|               |                  |      | 935           |                     |                        |            |                |           |             |
|               |                  |      | 940           |                     |                        |            |                |           |             |
|               |                  |      | 945           |                     |                        |            |                |           |             |
|               |                  |      | 950           |                     |                        |            |                |           |             |
|               |                  |      | 955           |                     |                        |            |                |           |             |
|               |                  |      | 960           |                     |                        |            |                |           |             |
|               |                  |      | 965           |                     |                        |            |                |           |             |
|               |                  |      | 970           |                     |                        |            |                |           |             |
|               |                  |      | 975           |                     |                        |            |                |           |             |
|               |                  |      | 980           |                     |                        |            |                |           |             |
|               |                  |      | 985           |                     |                        |            |                |           |             |
|               |                  |      | 990           |                     |                        |            |                |           |             |
|               |                  |      | 995           |                     |                        |            |                |           |             |
|               |                  |      | 1000          |                     |                        |            |                |           |             |

-Offset across creek continued as section J.  
-Medium-gray.

-Calcareous sandstone w/hematitic staining.  
-Light-gray w/orange weathering.

-Medium-gray.  
-Light-gray w/gray chert.

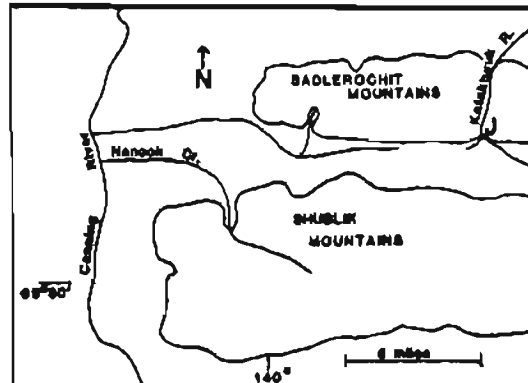
# STRATIGRAPHIC SECTION 'J'

LISBURNE GROUP

T3N SEC19 R27E

By Teresa A. Imm

1 of 2



| AGE           | FORMATION        | UNIT | THICKNESS (m) | DIAGENETIC FEATURES | SEDIMENTARY STRUCTURES | GRAIN TYPE | GRAPHIC COLUMN | ROCK TYPE | DESCRIPTION                                                        |
|---------------|------------------|------|---------------|---------------------|------------------------|------------|----------------|-----------|--------------------------------------------------------------------|
| MISSISSIPPIAN | ALAPAH FORMATION | Mau  | 100           |                     |                        |            |                |           |                                                                    |
|               |                  |      | 0             |                     |                        |            |                | M         |                                                                    |
|               |                  |      | 0             |                     |                        |            |                | P-W       | -Offset 1/4 mile to east, continued as section K.<br>-Marker unit. |
|               |                  |      | 0             |                     |                        |            |                | P-W       |                                                                    |
|               |                  |      | 0             |                     |                        |            |                | P-W       | -Light-gray w/ blocky weathering.                                  |
|               |                  |      | 0             |                     |                        |            |                | S         |                                                                    |

# STRATIGRAPHIC SECTION 'J' (continued)

2 of 2

| AGE           | FORMATION        | UNIT | THICKNESS (m) | DIAGENETIC<br>FEATURES | SEDIMENTARY<br>STRUCTURES | GRAIN TYPE | GRAPHIC<br>COLUMN | ROCK TYPE | DESCRIPTION                       |
|---------------|------------------|------|---------------|------------------------|---------------------------|------------|-------------------|-----------|-----------------------------------|
| MISSISSIPPIAN | ALAPAH FORMATION | Mal  | 75            |                        |                           |            |                   |           |                                   |
|               |                  |      | 70            |                        |                           |            |                   |           |                                   |
|               |                  |      | 65            | d                      |                           |            |                   | M         |                                   |
|               |                  |      | 60            |                        |                           | (f)        |                   | P-G       | -Light-gray.                      |
|               |                  |      | 55            |                        |                           |            |                   |           |                                   |
|               |                  |      | 50            | d                      |                           |            |                   | B         |                                   |
|               |                  |      | 45            |                        |                           |            |                   |           |                                   |
|               |                  |      | 40            |                        |                           |            |                   | W-P       |                                   |
|               |                  |      | 35            | x                      |                           |            |                   | P-G       | -Light-gray.                      |
|               |                  |      | 30            |                        |                           |            |                   | P-G       |                                   |
|               |                  |      | 25            |                        |                           |            |                   | W-P       | -Dark-gray, fine grained.         |
|               |                  |      | 20            |                        |                           |            |                   |           |                                   |
|               |                  |      | 15            |                        |                           |            |                   | P-G       | -Light-gray.                      |
|               |                  |      | 10            |                        |                           |            |                   | B         | -Dark-gray.                       |
|               |                  |      | 5             |                        | cu                        |            |                   | G         |                                   |
|               |                  |      | 0             |                        |                           |            |                   | P-G       | -Light-gray w/gray chert nodules. |
|               |                  |      |               |                        |                           |            |                   | P         |                                   |

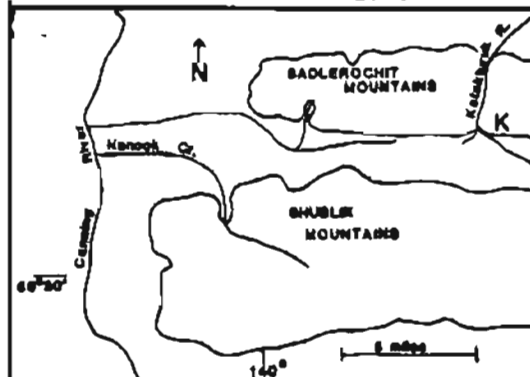
# STRATIGRAPHIC SECTION 'K'

LISBURNE GROUP

T3N SEC20 R27E

By Teresa A. Imm

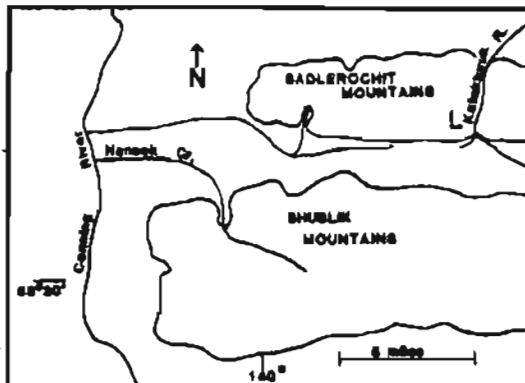
1 of 1



| MISSISSIPPIAN<br>ALAPAH FORMATION |  |  | AGE | FORMATION | UNIT | THICKNESS (m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | DIAGENETIC<br>FEATURES | SEDIMENTARY<br>STRUCTURES | GRAIN TYPE | GRAPHIC<br>COLUMN | ROCK TYPE | DESCRIPTION |
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| PENNSYLVANIAN |           | PERMIAN           |           | AGE                    |
|---------------|-----------|-------------------|-----------|------------------------|
| WAHOO LS.     |           | ECHOOKA FORMATION |           | FORMATION              |
| PWU           |           |                   |           | UNIT                   |
| 155           | 160       | 165               | 170       | 175                    |
| □ □ □ □ □     | □ □ □ □ □ | □ □ □ □ □         | □ □ □ □ □ | THICKNESS (m)          |
| □ □ □ □ □     | □ □ □ □ □ | □ □ □ □ □         | □ □ □ □ □ | DIAGENETIC FEATURES    |
| □ □ □ □ □     | □ □ □ □ □ | □ □ □ □ □         | □ □ □ □ □ | BEDIMENTARY STRUCTURES |
| □ □ □ □ □     | □ □ □ □ □ | □ □ □ □ □         | □ □ □ □ □ | GRAIN TYPE             |
| □ □ □ □ □     | □ □ □ □ □ | □ □ □ □ □         | □ □ □ □ □ | GRAPHIC COLUMN         |
| □ □ □ □ □     | □ □ □ □ □ | □ □ □ □ □         | □ □ □ □ □ | ROCK TYPE              |
|               |           |                   |           | DESCRIPTION            |



# STRATIGRAPHIC SECTION 'L' (continued)

2 of 3

| AGE           | FORMATION       | UNIT | THICKNESS (m) | DIAGENETIC FEATURES | SEDIMENTARY STRUCTURES | GRAIN TYPE | GRAPHIC COLUMN | ROCK TYPE | DESCRIPTION                                        |
|---------------|-----------------|------|---------------|---------------------|------------------------|------------|----------------|-----------|----------------------------------------------------|
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 150           | a                   |                        |            |                | P         | -Irregular hackley profile, Dark-brown weathering. |
|               |                 |      | 145           |                     |                        |            |                | P-G       | -Pinkish gray.                                     |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 140           | a                   |                        |            |                | P-W       | -Medium-gray.                                      |
|               |                 |      | 136           |                     |                        |            |                | P-G       |                                                    |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 130           | a                   |                        |            |                | P         |                                                    |
|               |                 |      | 125           |                     |                        |            |                | M-W       |                                                    |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 120           | a                   |                        |            |                | W         |                                                    |
|               |                 |      | 116           |                     |                        |            |                | P-G       | -Medium-gray.                                      |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 110           | a                   |                        |            |                | G         |                                                    |
|               |                 |      | 106           |                     |                        |            |                | G-P       |                                                    |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 100           | a                   |                        |            |                | P         |                                                    |
|               |                 |      | 95            |                     |                        |            |                | M-W       | -Light-gray w/brown weathering.                    |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 90            | a                   |                        |            |                | G         | -Medium-gray w/green chert nodules.                |
|               |                 |      | 85            |                     |                        |            |                | G-P       |                                                    |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 80            | a                   |                        |            |                | G         |                                                    |
|               |                 |      | 75            |                     |                        |            |                | G-P       | -Light-gray.                                       |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 70            | a                   |                        |            |                | M         |                                                    |
|               |                 |      | 65            |                     |                        |            |                | G         | -Medium-gray w/ greenish weathering.               |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 60            | a                   |                        |            |                | G-P       |                                                    |
|               |                 |      | 55            |                     |                        |            |                | G         |                                                    |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 50            | a                   |                        |            |                | G         |                                                    |
|               |                 |      | 45            |                     |                        |            |                | G         | -Red and green chert nodules, jasperized.          |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 40            | a                   |                        |            |                | G-P       |                                                    |
|               |                 |      | 35            |                     |                        |            |                | P         | -Dark-gray.                                        |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 30            | a                   |                        |            |                | P-G       |                                                    |
|               |                 |      | 25            |                     |                        |            |                | G         | -Light-gray.                                       |
| PENNSYLVANIAN | WAHOO LIMESTONE | PWU  | 20            | a                   |                        |            |                | P-G       |                                                    |
|               |                 |      | 15            |                     |                        |            |                | P-G       |                                                    |

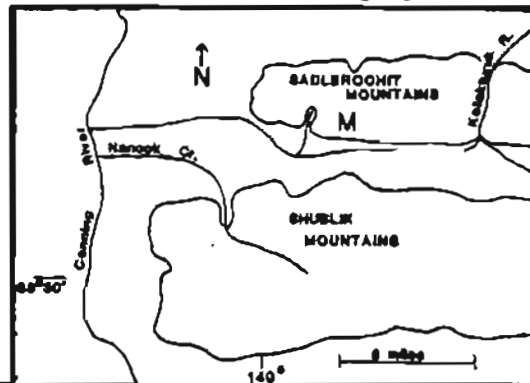
# STRATIGRAPHIC SECTION 'L' (continued)

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| AGE           | FORMATION  | UNIT | THICKNESS (m) | DIAGENETIC FEATURES | SEDIMENTARY STRUCTURES | GRAIN TYPE | GRAPHIC COLUMN | ROCK TYPE | DESCRIPTION                         |
|---------------|------------|------|---------------|---------------------|------------------------|------------|----------------|-----------|-------------------------------------|
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 0             |                     |                        |            |                | G-P       |                                     |
|               |            | 8    |               |                     |                        |            |                | G         | -Light-gray.                        |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 10            |                     |                        |            |                | G-P       | -Medium-gray w/black chert nodules. |
|               |            | 15   |               |                     |                        |            |                | G-P       |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 20            |                     |                        |            |                | G-P       | -Orange and black marker unit.      |
|               |            | 25   |               |                     |                        |            |                | G-P       | -Medium-gray.                       |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 30            |                     |                        |            |                | G-P       | -Light-gray.                        |
|               |            | 35   |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 40            |                     |                        |            |                | G         | -Light-gray w/abraded grains.       |
|               |            | 45   |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 50            |                     |                        |            |                | G         | -Light-gray.                        |
|               |            | 55   |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 60            |                     |                        |            |                | G         | -Medium-gray.                       |
|               |            | 65   |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 70            |                     |                        |            |                | G         | -Medium-gray.                       |
|               |            | 75   |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 80            |                     |                        |            |                | G         |                                     |
|               |            | 85   |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 90            |                     |                        |            |                | G         |                                     |
|               |            | 95   |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 100           |                     |                        |            |                | G         |                                     |
|               |            | 105  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 110           |                     |                        |            |                | G         |                                     |
|               |            | 115  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 120           |                     |                        |            |                | G         |                                     |
|               |            | 125  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 130           |                     |                        |            |                | G         |                                     |
|               |            | 135  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 140           |                     |                        |            |                | G         |                                     |
|               |            | 145  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 150           |                     |                        |            |                | G         |                                     |
|               |            | 155  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 160           |                     |                        |            |                | G         |                                     |
|               |            | 165  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 170           |                     |                        |            |                | G         |                                     |
|               |            | 175  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 180           |                     |                        |            |                | G         |                                     |
|               |            | 185  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 190           |                     |                        |            |                | G         |                                     |
|               |            | 195  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 200           |                     |                        |            |                | G         |                                     |
|               |            | 205  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 210           |                     |                        |            |                | G         |                                     |
|               |            | 215  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 220           |                     |                        |            |                | G         |                                     |
|               |            | 225  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 230           |                     |                        |            |                | G         |                                     |
|               |            | 235  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 240           |                     |                        |            |                | G         |                                     |
|               |            | 245  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 250           |                     |                        |            |                | G         |                                     |
|               |            | 255  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 260           |                     |                        |            |                | G         |                                     |
|               |            | 265  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 270           |                     |                        |            |                | G         |                                     |
|               |            | 275  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 280           |                     |                        |            |                | G         |                                     |
|               |            | 285  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 290           |                     |                        |            |                | G         |                                     |
|               |            | 295  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 300           |                     |                        |            |                | G         |                                     |
|               |            | 305  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 310           |                     |                        |            |                | G         |                                     |
|               |            | 315  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 320           |                     |                        |            |                | G         |                                     |
|               |            | 325  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 330           |                     |                        |            |                | G         |                                     |
|               |            | 335  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 340           |                     |                        |            |                | G         |                                     |
|               |            | 345  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 350           |                     |                        |            |                | G         |                                     |
|               |            | 355  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 360           |                     |                        |            |                | G         |                                     |
|               |            | 365  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 370           |                     |                        |            |                | G         |                                     |
|               |            | 375  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 380           |                     |                        |            |                | G         |                                     |
|               |            | 385  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 390           |                     |                        |            |                | G         |                                     |
|               |            | 395  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 400           |                     |                        |            |                | G         |                                     |
|               |            | 405  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 410           |                     |                        |            |                | G         |                                     |
|               |            | 415  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 420           |                     |                        |            |                | G         |                                     |
|               |            | 425  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 430           |                     |                        |            |                | G         |                                     |
|               |            | 435  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 440           |                     |                        |            |                | G         |                                     |
|               |            | 445  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 450           |                     |                        |            |                | G         |                                     |
|               |            | 455  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 460           |                     |                        |            |                | G         |                                     |
|               |            | 465  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 470           |                     |                        |            |                | G         |                                     |
|               |            | 475  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 480           |                     |                        |            |                | G         |                                     |
|               |            | 485  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 490           |                     |                        |            |                | G         |                                     |
|               |            | 495  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 500           |                     |                        |            |                | G         |                                     |
|               |            | 505  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 510           |                     |                        |            |                | G         |                                     |
|               |            | 515  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 520           |                     |                        |            |                | G         |                                     |
|               |            | 525  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 530           |                     |                        |            |                | G         |                                     |
|               |            | 535  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 540           |                     |                        |            |                | G         |                                     |
|               |            | 545  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 550           |                     |                        |            |                | G         |                                     |
|               |            | 555  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 560           |                     |                        |            |                | G         |                                     |
|               |            | 565  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 570           |                     |                        |            |                | G         |                                     |
|               |            | 575  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 580           |                     |                        |            |                | G         |                                     |
|               |            | 585  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 590           |                     |                        |            |                | G         |                                     |
|               |            | 595  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 600           |                     |                        |            |                | G         |                                     |
|               |            | 605  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 610           |                     |                        |            |                | G         |                                     |
|               |            | 615  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 620           |                     |                        |            |                | G         |                                     |
|               |            | 625  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 630           |                     |                        |            |                | G         |                                     |
|               |            | 635  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 640           |                     |                        |            |                | G         |                                     |
|               |            | 645  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 650           |                     |                        |            |                | G         |                                     |
|               |            | 655  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 660           |                     |                        |            |                | G         |                                     |
|               |            | 665  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 670           |                     |                        |            |                | G         |                                     |
|               |            | 675  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 680           |                     |                        |            |                | G         |                                     |
|               |            | 685  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 690           |                     |                        |            |                | G         |                                     |
|               |            | 695  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 700           |                     |                        |            |                | G         |                                     |
|               |            | 705  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 710           |                     |                        |            |                | G         |                                     |
|               |            | 715  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 720           |                     |                        |            |                | G         |                                     |
|               |            | 725  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 730           |                     |                        |            |                | G         |                                     |
|               |            | 735  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 740           |                     |                        |            |                | G         |                                     |
|               |            | 745  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 750           |                     |                        |            |                | G         |                                     |
|               |            | 755  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 760           |                     |                        |            |                | G         |                                     |
|               |            | 765  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 770           |                     |                        |            |                | G         |                                     |
|               |            | 775  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 780           |                     |                        |            |                | G         |                                     |
|               |            | 785  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 790           |                     |                        |            |                | G         |                                     |
|               |            | 795  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 800           |                     |                        |            |                | G         |                                     |
|               |            | 805  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 810           |                     |                        |            |                | G         |                                     |
|               |            | 815  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 820           |                     |                        |            |                | G         |                                     |
|               |            | 825  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 830           |                     |                        |            |                | G         |                                     |
|               |            | 835  |               |                     |                        |            |                | G         |                                     |
| MISSISSIPPIAN | ALAPAH FM. | Mau  | 840           |                     |                        |            |                | G         |                                     |
|               |            | 845  |               |                     |                        |            |                | G         | </                                  |




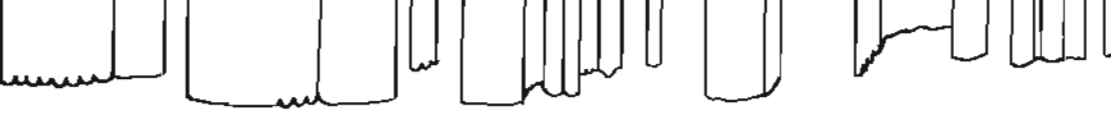
**By Teresa A. Imm**

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[illegible]

# STRATIGRAPHIC SECTION 'M' (continued)

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| PENNSYLVANIAN                                                                                                                                                                                                                                                 |     |     |     |     |     |     |     |     |     |     |     |     |     |     | AGE                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------------|
| WAHOO LIMESTONE                                                                                                                                                                                                                                               |     |     |     |     |     |     |     |     |     |     |     |     |     |     | FORMATION              |
| PwI                                                                                                                                                                                                                                                           |     |     |     |     |     |     | Pwu |     |     |     |     |     |     |     | UNIT                   |
| 285                                                                                                                                                                                                                                                           | 290 | 295 | 300 | 305 | 310 | 315 | 320 | 325 | 330 | 335 | 340 | 345 | 350 | 355 | THICKNESS (m)          |
|                                                                                                                                                                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     | DIAGENETIC FEATURES    |
|                                                                                                                                                                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     | SEDIMENTARY STRUCTURES |
|                                                                                                                                                                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     | GRAIN TYPE             |
|                                                                                                                                                                             |     |     |     |     |     |     |     |     |     |     |     |     |     |     | GRAPHIC COLUMN         |
| <p>P<br/>G-P<br/>P-G<br/>G<br/>G<br/>G-P<br/>P-W<br/>P<br/>P<br/>P-G<br/>G<br/>P<br/>P-G<br/>G-P<br/>P<br/>P-G<br/>P<br/>P-G<br/>G</p>                                                                                                                        |     |     |     |     |     |     |     |     |     |     |     |     |     |     | ROCK TYPE              |
| <p>-Light-gray.<br/>-Gray tan.<br/>-Medium-gray.<br/>-4.0m Medium-gray crinoidal-skeletal P-G.<br/>-Light grayish tan.<br/>-Highly jasperized.<br/>-Medium-gray.<br/>-Medium-gray.<br/>-Light-gray.<br/>-Light-gray.<br/>-Light-gray w/orange weathering.</p> |     |     |     |     |     |     |     |     |     |     |     |     |     |     | DESCRIPTION            |

-Light-gray.  
 -Gray tan.  
 -Medium-gray.  
 -4.0m Medium-gray crinoidal-skeletal P-G.  
 -Light grayish tan.  
 -Highly jasperized.  
 -Medium-gray.  
 -Medium-gray.  
 -Light-gray.  
 -Light-gray.  
 -Light-gray w/orange weathering.

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| MISSISSIPPIAN                                                                                                                                                                                                |     |     |     |     |     |     |     |     |     | PENNSYLVANIAN |     |     |     | AGE       |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------------|-----|-----|-----|-----------|------------------------|
| ALAPAH FORMATION                                                                                                                                                                                             |     |     |     |     |     |     |     |     |     | WAHOO LS.     |     |     |     | FORMATION |                        |
| Ma u                                                                                                                                                                                                         |     |     |     |     |     |     |     |     |     | Pw l          |     |     |     | UNIT      |                        |
| 205                                                                                                                                                                                                          | 210 | 215 | 220 | 225 | 230 | 235 | 240 | 245 | 250 | 255           | 260 | 265 | 270 | 275       | THICKNESS (m)          |
|                                                                                                                                                                                                              |     |     |     |     |     |     |     |     |     |               |     |     |     |           | DIAGENETIC FEATURES    |
|                                                                                                                                                                                                              |     |     |     |     |     |     |     |     |     |               |     |     |     |           | SEDIMENTARY STRUCTURES |
|                                                                                                                                                                                                              |     |     |     |     |     |     |     |     |     |               |     |     |     |           | GRAIN TYPE             |
|                                                                                                                                                                                                              |     |     |     |     |     |     |     |     |     |               |     |     |     |           | GRAPHIC COLUMN         |
| P-W<br>G-P<br>P-G<br>P-G<br>P<br>P-G<br>X<br>B<br>M<br>M<br>M<br>M<br>M<br>P                                                                                                                                 |     |     |     |     |     |     |     |     |     |               |     |     |     |           | ROCK TYPE              |
| -Light-gray.<br>-Light-gray.<br>-Light-gray.<br>-Light grayish pink.<br>-11.2m dolomitic crinoidal P talus, zone of highly stressed rocks.<br>-Brown gray and medium gray alternating units.<br>-Brown gray. |     |     |     |     |     |     |     |     |     |               |     |     |     |           | DESCRIPTION            |

# STRATIGRAPHIC SECTION 'M' (continued)

4 of 6

| AGE           | FORMATION        | UNIT | THICKNESS (m) | DIAGENETIC<br>FEATURES | SEDIMENTARY<br>STRUCTURES | GRAIN TYPE | GRAPHIC<br>COLUMN | ROCK TYPE                | DESCRIPTION                   |
|---------------|------------------|------|---------------|------------------------|---------------------------|------------|-------------------|--------------------------|-------------------------------|
| MISSISSIPPIAN | ALAPAH FORMATION | Mau  | 130 135       | *                      |                           | ★          |                   | P                        | -Medium-gray.                 |
|               |                  |      | 140 145       |                        |                           | ★          |                   | M-W<br>P-W<br>M-W        |                               |
| MISSISSIPPIAN | ALAPAH FORMATION | Mal  | 150 155       |                        |                           | (★         |                   | M                        | -Brown gray.                  |
|               |                  |      | 160 165       |                        |                           | ★          |                   | W-P                      |                               |
| MISSISSIPPIAN | ALAPAH FORMATION | Mau  | 170 175       |                        |                           | ★          |                   | W-P                      | -Brown gray.                  |
|               |                  |      | 180 185       |                        |                           | ★          |                   | W-P                      | -Medium-gray.                 |
| MISSISSIPPIAN | ALAPAH FORMATION | Mal  | 190 195       |                        |                           | ★          |                   |                          | -5.2m skeletal P-W talus.     |
|               |                  |      | 200 205       |                        |                           | ★          |                   | P-W<br>P-W<br>P-G<br>P-W |                               |
| MISSISSIPPIAN | ALAPAH FORMATION | Mau  | 210 215       |                        |                           | ★          |                   | G                        | -Dark-gray, micro-stylolites. |
|               |                  |      | 220 225       |                        |                           | ★          |                   | P                        |                               |

# STRATIGRAPHIC SECTION 'M' (continued)

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| AGE           | FORMATION        | UNIT | THICKNESS (m) | DIAGENETIC FEATURES | SEDIMENTARY STRUCTURES | GRAIN TYPE | GRAPHIC COLUMN | ROCK TYPE | DESCRIPTION                                                       |
|---------------|------------------|------|---------------|---------------------|------------------------|------------|----------------|-----------|-------------------------------------------------------------------|
| MISSISSIPPIAN | ALAPAH FORMATION | Ma1  | 110           |                     |                        | (          |                | P         | -Light-gray.                                                      |
|               |                  |      | 120           |                     |                        | X          |                | W-P       | -Dark-gray.                                                       |
|               |                  |      | 115           |                     |                        | X          |                |           | -8.4m crinoidal-bryozoan W-P talus.                               |
|               |                  |      | 105           |                     |                        | (          |                | P-G       | -Light-gray.                                                      |
|               |                  |      | 100           |                     | ≡                      | • ○ (      |                |           |                                                                   |
|               |                  |      | 95            |                     | ≡                      | • ( ?      |                | M-W       | -Dark-gray.                                                       |
|               |                  |      | 90            |                     |                        |            |                | W-P       | -Light-gray.                                                      |
|               |                  |      | 85            |                     |                        |            |                | M-W       |                                                                   |
|               |                  |      | 80            |                     |                        | X          |                | M-W       | -Dark-gray.                                                       |
|               |                  |      | 75            |                     |                        | •          |                | P         |                                                                   |
|               |                  |      | 70            |                     |                        | • (G)      |                | P-G       | -Light-gray.                                                      |
|               |                  |      | 65            |                     |                        | X          |                |           |                                                                   |
|               |                  |      | 60            |                     |                        | (          |                | M-W       | -Gray brown w/red hematitic calcareous sandstone on top of ledge. |
|               |                  |      | 55            |                     |                        | • ∅        |                | P-G       | -Medium-gray.                                                     |
|               |                  |      | 50            |                     |                        | X          |                |           |                                                                   |
|               |                  |      |               |                     | Eu                     |            |                | P-G       |                                                                   |

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| MISSISSIPPIAN         |                                                                                                      | AGE                    |
|-----------------------|------------------------------------------------------------------------------------------------------|------------------------|
| KEKIKTUK CONGLOMERATE | ALAPAH FORMATION                                                                                     | FORMATION              |
|                       | Mal                                                                                                  | UNIT                   |
|                       | 0 5 10 15 20 25 30 35 40 45                                                                          | THICKNESS (m)          |
|                       |                                                                                                      | DIAGENETIC FEATURES    |
|                       |                                                                                                      | SEDIMENTARY STRUCTURES |
|                       |                                                                                                      | GRAIN TYPE             |
|                       |                                                                                                      | GRAPHIC COLUMN         |
|                       | B<br>P-G<br>P-G                                                                                      | ROCK TYPE              |
|                       | -Medium-gray.<br>-Medium-gray, stylolitic.<br>-Medium-gray.<br>-Clean quartzite w/orange weathering. | DESCRIPTION            |



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**T3N SEC21 R26E**

**By Teresa A. Imm**

| PENNSYLVANIAN                    | PERMIAN                                                                                                                                                                                                                         |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WAHOO LIMESTONE                  | ECHOOKA FORMATION                                                                                                                                                                                                               |
| UNIT                             | AGE                                                                                                                                                                                                                             |
| THICKNESS (m)                    | FORMATION                                                                                                                                                                                                                       |
| DIAGENETIC FEATURES              | UNIT                                                                                                                                                                                                                            |
| SEDIMENTARY STRUCTURES           | THICKNESS (m)                                                                                                                                                                                                                   |
| GRAIN TYPE                       | DIAGENETIC FEATURES                                                                                                                                                                                                             |
| GRAPHIC COLUMN                   | SEDIMENTARY STRUCTURES                                                                                                                                                                                                          |
| ROCK TYPE                        | GRAIN TYPE                                                                                                                                                                                                                      |
| DESCRIPTION                      | GRAPHIC COLUMN                                                                                                                                                                                                                  |
| <p>* 110 115 120 126 130 136</p> | <p>P - W<br/>P - G<br/>G - P<br/>M<br/>G - P<br/>P - W</p> <p>-Light-gray.<br/>-Light grayish tan.</p> <p>-3.6m dolomitic covered interval.</p> <p>-Light-gray w/stylolite.<br/>-2.5m dolomitic rubble.<br/>-Brownish gray.</p> |

# STRATIGRAPHIC SECTION 'N' (continued)

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| AGE           | FORMATION       | UNIT | THICKNESS (m) | DIAGENETIC FEATURES | BEDIMENTARY STRUCTURES | GRAIN TYPE | GRAPHIC COLUMN | ROCK TYPE | DESCRIPTION                 |
|---------------|-----------------|------|---------------|---------------------|------------------------|------------|----------------|-----------|-----------------------------|
| PENNSYLVANIAN | WAHOO LIMESTONE | Pwu  | 106           | o *                 | ~                      | o          |                | Q         | -Pinkish gray.              |
|               |                 |      | 100           | o *                 |                        | o          |                | P-P       |                             |
|               |                 |      | 98            | o *                 |                        | o          |                | W-P       | -Medium-gray.               |
|               |                 |      | 96            | o *                 |                        | o          |                | P-W       |                             |
|               |                 |      | 94            | o *                 |                        | o          |                | P-P       | -Brownish gray.             |
|               |                 |      | 92            | o *                 |                        | o          |                | P         | -Brownish gray.             |
|               |                 | Pwi  | 80            | o *                 |                        | o          |                | P-Q       | -Light-gray stressed rocks. |
|               |                 |      | 78            | o *                 |                        | o          |                | P-Q       | -Light-gray.                |
|               |                 |      | 76            | o *                 |                        | o          |                | P-W       |                             |
|               |                 |      | 70            | o *                 |                        | o          |                | Q         |                             |
|               |                 |      | 68            | o *                 |                        | o          |                | W-P       | -Medium-gray.               |
|               |                 |      | 66            | o *                 |                        | o          |                | P         | -Condensed zone.            |
|               |                 | Pwi  | 64            | o *                 |                        | o          |                | P         | -Light-gray.                |
|               |                 |      | 62            | o *                 |                        | o          |                | P         | -Light-gray.                |
|               |                 |      | 60            | o *                 |                        | o          |                | P         | -Light-gray.                |
|               |                 |      | 58            | o *                 |                        | o          |                | P-W       |                             |
|               |                 |      | 56            | o *                 |                        | o          |                | P         | -Light-gray.                |
|               |                 |      | 54            | o *                 |                        | o          |                | P         | -Light-gray.                |

### STRATIGRAPHIC SECTION 'N' (continued)

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| MISSISSIPPIAN    |  | PENNSYLVANIAN |  | AGE                    |
|------------------|--|---------------|--|------------------------|
| ALAPAH FORMATION |  | WAHOO LS.     |  | FORMATION              |
| Mau              |  | PWI           |  | UNIT                   |
| 0                |  | 0             |  | THICKNESS (m)          |
| 0                |  | 0             |  | DIAGENETIC FEATURES    |
| 0                |  | 0             |  | BEDIMENTARY STRUCTURES |
| 0                |  | 0             |  | GRAIN TYPE             |
| 0                |  | 0             |  | GRAPHIC COLUMN         |
| 0                |  | 0             |  | ROCK TYPE              |
| 0                |  | 0             |  | DESCRIPTION            |

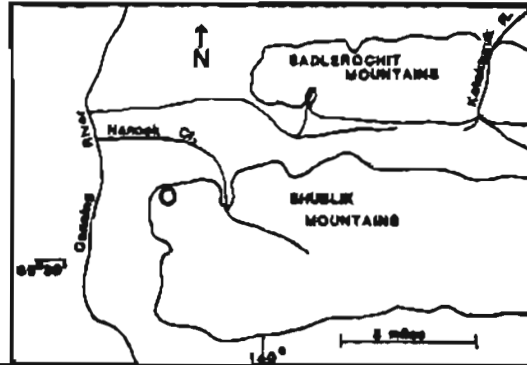
# STRATIGRAPHIC SECTION 'O'

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## LISBURNE GROUP

T2N SEC11 R24E

By Teresa A. Imm



| AGE           | FORMATION | UNIT            | THICKNESS (m)              | DIAGENETIC FEATURES | SEDIMENTARY STRUCTURES | GRAIN TYPE | GRAPHIC COLUMN | ROCK TYPE                                          | DESCRIPTION                                                                                                                        |
|---------------|-----------|-----------------|----------------------------|---------------------|------------------------|------------|----------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
|               |           |                 |                            |                     |                        |            |                |                                                    |                                                                                                                                    |
| PENNSYLVANIAN | PERMIAN   | ECHOOKA FM.     |                            |                     |                        |            |                |                                                    |                                                                                                                                    |
|               |           | WAHOO LIMESTONE |                            |                     |                        |            |                |                                                    |                                                                                                                                    |
|               |           | PWU             | 100 106 110                | g ▲                 |                        |            |                | P-W<br>P-G<br>G-P<br>W-P<br>W<br>G                 | -Medium-gray, pyritic.<br>-Medium-gray.                                                                                            |
|               |           |                 | 80 85 90 95 100 105 110    | g ▲                 |                        |            |                | P-G<br>G<br>G<br>P<br>P<br>M<br>W<br>G<br>B<br>M-W | -Light grayish tan w/hematitic staining.<br>-Medium-gray, stylolitic.<br>-Orange gray weathering.<br>-Medium-gray.<br>-Light-gray. |
|               |           |                 | 75 80 85 90 95 100 105 110 | g ▲                 |                        |            |                | W-M<br>P-W<br>P-G                                  | -Orange weathering.                                                                                                                |

# STRATIGRAPHIC SECTION 'O' (continued)


2 of 2

| AGE     | FORMATION     | UNIT | THICKNESS (m) | DIAGENETIC FEATURES | SEDIMENTARY STRUCTURES | GRAIN TYPE | GRAPHIC COLUMN | ROCK TYPE | DESCRIPTION                     |
|---------|---------------|------|---------------|---------------------|------------------------|------------|----------------|-----------|---------------------------------|
| MISS. ? | PENNSYLVANIAN |      |               |                     |                        |            |                |           |                                 |
|         | ALAPAH FM.    |      |               |                     |                        |            |                |           |                                 |
|         |               | Mau  | 0             | *                   | ~                      | ~          | ~              | P-G       | -Dark-gray.                     |
|         |               |      | 5             | *                   | ~                      | ~          | ~              | P-G       | -Dark-gray.                     |
|         |               |      | 10            | *                   | ~                      | ~          | ~              | P         | -Medium-gray stressed rocks.    |
|         |               |      | 15            | *                   | ~                      | ~          | ~              | P-G       | -Medium-gray.                   |
|         |               |      | 20            | *                   | ~                      | ~          | ~              | W         | -Dark-gray.                     |
|         |               |      | 25            | *                   | ~                      | ~          | ~              | P         | -Medium-gray.                   |
|         |               |      | 30            | *                   | ~                      | ~          | ~              | P-W       | -Dark-gray.                     |
|         |               |      | 35            | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 40            | *                   | ~                      | ~          | ~              | P-W       | -Grayish tan.                   |
|         |               |      | 45            | *                   | ~                      | ~          | ~              | P-G       | -Orange weathering.             |
|         |               |      | 50            | *                   | ~                      | ~          | ~              | P         | -Medium-gray, highly weathered. |
|         |               |      | 55            | *                   | ~                      | ~          | ~              | M         | -Medium-gray, highly weathered. |
|         |               |      | 60            | *                   | ~                      | ~          | ~              | P-W       | -Brown gray.                    |
|         |               |      | 65            | *                   | ~                      | ~          | ~              | P-G       | -Dark-gray.                     |
|         |               |      | 70            | *                   | ~                      | ~          | ~              | P         | -Dark-gray.                     |
|         |               |      | 75            | *                   | ~                      | ~          | ~              | M         | -Light-gray.                    |
|         |               |      | 80            | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 85            | *                   | ~                      | ~          | ~              | P-W       | -Light-gray.                    |
|         |               |      | 90            | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 95            | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 100           | *                   | ~                      | ~          | ~              | P-W       | -Light-gray.                    |
|         |               |      | 105           | *                   | ~                      | ~          | ~              | P-G       | -Light-gray.                    |
|         |               |      | 110           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 115           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 120           | *                   | ~                      | ~          | ~              | P-W       | -Light-gray.                    |
|         |               |      | 125           | *                   | ~                      | ~          | ~              | P-G       | -Light-gray.                    |
|         |               |      | 130           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 135           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 140           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 145           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 150           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 155           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 160           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 165           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 170           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 175           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 180           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 185           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 190           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 195           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 200           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 205           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 210           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 215           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 220           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 225           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 230           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 235           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 240           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 245           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 250           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 255           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 260           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 265           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 270           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 275           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 280           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 285           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 290           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 295           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 300           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 305           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 310           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 315           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 320           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 325           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 330           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 335           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 340           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 345           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 350           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 355           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 360           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 365           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 370           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 375           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 380           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 385           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 390           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 395           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 400           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 405           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 410           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 415           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 420           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 425           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 430           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 435           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 440           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 445           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 450           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 455           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 460           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 465           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 470           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 475           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 480           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 485           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 490           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 495           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 500           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 505           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 510           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 515           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 520           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 525           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 530           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 535           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 540           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 545           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 550           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 555           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 560           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 565           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 570           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 575           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 580           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 585           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 590           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 595           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 600           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 605           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 610           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 615           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 620           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 625           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 630           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 635           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 640           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 645           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 650           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 655           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 660           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 665           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 670           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 675           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 680           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 685           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 690           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 695           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 700           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 705           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 710           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 715           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 720           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 725           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 730           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 735           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 740           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 745           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 750           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 755           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 760           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 765           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 770           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 775           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 780           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 785           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 790           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 795           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 800           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 805           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 810           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 815           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 820           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 825           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 830           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 835           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 840           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 845           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 850           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 855           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 860           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 865           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 870           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 875           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 880           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 885           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 890           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 895           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 900           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 905           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 910           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 915           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 920           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 925           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 930           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 935           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 940           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 945           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 950           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 955           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 960           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 965           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 970           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 975           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 980           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 985           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 990           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 995           | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |
|         |               |      | 1000          | *                   | ~                      | ~          | ~              | P         | -Light-gray.                    |

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**T2N SEC12 R24E**

**By Teresa A. Imm**

| MISSISSIPPIAN                                                                       |     |     |     |     |     |     |     |     |     | ? PENN.                                                               |  | AGE       |  |
|-------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------------------------------------------------------------------|--|-----------|--|
| ALAPAH FORMATION                                                                    |     |     |     |     |     |     |     |     |     | WAHOO LB.                                                             |  | FORMATION |  |
| Ma u                                                                                |     |     |     |     |     |     |     |     |     | P w u                                                                 |  | UNIT      |  |
| 185                                                                                 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | THICKNESS (m)                                                         |  |           |  |
| * 0 0                                                                               |     |     |     |     |     |     |     |     |     | DIAGENETIC FEATURES                                                   |  |           |  |
|                                                                                     |     |     |     |     |     |     |     |     |     | BEDIMENTARY STRUCTURES                                                |  |           |  |
|  |     |     |     |     |     |     |     |     |     | GRAIN TYPE                                                            |  |           |  |
|                                                                                     |     |     |     |     |     |     |     |     |     | GRAPHIC COLUMN                                                        |  |           |  |
|                                                                                     |     |     |     |     |     |     |     |     |     | ROCK TYPE                                                             |  |           |  |
|                                                                                     |     |     |     |     |     |     |     |     |     | DESCRIPTION                                                           |  |           |  |
|                                                                                     |     |     |     |     |     |     |     |     |     | -21.0m talus, measured to the top of the last occurrence of mudstone. |  |           |  |
|                                                                                     |     |     |     |     |     |     |     |     |     | M                                                                     |  |           |  |
|                                                                                     |     |     |     |     |     |     |     |     |     | -Dark gray brown w/ irregular profile.                                |  |           |  |
|                                                                                     |     |     |     |     |     |     |     |     |     | W-P                                                                   |  |           |  |
|                                                                                     |     |     |     |     |     |     |     |     |     | -Dark-brown gray, condensed.                                          |  |           |  |
|                                                                                     |     |     |     |     |     |     |     |     |     | M                                                                     |  |           |  |
|                                                                                     |     |     |     |     |     |     |     |     |     | -Dark-gray.                                                           |  |           |  |

## STRATIGRAPHIC SECTION 'P' (continued)

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[illegible]

## 394

| MISSISSIPPIAN    | AGE                                    |
|------------------|----------------------------------------|
| ALAPAH FORMATION | FORMATION                              |
| Mal              | UNIT                                   |
| 30 20 10 0 100   | THICKNESS (m)                          |
|                  | DIAGENETIC FEATURES                    |
|                  | SEDIMENTARY STRUCTURES                 |
|                  | GRAIN TYPE                             |
|                  | GRAPHIC COLUMN                         |
|                  | ROCK TYPE                              |
|                  | DESCRIPTION                            |
|                  | -Dark-gray.                            |
|                  | -Dark gray brown weathers tan.         |
|                  | -Dark-gray.                            |
|                  | -Orange weathering.                    |
|                  | -Medium-gray w/ solitary coral at top. |
|                  | -Brown.                                |
|                  | -Light-gray.                           |
|                  | -Dark-brown gray.                      |
|                  | -Light-gray.                           |
|                  | -Light brown gray.                     |
|                  | -Dark brown gray.                      |
|                  | -Black.                                |
|                  | -Medium-gray.                          |
|                  | -Medium-gray w/early diagenetic chert. |
|                  | -Black w/ostracods.                    |
|                  | -Buff, blocky weathering unit.         |
|                  | -Dark-gray.                            |
|                  | -Dark gray brown.                      |



# STRATIGRAPHIC SECTION 'P' (continued)

4 of 4

| AGE           | FORMATION    | UNIT       | THICKNESS (m) | DIAGENETIC<br>FEATURES | SEDIMENTARY<br>STRUCTURES | GRAIN TYPE | GRAPHIC<br>COLUMN | ROCK TYPE | DESCRIPTION                   |
|---------------|--------------|------------|---------------|------------------------|---------------------------|------------|-------------------|-----------|-------------------------------|
| MISSISSIPPIAN | KAYAK SHALE? | ALAPAH FM. |               |                        |                           |            |                   |           |                               |
|               |              | Mal        | 20            |                        |                           |            |                   | M         | -Dark gray black.             |
|               |              |            | 10            |                        |                           |            |                   | P-W       | -Medium-gray.                 |
|               |              |            | 10            |                        |                           |            |                   | M         | -Black, fine-grained.         |
|               |              |            | 10            |                        |                           |            |                   | P-G       | -Dark-gray.                   |
|               |              |            | 10            |                        |                           |            |                   | P-G       | -Brownish gray.<br>-Tan-gray. |

APPENDIX II

Bedrock maps of the Lisburne Group

## DESCRIPTION OF MAP UNITS

### TRIASSIC

Tl - Ivishak Formation

### PERMIAN

Pe - Echooka Formation

### PENNSYLVANIAN

Pw - Wahoo Limestone (undifferentiated)

Pwu - Wahoo Limestone (upper)

Pwl - Wahoo Limestone (lower)

### MISSISSIPPIAN

Mau - Alapah Formation (upper)

Mal - Alapah Formation (lower)

Me - Endicott Group (undifferentiated)

Mky - Kayak Shale

Mk - Kekiktuk Conglomerate


### PRE-CAMBRIAN


PCK - Katakturuk Dolomite

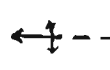
### OTHER

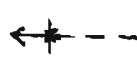
m - Mafic volcanics (age unknown)

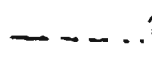
## GEOLOGIC MAP SYMBOLS

 Strike and dip of beds


 Strike and dip of overturned beds

 -- Strike of the axial trace and plunge of the axis of a large anticline; dashed where approximately located


 -- Strike of the axial trace and plunge of the axis of a large syncline; dashed where approximately located

 ---? Contact, solid where known, dashed where approximately located, dotted where inferred, queried where questionable

 ---? Fault, solid where known, dashed where approximated, dotted where inferred, queried where questionable

 ---? Thrust fault, solid where known, dashed where approximated, dotted where inferred, queried where questionable

..... Bedding traces

 Locations of measured stratigraphic sections

I-P Measured section designations