GEOLOGY OF

THE LOCHALSH-MISSANABIE AREA

PORT ARTHUR, Ontario

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GEOLOGY OF THE LOCHALSH-MISSANABIE AREA

INTRODUCTION

LOCATION & ACCESS

Detailed geological mapping of the Lochalsh - Missanabie area was undertaken to complete the geological record between the Goudreau-Lochalsh area(1) on the west and the Rennie-Leeson area(2) on the east. The area had been mapped on a reconnaissance basis in 1935(3) but no other detailed work had been undertaken.

In extent the area includes the townships of Glasgow, Meath, and the north half of townships 46 and 47, slightly more than eighty square miles.

Located on the east boundary of the District of Algoma, the Lochalsh-Missanabie area lies 60 miles west of Chapleau, a divisional point on the Canadian Pacific Railway. The stations of Lochalsh and Missanabie lie just outside the map area, 0.5 miles east and 1.9 miles west respectively.

The area is readily accessible from either of the above stations on the Canadian Pacific Railway.

TOPOGRAPHY & DRAINAGE

The area is characterized by a central section of flat lying sand and gravel plain broken by a few narrow, east-west trending ridges of more resistant rock. It is occupied by several lakes, the principal being Meath, Martin and Easy Lakes. A low, partially buried ridge separates this section from the basin of Dog Lake in the south and south-west.

In the east and south-east where the bedrock is mainly granite, the country is broken and rough with numerous high hills and long well defined northeasterly trending fault valleys.

The north and west portion of the map area is characterized by parallel rocky ridges that swing from east-west to north-west across the map area.

The Dog River and its tributaries form the main drainage system of the area and as such may be used as an access route. Throughout most of its length the Dog River is a meandering stream broken by rapids where it passes over partially covered ridges.

Wabatongushi Lake forms the western boundary of the area and is drained into Dog Lake by the Lochalsh River. A control dam has been constructed at the outlet of Wabatongushi Lake to control water supply for hydro electric power generation in the Michipicoten area to the south.

HISTORY OF THE AREA

One of the earliest routes from Lake Superior to Hudson Bay crossed Dog Lake to the height of land and into Crooked Lake, the head waters of the Missinaibi River. Undoubtedly during use of this route much of the shoreline of Dog Lake and Dog River must have been explored.

Earliest geological work was carried out by Robert Bell(1) in 1875 in which he noted the rock types on Dog Lake. The adjoining areas were variously reported on as already indicated.

In 1934 E.M. Burwash(2) carried out a preliminary survey of the Lochalsh-Missinaibi area and in 1944 E.L Bruce(3) mapped township 47.

Interest in mining activity evidently spread from the Michipicoten area in the south-west and the L'oudeau area to the west. Gold was discovered at Emily Bay on Dog Lake in 1896 but little other

(2) Burwash, E.M., Op Cit.
action appears to have taken place until after the close of the first World War when gold was discovered near Goudreau. A later period of activity took place after discovery of the Renabie Mine property in 1939-40.

**GENERAL GEOLOGY**

Consolidated rocks of the area are all of pre-Cambrian age. The oldest, believed to be of Keewatin age, consist of two series of flow rocks, a basic or andesitic type and an acidic, rhyolitic type. Lesser amounts of tuffs and breccias are associated with these rocks. A sedimentary type of probable Dore age is the dominant rock type around the east shore of Wabatongushi Lake.

Granite intrusives in the form of elongate stocks underlie much of the east central and south-east portion of the map area. These are classed as Algoman age as are several large diorite dikes of remarkable continuity that cut the granite.

The youngest rocks are quartz and olivine diabase and syenite dikes.

**Table of Formations**

<table>
<thead>
<tr>
<th>Formation</th>
<th>Description</th>
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<tbody>
<tr>
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<td>Sand, gravel, drift</td>
</tr>
<tr>
<td>Pleistocene</td>
<td>Syenite, quartz and olivine diabase</td>
</tr>
<tr>
<td>Pre-Cambrian</td>
<td>Diorite, granite gneiss, syenite</td>
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<tr>
<td>Keweenawan</td>
<td>Amphibolite schist, slaty greywacke conglomerate</td>
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<tr>
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<td>Dore</td>
<td>Iron formation</td>
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<tr>
<td>Keewatin</td>
<td>Andesitic lavas</td>
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The rocks classified as of Keewatin age may in general be divided into two main types, an old basic type and a younger acidic type. The relative age relationship was determined from ellipsoidal pillow lavas found along the shores of Dog Lake.

The basic type is essentially andesitic in composition. It is a dull green colour and in most cases is altered to the extent that chlorite is an abundant constituent. Shearing action is prevalent so that only in a few places along the shores of Dog Lake may original textures be discerned. Apart from the pillow lavas mentioned, amygda-loidal phases were found in the south central section of the map area.

The andesitic types are confined mainly to the perimeter of Dog Lake, the south-east corner of the map area from Mid Lake to the Renable road and at the east end of Easy Lake.

In the south-east part of the area numerous narrow bands of iron formation up to two feet in width may be found intercalated within the andesites. As observed, this would constitute a section approximately three-quarters of a mile wide. This formation consists of fine grained magnetite-rich bands of material of a slaty structure separated by other bands of siliceous, slaty non-magnetic material.

The acidic volcanic rocks ranging from rhyolite to dacite in composition are the most abundant of the Keewatin members. They form a central belt extending from Loch Katrine and Neath Lake in the west through to the eastern limit of the map area. In general they are light grey to buff, fine grained, hard siliceous rock. In some places the rhyolites tend to be porphyritic but most often are massive to sheared.

South of Easy Lake some sections of the belt are slaty. South of Martin Lake there is some rhyolite agglomerate. Bands of tuffaceous material are not uncommon, particularly along the ridge on the north-west side of Easy Lake.

Dore

A predominantly sedimentary series of rocks in the western portion of the area have been mapped as of Dore age. These rocks represent the continuation of a belt crossing the Goudreau-Lochalsh sheet as
Considerable disagreement has arisen in the past concerning the correct position of the Dore series in the early pre-Cambrian time scale. Colins and Quirke\(^2\), during their work in the Michipicoten region concluded that the Dore series was a part of the Keewatin, occupying a more or less central portion of the Keewatin. Later investigators\(^3\) have correlated the Dore with the Timiskaming on lithological and structural evidences.

The Dore series in the type section is characterized mainly by the predominance of conglomerate. In the Lochalsh-Missanabie area very little conglomerate is evident, the principal rock formations being slaty greywacke grading to grey, fine grained quartz biotite gneiss. Some narrow bands along the east shore of Wabatongushi Lake appear to be pyroclastics.

The area mapped as Dore is limited to the east shore of Wabatongushi Lake and roughly forms a band from one-half to one mile wide that parallels the shore of this lake. Granite intrudes the Dore on the west and where the contact is exposed as along the east central portion of the lake, it is a transitional zone grading from massive, grey granite through an intimate complex of altered sediments and granite into normal sedimentary types. Numerous pink feldspar dikes up to eight feet in width are found in the contact zone.

**Algoman**

**Granite, Granite Gneiss & Syenite**

Within the map area there are six distinct intrusive masses ranging in composition from granite to syenite.

On the north and west the area is bounded by grey granite.

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gneiss of batholithic dimensions. This is a light grey weathering, medium to fine grained rock composed of a granular aggregate of quartz, orthoclase and biotite. The biotite crystals are oriented sufficiently in sub parallel arrangement to give the rock a gneissic appearance.

Along the northern boundary, the contact between granite gneiss and the acid lavas and sediments is sharp and well defined in contrast to the contact along the east shore of Wabatongushi Lake where it is gradational. Starting from the Dore sedimentary rocks on the east, a gradual change to gneissic sedimentary material, to migmatite, then to gneissic granite is apparent in crossing this contact zone. Relatively fresh, pink syenite has intruded the rocks of the contact zone. The syenite appears as stringers and sills ten feet or more in width. The sills are conformable with the granite-sediment contact.

The remaining five granitic intrusives are individual masses of stocklike proportions.

On the north-west shore of Carter Lake and on the west shore of the lake immediately to the north a fine grained, grey, gneissic granite outcrop is sharp and well defined in contrast to the contact along the east shore of Wabatongushi Lake where it is gradational. Starting from the Dore sedimentary rocks on the east, a gradual change to gneissic sedimentary material, to migmatite, then to gneissic granite is apparent in crossing this contact zone. Relatively fresh, pink syenite has intruded the rocks of the contact zone. The syenite appears as stringers and sills ten feet or more in width. The sills are conformable with the granite-sediment contact.

The south shore of Easy Lake and high ground immediately to the south are underlain by a red granite of normal composition. It is believed that this mass extends under the waters of Easy Lake and westward under the low ground at least as far as Meath Lake. No outcrops were seen here but all float is of granitic composition.

A stock, predominantly of syenitic composition extends from Martin Lake eastward to McKee Lake on the east boundary of the map area. It is a relatively massive, coarse grained pinkish rock composed essentially of orthoclase with some plagioclase, quartz and hornblende. The veins on the property of M&I Island Mines Limited are located on the southern edge of this intrusive.

A large granite intrusive extends eastward and southeastward from McKewen Lake beyond the limits of the map area. Around the shores of McKewen Lake the rock is a coarse grained pink granite containing elongate forms of quartz imbedded in irregular masses of orthoclase and containing up to 15% epidote. Scattered foils of chlorite are also present. Because the quartz resists weathering better than the other constituent minerals, the rock has a rough-grained appearance on the surface. Further to the east in the vicinity of Missanabie the rock is a normal hornblende granite.
A small body of granite extends from the south shore of Wabatongushi through Loch Lomond to Loch Katrine. This is a medium to coarse grained hornblende granite.

**Diorite**

Three large, persistent dikes of diorite cross the southeast portion of the map area in a northeasterly direction. The dikes have a coarse granitoid texture and weather to a greyish green colour. They are composed essentially of hornblende and plagioclase.

In the adjoining Remie-Leeson area Bruce(1) has classed the diorite dikes as older than the granite intrusives. In the Lochalsh-Missanabie area their intrusive relation to the granite may be clearly seen in many places, thus definitely establishing the dikes as younger than the granite.

**Keweenawan**

**Diabase**

Dikes of olivine and quartz diabase ranging up to seventy-five feet in width are common throughout the area. No attempt was made to differentiate in detail between the two. Generally their trend is north to north-west. Several of the larger dikes were traced uninterrupted for great distances. Some of these display porphyritic phases.

The dikes are a grey to brown weathering rock of fine to medium grain. The olivine variety appears fresher and is blackish green in colour on the fresh surface. The porphyritic varieties have phenocrysts of yellowish white plagioclase, irregular in outline and ranging up to three-quarters of an inch across. The porphyritic texture is not consistent, varying from a few scattered phenocrysts to large areas of closely spaced phenocrysts.

**Syenite**

Pink to reddish syenite dikes and stringers are the youngest rocks in the area. Dikes of this material were found cutting diabase dikes and all other rocks.

Pink syenite dikes ranging up to 10 feet in width are quite common along the contact zone between sediments and the main granite.

(1) Bruce, E.L. Op cit.
mass on the north-east shore of Wabatongushi Lake. Elsewhere in the area small dikes and seams of pink orthoclase cut granitic rocks and diorite dikes alike. The rather indistinct seams and patches of pink material in some of the greyish granites may be due to this period of activity.

Pleistocene

Unconsolidated sands and gravels extend throughout the central section of the map area from Dog Lake to beyond the northern boundary. In the north, Saturday, Sunday, June and Fifty-nine Lakes all lie in an extensive outwash plain underlain by coarse gravels and cobbles. This plain is terminated on the south by a rocky ridge extending east and west from the north shore of Moorehouse Lake. South of the ridge is an extensive sand plain occupied by Heath and Easy Lake, representing finer material washed from morainal material to the north.

South of Heath Lake and eastward through Pinney, Martin and Harcourt Lakes is the remnant of another older outwash plain of coarse gravels, boulders and sand. Some kettle holes are present. Rock ridges in this area protrude through the blanket of glaciofluvial material.

Former high water drainage channels such as between Easy and Martin Lakes and Pinney Lake to Dog River are prominent features where eroded in the outwash material.

A short distance below the first rapids on the Dog River, banks up to 50 feet high have been cut through varved lake deposits. This would place an ancestral Dog Lake at an approximate elevation 75 feet higher than at present. This coincides roughly with beach deposits at elevation 1165 feet on Wabatongushi Lake.

Sand and gravel deposits in the vicinity of mileage 62.5 on the Canadian Pacific Railway mainline probably represent beaches of the older Dog Lake. The appended map shows distribution of sands and gravels in the map area.

STRUCTURE

Basic Keewatin flows curve around the north shore of Dog Lake in a relatively narrow band representing the eastern extremity of
the main section to the west. Pillow structures indicate tops facing northerly. Beyond these basic types and occupying the central portion of the map area are acidic flow types with the same general strike trend as above. Altered, basic extrusives along the north and north east in contact with the granite complete the stratigraphic sequence across the central section of the map area. This central and eastern section appears to be a continuation of the anticlinal structure to the south-west.

The structure of the Dore series is somewhat more complex. Along the south shore of Wabatongushi Lake these rocks strike north-east and dip steeply to the south-east. On the south-east corner of the lake the strike swings abruptly to the north and dip becomes relatively flat. At the northern end the band appears to have a fault contact with the Keewatin. Based on information available, it appears that the Dore rocks have been folded into an overturned anticline against the Keewatin. Intrusive granite on the west has undoubtedly complicated the original structure.

Two sets of north-east and north-west faults are recognizable within the area. The older set is occupied in many instances by the large northeasterly trending diorite dikes that are prominent in the eastern portion of the map area. Large persistent diabase dikes occupy north-northwesterly trending faults of younger age.

**ECONOMIC GEOLOGY**

Gold and copper constitute the principal metallic mineralization of economic interest in the Lochalsh-Missanabie area.

The gold is mainly associated with quartz in the form of veins, stringers and lenses. In one instance low gold values are found in a pyritized shear zone.

Chalcopyrite associated with quartz veins occurs at two known locations, at one of which the mineral is fairly abundant and the occurrence was explored for copper. Minor bornite is also present.

Low nickel values with copper are reported from some sections of the pyritized shear zone.

The central and northeastern portions of the area contain extensive sand and gravel deposits which warrant further examination as a source of concrete aggregate and smelter flux.

**Quartz Veins**

A number of quartz veins were noted in the southern portion
of the area. Some are persistent single structures while others are short lenses arranged in an echelon pattern. The vein material consists primarily of quartz mineralized with varying amounts of pyrite. Some are gold-bearing and some contain copper mineralization. Most are found in or near rhyolite, but one occurs in andesite and two sizeable veins are in syenite. The majority of these veins are narrow, but their occurrence within the southern half of the area suggests that there may be some structural feature which has permitted the injection of mineralizing solutions in this section in contrast to the northern portion of the map area.

Pyritized Shear Zone

South of the Loch Lomond granite intrusion and lying between it and the Canadian Pacific Railway is a belt two and a half miles long within which there are numerous exposures of a large shear zone impregnated with pyrite. One section near the outlet of the Lochalsh River from Loch Lomond is banded quartz and pyrite (iron formation) similar to that found in the Goudreau area.

The west end of the zone, which is situated in basic lavas, lies in close proximity to the granite contact. At the east end near Loch Katrine a band of barren siliceous sericite schist bounds the northern part of the mineralized zone. Since the rocks are rhyolites on the east side of Loch Katrine, it would appear that this large shear zone has developed in the contact area between andesitic and rhyolitic flows which in turn are separated by a narrow band of sedimentary material.

The form and intensity of mineralization as observed in the various exposures lead to the conclusion that the sections of heaviest pyrite mineralization are essentially lenticular bodies within the main zone of shearing.

MINERAL OCCURRENCES & MINING PROPERTIES

Mining activity in the Lochalsh-Missanabie area during the summer of 1959 was at a very low ebb. The only active exploration being carried out was diamond drilling on the property of Milmar Island Mines Ltd. at Mid Lake.

In the following data, the numbers refer to the locations of the various properties and occurrences as shown on the accompanying geological map. The properties have been worked within recent years. Some are in good standing while others are open for staking.
1. Pinney Lake

Two patented claims SSM 2341-h2 are located between Pinney Lake and Loch Katrine. On this ground a quartz vein is located approximately one thousand feet north of the portage between Loch Katrine and the small lake directly south of Pinney Lake. The quartz vein averages four inches wide, dips vertically and strikes N 60° W over the end of a low ridge. The length of the exposure is 100 feet. The south section has been stripped and a shallow trench excavated for a distance of 20 feet. On the north side of the ridge a pit 15 feet deep has been sunk on the vein. Vein matter consists primarily of milky quartz with a few specks of pyrite. The host rock is a slightly sheared massive rhyolite.

2. Dog River Rapids

One-quarter of a mile north of the first rapids on the Dog River a series of small quartz veins outcrop along the southern slope of a ridge of rhyolite. The zone drops off at either end under heavy overburden, being exposed for approximately 150 feet along its strike.

Vein matter consists of a series of short lenses of quartz up to six inches in width arranged in an echelon pattern in a poorly developed shear zone in the hard siliceous rhyolite. While it is an old discovery, dating back to at least 1931, some diamond drilling was undertaken within the past two years. Substantial values in gold are reported to have been obtained but evidently insufficient continuity or distribution of values caused abandonment of the exploration program.

3A. Easy Lake

A prospect, apparently of considerable age, is located about 1000 feet west of the outlet of Easy Lake. It consists of a lenticular six inch quartz vein exposed on one wall of a shallow pit sunk in an altered diorite. The strike is east-west and dip vertical. No metallic mineralization could be seen. The work was probably done prior to 1935, and no other information is available.

3B. Easy Lake

On the east side of a small peninsula near the outlet of Easy Lake a quartz vein mineralized with pyrite and siderite occurs on a low reef at lake level. This vein is in a sheared contact between diorite and andesite. It lies a short distance south of and parallel
to the granite contact. Averaging six inches in width, the vein disappears into the lake at either end, being exposed for approximately 25 feet in all.

4. Mileage 59.5, Canadian Pacific Railway

A gold showing is located on the north side of the Canadian Pacific Railway track on the right-of-way about mileage 59.5. High gold values are reported to have been obtained from some rusty quartz stringers one inch in width along a length of approximately five feet. The host rock is a fractured, contorted rhyolite. The stringers strike N 30° W. A diamond drill hole is reported to have been put down on the south side of the track but did not intersect the vein system.

5. Gaurnaccio Property

A number of lapsed claims immediately west of the Renabie Road in Township 16 were the former property of Gaurnaccio Gold Mines Ltd. Work on this property was carried out during the Renabie rush. Numerous old pits and trenches may be seen but all are badly caved and grown over. Gold values were found associated with quartz stringers in andesite and iron formation, a situation similar to that found on the ground of Stover Gold Mines adjoining in Stover Township.

There are several exposures of the iron formation on this property. Some have been fractured and mineralized with quartz stringers carrying small amounts of chalcopyrite and pyrite. Individual stringers seldom exceed six inches in width. Gold values up to .58 oz. per ton have been reported. It is believed that an insufficient number or concentration of the gold bearing stringers could be found to warrant further work.

6. Milmar Island Mines Ltd.

This property is located on the south shore of Mud Lake in Township 16 and lies immediately north-west of Gaurnaccio Gold Mines Ltd. It was originally staked in 1951 by Mr. S. Pileggi of Missanabie.

Two veins are exposed on the south central shore of Mud Lake. The southerly or No. 1 vein strikes N 65° W and dips 73 degrees north. No. 2 vein, 750 feet northeasterly along the lakeshore, strikes N 36° W and dips 77 degrees south. Both veins are developed in breccia zones in syenite and range up to six feet in width. Number one vein has been traced for 850 feet southeasterly while No. 2 vein has been traced 160 feet to the south and for 500 feet beyond the north-west side of the lake.
Vein matter consists of quartz, calcite and chalcopyrite with minor amounts of pyrite, bornite and magnetite. The vein minerals surround and partially replace the breccia fragments.

Old reports indicate that copper is the only metal of value present. Highest values reported are 7.14% copper across 1.5 feet and the lowest 1.19% copper across 4.0 feet in the No. 1 vein. The best result in No. 2 vein was 1.71% across 5.0 feet. The foregoing values were reported at the time the property was held by Kent Mines Ltd. The present owners were preparing to diamond drill the No. 1 vein in August, 1959, in a limited program to explore the veins at depth.

7. Mulligan Claims

These are held by Mr. J. Mulligan of Gutelius, the original staker. This property lies between the Lochalsh River at Gutelius and Loch Katrine, immediately north of the Canadian Pacific Railway. The claims cover the western half of the large pyritized shear zone, described under "Economic Geology." Exploration consists of stripping and trenching at several points on the zone. Low values in nickel and copper, plus occasional low gold values, are reported from some of these workings. Their location and description follow.

Going north from the Railroad in the vicinity of Mile 63, the rocks are sheared andesites for the first 1000 feet. On approaching low ground at this point there is a transition to quartz-sericite schist striking N 70° W. Because of low swampy ground few exposures may be seen. Stripping and trenching shows up three zones of the schist containing bands, stringers and disseminations of granular pyrite. Other small stripplings indicate that the zone within which mineralization occurs is at least 500 feet wide.

On the east bank of the Lochalsh River large frost heaved blocks of siliceous sericite schist with sections heavily impregnated with pyrite are to be seen across a width of 150 feet. It is entirely possible that the zone is in excess of this width. Pyrite concentration is probably in the neighbourhood of 20%.

Approximately 500 feet south-east of the above section a shallow pit has been sunk on a pyritic iron formation six feet wide. This formation consists of bands and nodules of pyrite up to two inches wide separated in part by dark siliceous and sericitic material and in part by bands of light coloured, fine, granular quartz. In one light
coloured band crystals of tremolite are developed.

8. Algoma Ore Properties

This property includes the west portion of the shear zone referred to above. Some diamond drilling and geophysical exploration was carried out in 1958 but the results of this work are not available.

A narrow band of mixed sericite schist and sheared argillaceous sediments on the west side of the Lochalsh River coincides roughly with the strike of the formation on the east side. Some pyrite is present here also.

Further to the west heavy bush and overburden limit the number of exposures. A few widely spaced trenches do, however, indicate the continuity of the zone.

SUMMARY OF ECONOMIC POSSIBILITIES

The geology of the Lochalsh-Missanabie area is essentially similar to that found in the adjoining areas to the east and west. In both of these areas gold deposits of commercial importance have been developed. In the Goudreau-Lochalsh area to the west, gold deposits occur mainly in the basic Keewatin flow rocks while in the Rennie-Leeon area to the east at the Renable Mine gold bearing quartz is found in granite and granite gneiss.

Recently, Algoma Ore Properties reopened their pyrite-siderite deposits near Goudreau and are shipping the raw ore to Jamestown (Wawa) for sintering to produce furnace feed for the steel mills at Sault Ste. Marie.

The granite intrusives in the east central section may have been largely overlooked as potential host rocks for gold-bearing quartz. Deposits similar to those at Renable may be present in, or close to, these intrusives. This opinion is strongly supported since mineralization at Milmar Island Mines Ltd., indicates the presence of mineralizing agencies active after the intrusion of the granite masses.

The combination of basic lavas, intruded by diabase, diorite and granite dikes and stocks in the Goudreau-Lochalsh area to the west is repeated in the southern part of the Lochalsh-Missanabie area.
Since commercial gold deposits have been developed in the basic lavas of the Goudreau section, the potential of the Lochalsh-Missanabie area seems very encouraging and worthy of detailed exploration.

Other deposits of pyrite and/or siderite are undoubtedly present in the area east of Goudreau. Since both minerals weather easily, outcrops may be sparse and difficult to find. Prospecting by geophysical and geochemical means seems indicated. Any deposit of this type would be of interest to both iron exploration companies or chemical processing companies.

In general, the prospecting opportunities in the Lochalsh-Missanabie area appear to be very good, providing the field crews are patient and diligent.

Respectfully submitted,

(Sgd.) Trevor W. Page


Trevor W. Page, P.Eng.
SEE ACCOMPANYING MAP(S) IDENTIFIED AS

MEATH - 0018-A1 #1

#2

LOCATED IN THE MAP CHANNEL IN THE FOLLOWING SEQUENCE (X)