

SOCONY-VACUUM EXPLORATION COMPANY

REPORT ON

EXPERIMENTAL GEOPHYSICAL SHOOTING

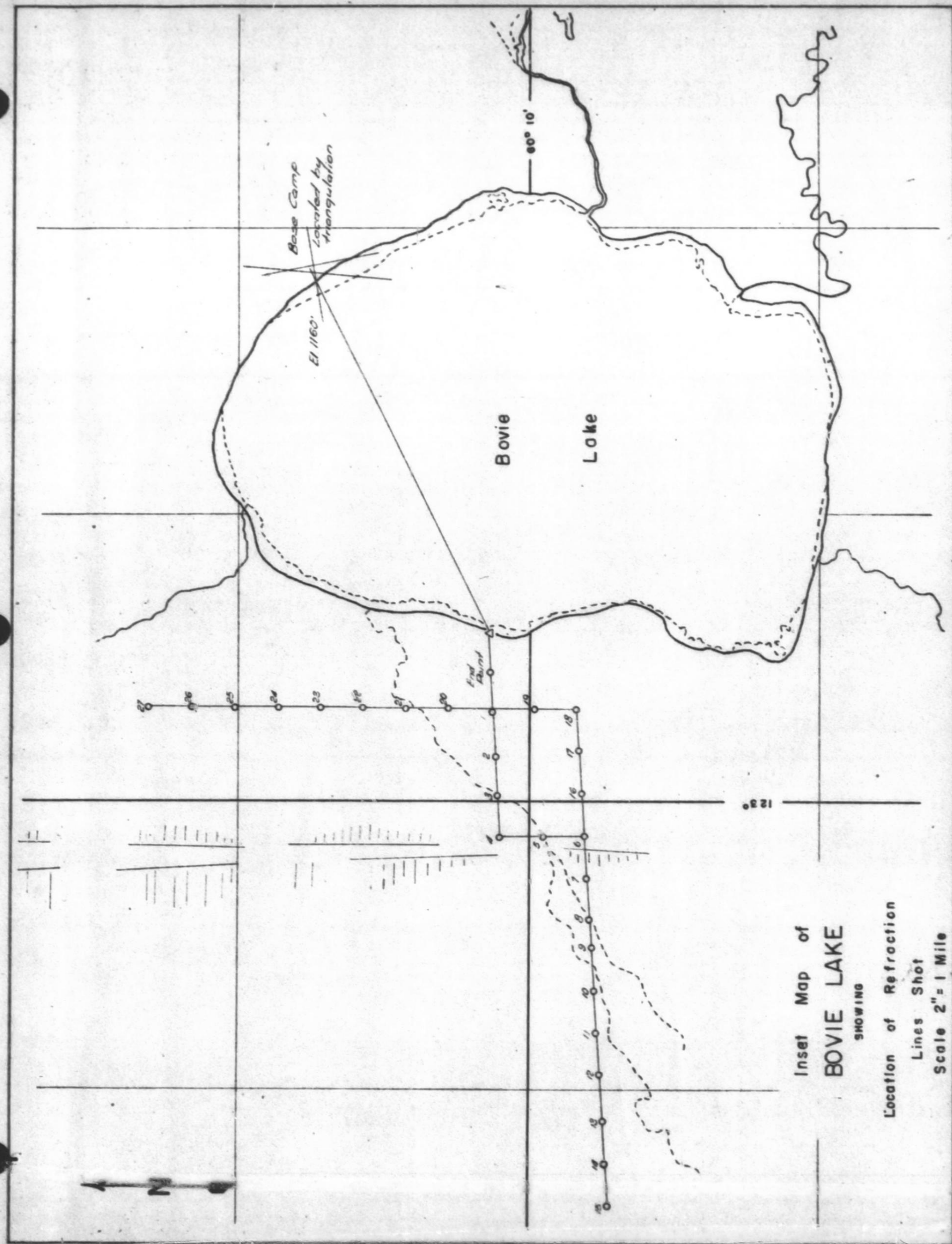
BOVIE LAKE - MAXHAMISH BLOCK

FOR THE NORTHERN FOOTHILLS GROUP

PEACE RIVER, ALBERTA

BY: G. G. GIBSON

JULY 1952



REPORT ON EXPERIMENTAL GEOPHYSICAL SHOOTING

WITHIN THE BOVIE LAKE MAXHAMISH BLOCK

I. Location.

The Bovie Lake Maxhamish Block totals approximately 204,030 acres and is made up of 3 permit areas, Permit 106, 226 and 227. The Block lies across the boundary between British Columbia and the Northwest Territories with Permit Area 106, or roughly the southern third of the Block in British Columbia and Permit Areas 226 and 227 or the northern two-thirds of the Block in the Northwest Territories. The western edge of the Block lies approximately 20 miles airline distance east of Fort Liard.

II. Object and Scope of the Work.

The object of this experimental program was first to gain all the information possible about the subsurface structural conditions associated with the prominent surface feature present in the Bovie Lake Maxhamish Block, and second, to ascertain the feasibility of exploring other remote blocks with similar portable seismic equipment. The scope of the work was limited since the \$25,000.00 budget allotted for the operation had to include the expensive moves into the block and return as well as rental of recording equipment and the purchase of all necessary camp equipment and supplies. These expenses spread over the short operating period gave a very high daily operating cost. Costs per day would be reduced greatly if a similar venture were undertaken for a longer working period.

III. Surface Conditions.

The major surface expressions present within the Bovie Lake Maxhamish Block is a long surface ridge running roughly north south for a distance of approximately 30 miles and divided into 3 separate sections by 2 valleys cutting through it. The most southerly of these valleys occurs at approximately 60 degrees 00 minutes, north latitude and contains the Petitot River. The northern valley is the smaller of the two and is located immediately west of the south end of Bovie Lake. It contains an unnamed creek. The greatest surface relief present is on the order of 400 feet and occurs near the central portion of the ridge. The ridge has a steep eastern slope becoming almost a sheer wall in places and a gentle western slope. The surrounding terrain is

flat with a great deal of muskeg and many small lakes. Vegetation consists of the usual twisted, stunted muskeg spruce, tamarack and willow growth. The timber is heavier on the ridge itself with individual trees up to 20 inches in diameter.

The surface drift appears to be brown and blue clay with some boulders and gravel. Outcrops of cherty limestone were observed on the sheer eastern face and what appears to be the same formation was encountered along the top of the ridge at a depth of approximately five feet. One hole was drilled to 54 feet at the foot of the eastern side of the ridge and another was drilled to 20 feet in the muskeg on the west end of our line. A third hole east of our line was drilled to 50 feet but none of the remaining holes could be drilled deeper than 10 feet before they were stopped by hard limestone on top of the ridge, and perma frost to the east of it.

IV. Access Route.

All heavy equipment was assembled at Fort Nelson and barged down the Nelson River to the Liard River and down the Liard River to Fort Liard. The total barge trip was approximately 130 miles. The trip from Fort Liard to Bovie Lake was made by pack train over a 30 mile pack trail. Twenty horses and two packers were employed. A tent camp was set up on Bovie Lake for the crew. Communication with Calgary was maintained by using a portable 10-Watt radio at the camp and a 50-Watt set at Fort Liard. This enabled us to relay messages from the camp to Fort Liard and thence to Peace River. Messages received in Peace River were relayed to Calgary by teletype.

V. Duration of the Work.

Preparatory work such as assembling the necessary supplies at Fort Nelson and transporting them to the prospect area were started well before the actual shooting date. Work also continued for several days after the shooting program was completed to return the equipment to civilization.

Field work actually started June 24th when men with chain saws and axes started clearing line. The recording equipment was field tested June 25th and our first profile was shot June 26th. Field work was carried on until suspended by a burned out timing motor July 18th. Personnel and recording equipment were returned to Fort Nelson by air

with heavy equipment following by barge.

VI. Equipment and Field Techniques Used.

Portable recording and shooting equipment was engaged from the Electro Technical Company of Houston and Calgary, who also supplied two technicians. A portable drilling outfit with operator was rented from Geophysical Associates of Canada. The remainder of the staff with the exception of the two packers were Socony-Vacuum employees.

The portable recording and shooting equipment functioned very well under extremely adverse conditions. The severe jolting it received from the large charges fired did not affect it either electronically or mechanically and it stood up very well under transport by packhorse. The burned out timing motor was due to a severe soaking it received when the camera case was inadvertently left open during a very heavy rain shower. The amplifiers, camera, batteries and shooting box were packed in panniers carried by horses and the cables and phones were piled on top of the pack saddles. Dynamite was carried on one pack horse and caps were carried by hand.

The portable drilling outfit rented from Geophysical Associates of Canada was carried on travois drawn behind horses. One travois held the rotary table and the aircooled motor to drive it, the swivel, Kelly hose and drillstem. The second one carried the centrifugal type mud pump and aircooled motor to drive it and the suction hose. Water was carried where necessary in ten gallon kegs slung on pack saddles, two to a horse. Most holes were water setups and little water was hauled.

The portable drill described above was not sufficiently powerful to drill holes to the depth required for successful shooting. Attempts were made using it both as a dry bucket type power auger and as a conventional wet drill. When used as a dry auger, sufficient weight could not be applied to the auger to penetrate the perma frost. When used as a conventional drill the same difficulty was encountered in getting the bit to dig. Small rocks falling into the hole would also jam the bit and stall the motor driving the rotary table.

We believe that our inability to drill holes sufficiently deep, with the equipment at hand was the major factor governing our lack of success, in obtaining usable reflection records. With equipment capable of drilling a 70 to 80 foot hole we have no doubt that successful reflection records could be obtained. This belief is supported by the indications of reflections present on records obtained in the few holes we were successful in drilling deeper than 10 feet.

Surveying was done with an alidade and plane table. We had planned to tie our work to the Dominion Government boundary survey to the south of us, but since they were not carrying elevations and since the location of their "astro" station was in doubt, this idea was impractical. Our line was located with reference to prominent land marks around the lake by triangulation and an approximate elevation was obtained by using the aircraft altimeter. The station barometric pressure gradient were obtained from the Fort Nelson control tower by radio. This station barometric pressure corrected for gradient was set on the aircraft altimeter and the elevation read directly. Several readings were taken and an elevation for the lake established from the average value. This average base elevation was used for all our work.

Chain saws and axes were used for cutting line. Three men with one chain saw and two axes made excellent time cutting line through heavy timber. Progress through scrub brush was somewhat slower where the chain saws could not be used to such good advantage.

VII. Shooting Methods Used.

We were unable to drill holes deep enough for successful reflection shooting, so a refraction program was substituted.

Reversed refraction profiles were shot with spreads varying from 1800 feet to 3600 feet. After some experimentation, a standard spread of 2700 feet was adopted. Twelve stations with two phones set side by side at right angles to the spread were used to give ground coverage from 0 to 1800 feet. The interval between stations was 150 feet. A second shot was fired from the same setup with a similar pattern of phones laid out from 900 to 2700 feet. This procedure gave an overlap of six phones on the previous spread for tie purposes. The 3600 foot spread was laid out in a similar manner with phones set from 1800 to 3600 feet.

Refraction breaks on the whole were fair to good for phones out to 2700 feet. Several 3600 foot spreads were shot but the breaks on the far traces were too weak to be reliable even with dynamite charges with 100 pounds or better. Some discrepancies in arrival times to common phones on successive shots were noted, but we believe these misties to be the result of shooting the second and successive shots planted in the craters blown by previous shots.

Two lines of reversed refraction profiles were shot. The first ran east west across the surface feature and the second was a north south line on the east side of the feature. A third line was attempted 1800 feet north of the first east west line and parallel to it. This line was extended only partially across the surface feature before it was stopped by a sheer wall. We had planned to run a third east west line across the surface feature at the northern end of the north south line, but we were unable to complete this work due to the burned out timing motor that stopped our operations.

VIII. Discussion of Results.

Since we were not successful in obtaining usable reflection data, we have confined our remarks here to the refraction data obtained. Although our program was very sketchy, we believe that our shooting did give some clues as to the attitude of the beds below the surface.

Submitted with this report are two sections showing the surface elevation along each of the two lines cut and plots of the first arrival times on the refraction profiles shot along these lines. Raw first arrival times are plotted in all cases with no corrections applied for either elevation or weathering. No close in refractions were shot to provide continuous weathering control and since all shots were fired on the surface no uphole times are available. As an approximate measure of near surface velocity, we have used the slope of a line through the first arrival time of the near phone produced back through the origin. The velocities obtained this way compare favorably with the uphole times obtained in the few deep holes we could drill.

In general, throughout all the refraction profiles plotted, we were able to follow three major velocity discontinuities associated with the following four velocities:-

1. The near surface velocity of 2000 to 3000 feet per second which appeared to be the weathered zone.
2. A sub-weathering velocity of 6300 feet per second which we assigned to drift and unconsolidated material such as glacial till.
3. A somewhat higher velocity of 8000 feet per second which we suggest could be assigned to Cretaceous sediments.
4. A higher velocity of 10,500 feet per second which we assumed to represent the Pennsylvanian or Mississippian formations. This velocity was the highest encountered

in any of our shooting with the exception of one profile, shot point 6 west, which gave a velocity of 11,500 feet per second.

The formations we have tentatively assigned to the various velocities encountered appear to conform fairly well with what is known of the area from field geology. It may be argued that the sub-weathering velocity of 6300 feet per second and the velocity assigned to the Cretaceous sediments of 8000 feet per second and that assigned to the Pennsylvanian or Mississippian at 10,500 feet per second are not as great as the velocities generally believed to exist in these formations. This thought has occurred to us but at present we see no other explanation or no other formations we can assign to the velocity discontinuities, we have definitely shown to exist.

We now turn to the sections enclosed with this report for a brief discussion of each section in detail. For convenience sake we will deal with each section separately.

Section #1

This section is an east west section extending across the known surface feature. It is located part way up the north side of the small valley at Bovie Lake and consequently does not show the rather extreme surface relief that is present both to the north and to the south of it.

The extreme west end of the line, shot points 15 east and 12 west show first, a weathered layer with velocities of 2100 feet per second and 3200 feet per second respectively. As we have pointed out previously, the near surface velocity was arrived at arbitrarily by taking the slope of the line joining the first arrival time at the first phone to the origin. Thus there will undoubtedly be errors present here, but their magnitude will be small and will not effect the overall picture greatly. Underlying the weathered layer, we show successively a 6300 foot per second layer and an 8000 foot layer.

The 2700 foot spread used as a unit for all profiles was apparently not long enough to penetrate to the 10,500 foot per second layer on these profiles. In order to assign a minimum thickness to the 8000 foot per second layer in our calculations, however, we have arbitrarily drawn a 10,500 foot per second slope through the last point on each curve.

The second reversed pair, shot points 12 east and 9 west, show the weathered layer with velocities of 3100 feet per second and 3200 feet per second respectively underlain successively by a 6300 foot

per second layer and an 8000 foot per second layer and a 10,500 foot per second layer. An inspection of these curves will show that the 8000 foot per second segment has decreased markedly and the 10,500 foot per second layer is represented by several points on each profile. This profile is the same standard 2700 foot length as the previous one.

Proceeding to the third reversed pair, shot points 9 east and 6 west, significant changes will be noted. The velocities shown in the weathered layer at 2900 feet per second and 2100 feet per second are normal but abnormal conditions are shown on the deeper layers. The 8000 foot per second layer which was present to a pronounced degree in the first pair of profiles and to a lesser degree in the second pair of profiles has disappeared in both profiles of the third pair. Secondly, the 6300 foot per second layer is greatly reduced on shot point 9 east and is entirely absent in shot point 6 west. In addition to the above abnormalities, an unexplained offset will be noticed at the midpoint of profile 9 east and some stray arrivals showing a velocity of 9500 feet per second are present on profile 6 west. The exact significance of these anomalous offsets and arrivals is not clear to us at present but may possibly be the result of minor faulting. Much closer control over a far greater area would be necessary to determine whether this hypothesis is correct.

The fourth reversed pair of profiles, shot points 6 east and 18 west show evidence of more disturbed conditions than any of the previous pairs to the west. Since this pair of reversed profiles are located on the eastern slope of the surface expression, this is to be expected. Although a great deal of disturbance is evident, our original velocities can still be used with fair success. Shot point 6 east shows no weathered layer and a small thickness of 6300 foot per second material underlain by 10,500 foot per second material. There is evidence of a segment of much higher velocity (in the order of 20,000 feet per second) at the centre of this profile and also a random lineup showing 8000 feet per second on the more distant traces. These velocities are not evident on the reversed profile and we again cannot assign them to anything except possibly extremely steep dip or minor faulting. With outcrops of Pennsylvanian or Mississippian formation on the surface 1800 feet to the north, it is not hard to justify such random arrivals.

A mathematical analysis of the scant data obtained may appear to be unwarranted, particularly when one is aware of the inherent inaccuracies in any method of calculating thicknesses of successive layers from refraction profiles, but in this case, we suggest that such a step is justified. We believe that the results calculated from the profiles shown together with what is known from surface geology, may aid us in making an educated guess as to the subsurface conditions present. To this end we have used Mr. Nettleton's formula and calculated the

thicknesses of the successive layers shown on the profiles using the velocities and intercepts indicated on the refraction plots. This information is shown in Plate 1A.

An examination of this plate, shows that underlying a comparatively uniform surface, we have a fairly regular weathered zone. The drift thickness is zero at shot point 6 and increases markedly both to the west and to the east as the underlying strata dip more sharply. The 8000 foot per second beds assumed to represent Cretaceous sediments are totally absent at shot point 6 and from there to the east. It appears however slightly to the west of shot point 6 and increases in thickness very rapidly to the west. The top of the 10,500 foot per second material or suggested Pennsylvanian is highest at shot point 6 and dips steeply to the east and west. The depths for this interface at the west edge are minimum depths since as we pointed out earlier, no bed of this velocity was penetrated on the last two profiles, but an arbitrary 10,500 foot per second line was run through the last point on the curve. No good evidence of any large scale faulting is present anywhere on this section.

Section #2

Section 2 is a representation of a north south line shot on the east side of the surface feature and parallel to it. Shot point 18 on the south end of the line is a common point with shot point 18 on the previous east west line.

The same general velocity distribution shown on the east west section is also present on the north south section with one important exception. We have no evidence of an 8000 foot per second layer on any of the profiles shot in this line. With this exception the other velocities of approximately 2000 feet per second, 6300 feet per second and 10,500 feet per second are similar.

Starting at the extreme southern end of the section, with the reversed pair, shot point 18 north and shot point 20 south, we have a weathered zone of 2300 feet per second and 1900 feet per second respectively underlain successively by a drift zone of 6300 feet per second and a possible Pennsylvanian zone of 10,500 feet per second. The 10,500 foot per second bed appears well developed, but no 8000 foot per second layer is present. The second reversed pair, shot points 20 north and 23 south show a thicker weathered zone of 1700 feet per second and 2000 feet per second underlain again by beds of 6300 foot per second and 10,500 feet per second velocity. The 6300 foot per second bed has increased in thickness on each profile and the 10,500 foot per second bed consequently is deeper and occurs only on the last 4 and 2 traces respectively. The 8000 foot per second bed is again absent.

The final reversed pair, shot points 23 north and 26 south, show a weathered zone of 2000 and 2400 feet per second respectively underlain again by a 6300 foot per second drift zone. Neither the 8000 foot per second layer or 10,500 foot per second layer is present on either profile. Here again, reasoning from previous profiles, we have arbitrarily drawn a 10,500 foot per second velocity through the last point on the curve to allow us to calculate minimum thickness for the 6300 foot per second bed or these last two profiles.

With the same reservations put forth for the previous east west section, we have done a mathematical analysis of these profiles using Mr. Nettleson's velocity and intercept formula to solve for the thickness of the various velocity layers. A rather approximate picture of these results is presented in Plate 2A.

An examination of Plate 2A shows a comparatively uniform surface and weathered zone underlain by surface drift rapidly increasing in thickness to the north as the underlying strata dips steeply to the north. There is no evidence of any 8000 foot per second material present.

IX. Conclusions.

1. Operational Factors.

Although as pointed out previously, this work was of a strictly experimental nature and of very limited duration, we believe that certain conclusions may be drawn from our results.

- (1) We believe that with certain refinements, a like program of portable refraction shooting could be used to advantage in remote areas of known high dipping beds.
- (2) With the exception of drilling equipment, strictly portable operations can be maintained in remote areas with little trouble. In normal muskeg country or shallow shooting areas where no perma frost is encountered possibly even the drilling equipment we had would have been adequate to obtain successful reflection records.

2. Conclusion as to the Structure Present in the Area.

Although we are aware that it is extremely risky to base any assumptions as to structure present on the inadequate control we were able to shoot, we suggest that some conclusions may be drawn.

From a combination of what is known of the surface geology and what geophysical data we could gather, we suggest that the surface structure shown at Bovie Lake is the result of a nearly vertical uplift with only minor faulting present at the crest. The 8000 foot per second beds which we have suggested may be Cretaceous sediments, appear to have been entirely eroded at the crest of the structure, but increase in thickness greatly as we progress west of the crest. We could not demonstrate the existence of an 8000 foot per second layer east of the surface feature on our north south line which suggests that in the locale covered by our work at least, the Cretaceous beds have been eroded off east of the surface structure. It may be however, that our east west line was located near the apex of the structure and if our line extended sufficiently far north, the Cretaceous beds would have been picked up on this north south line east of the structure. This hypothesis is supported by the steep north dip shown on the deeper beds and the known occurrence of Cretaceous outcrops some miles north of our work.

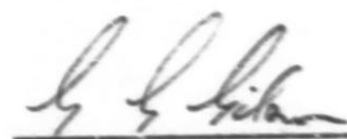
The location of the east west line on the north side of one of the valleys dividing the surface feature into three sections also points out a significant fact. If the subsurface conditions had followed the surface, we would expect to have three separate features with dips closing off both ends of the structures at the surface valleys. Thus, the north south line should show south dip to indicate a closure at the surface valley. The fact that north dip is shown leads us to believe that the northern two-thirds of the surface structure are actually one large structure on the subsurface rather than two separate one's as indicated by the surface geology.

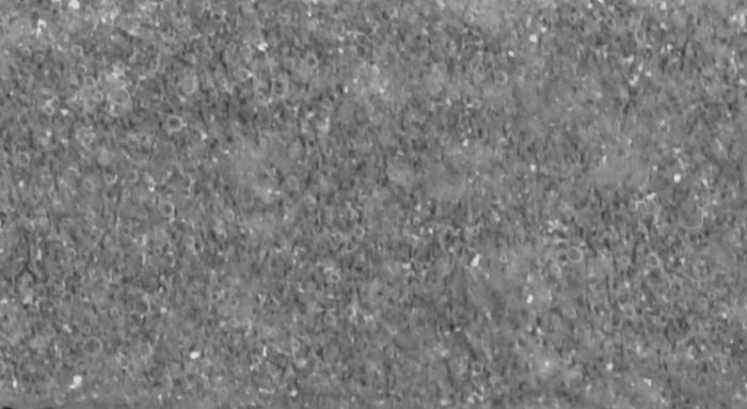
In closing, may we suggest that despite the difficulties involved in operating in this area, that additional work be done to determine the best location for a deep test.

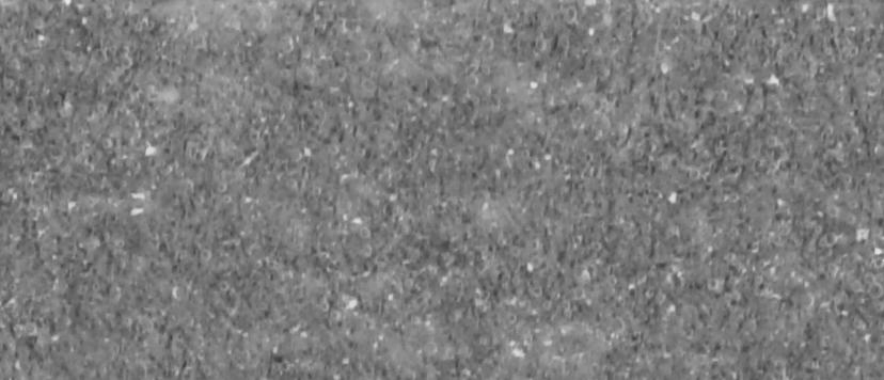
A diamond drill program could easily be supplied by air and could be operated either winter or summer and could give us conclusive evidence of the presence or absence of Cretaceous sediments east of the surface crest.

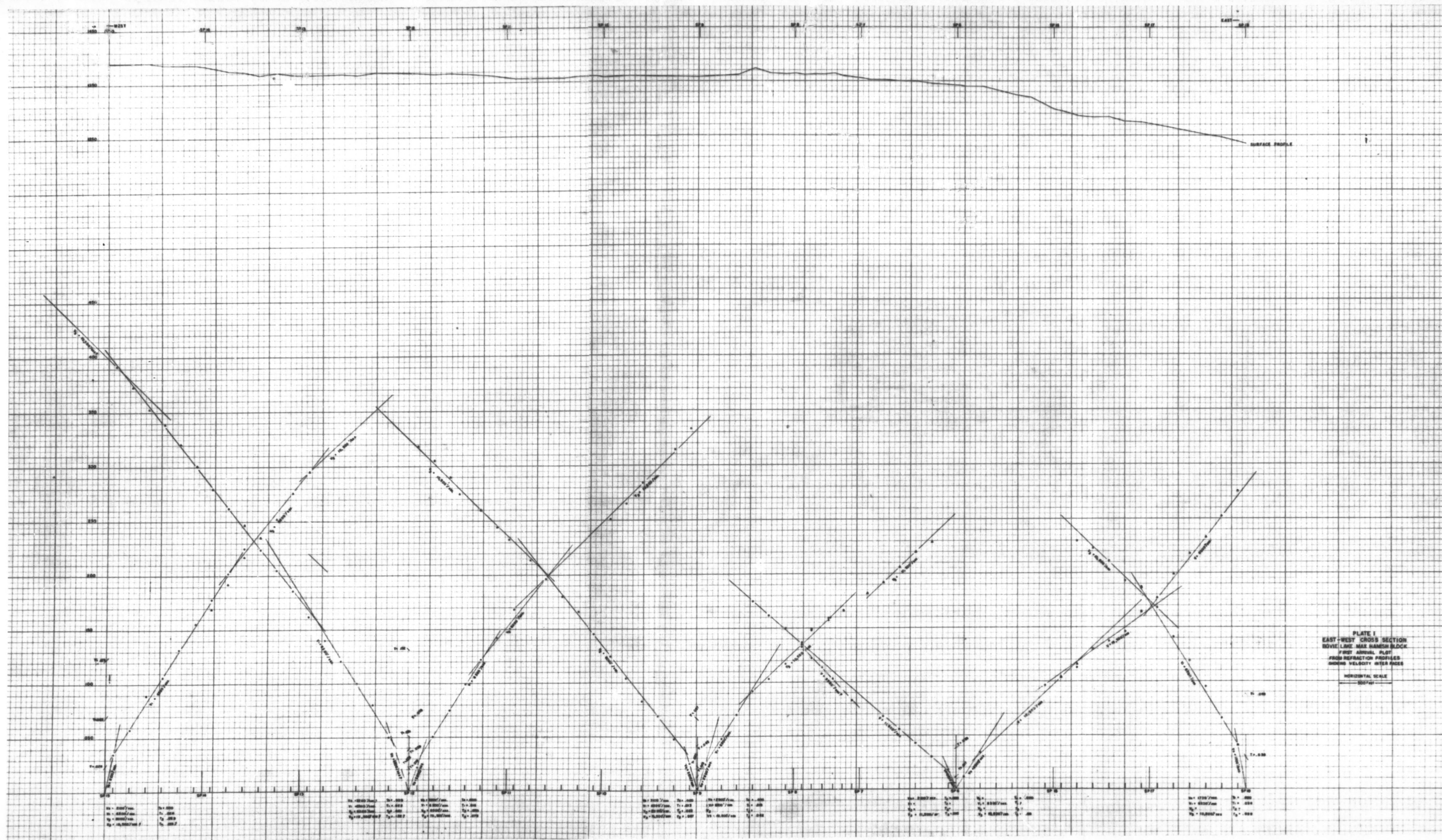
With advanced preparation, a conventional seismic crew with drilling equipment heavy enough to drill holes for reflection shooting could be operated during winter months. Several lines of reflection profiles, both eastwest across the structure and north south on both sides of it, could be very probably determine exactly the nature and extent of faulting if any present, and consequently provide a drilling location on this promising looking feature.

Respectfully submitted,


 G. G. Gibson.







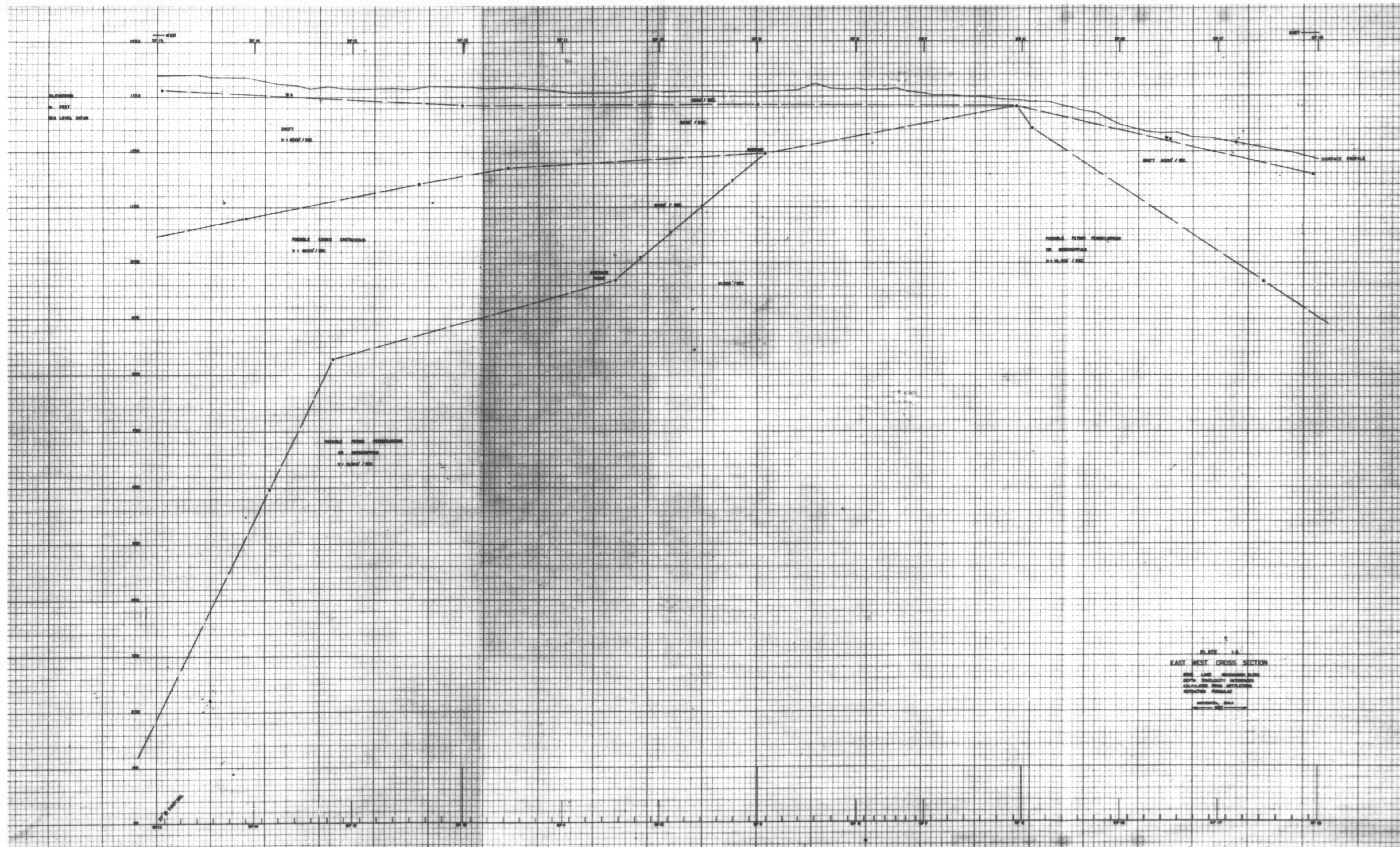


PLATE 1A
 EAST WEST CROSS SECTION
 SURFACE PROFILE
 DRIFT
 POSSIBLE CRUSTAL DISCONTINUITY
 POSSIBLE MOHOROVICIC DISCONTINUITY
 REFRACTOR PROFILE
 VELOCITY SCALE
 1000' / SEC.

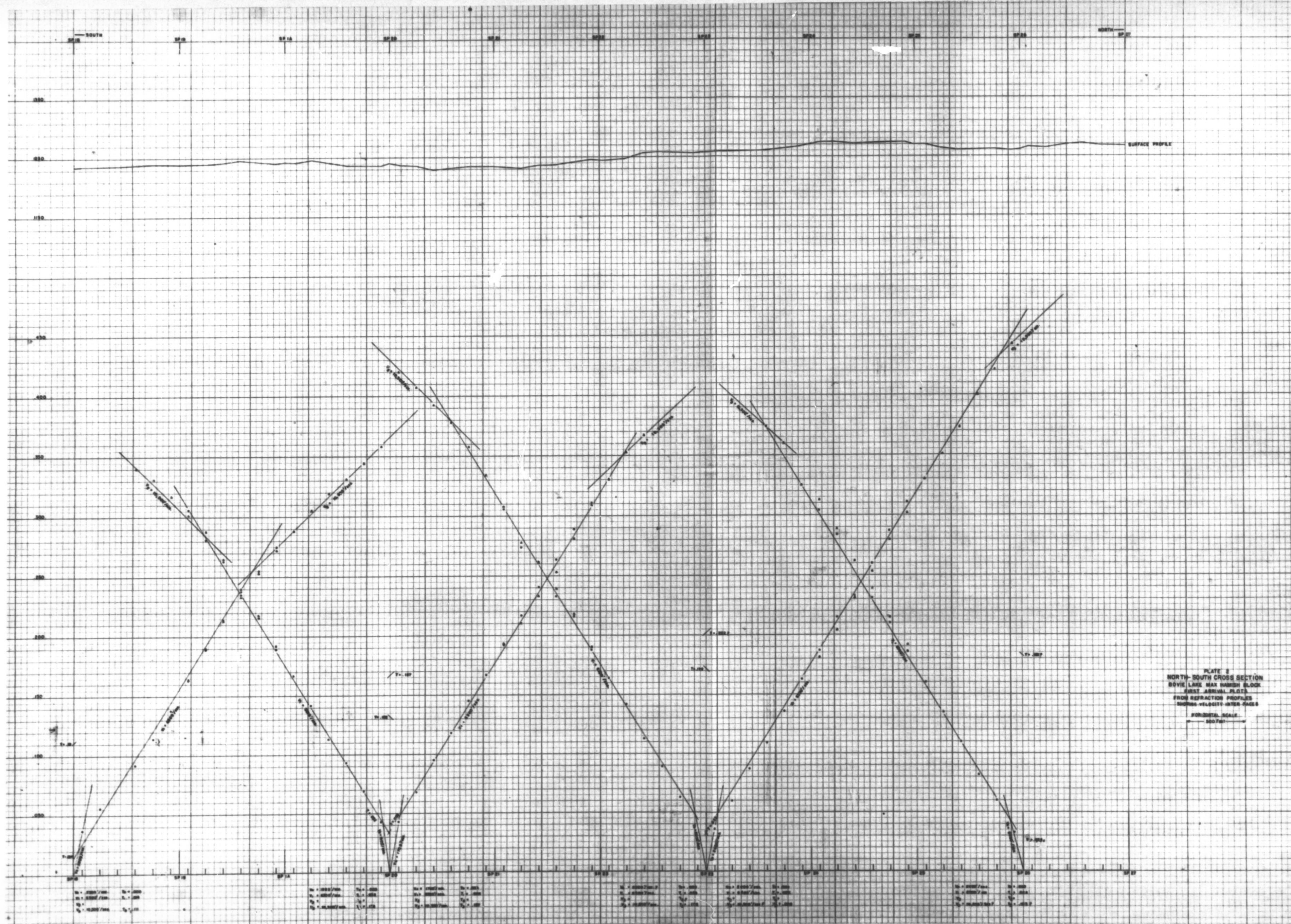


PLATE 2
NORTH-SOUTH CROSS SECTION
BOVIE LAKE MAN HARBOR BLOCK
FIRST ARRIVAL PLOTS
FROM REFRACTION PROFILES
SHOWING VELOCITY INTER-SECT
HORIZONTAL SCALE
500 FEET

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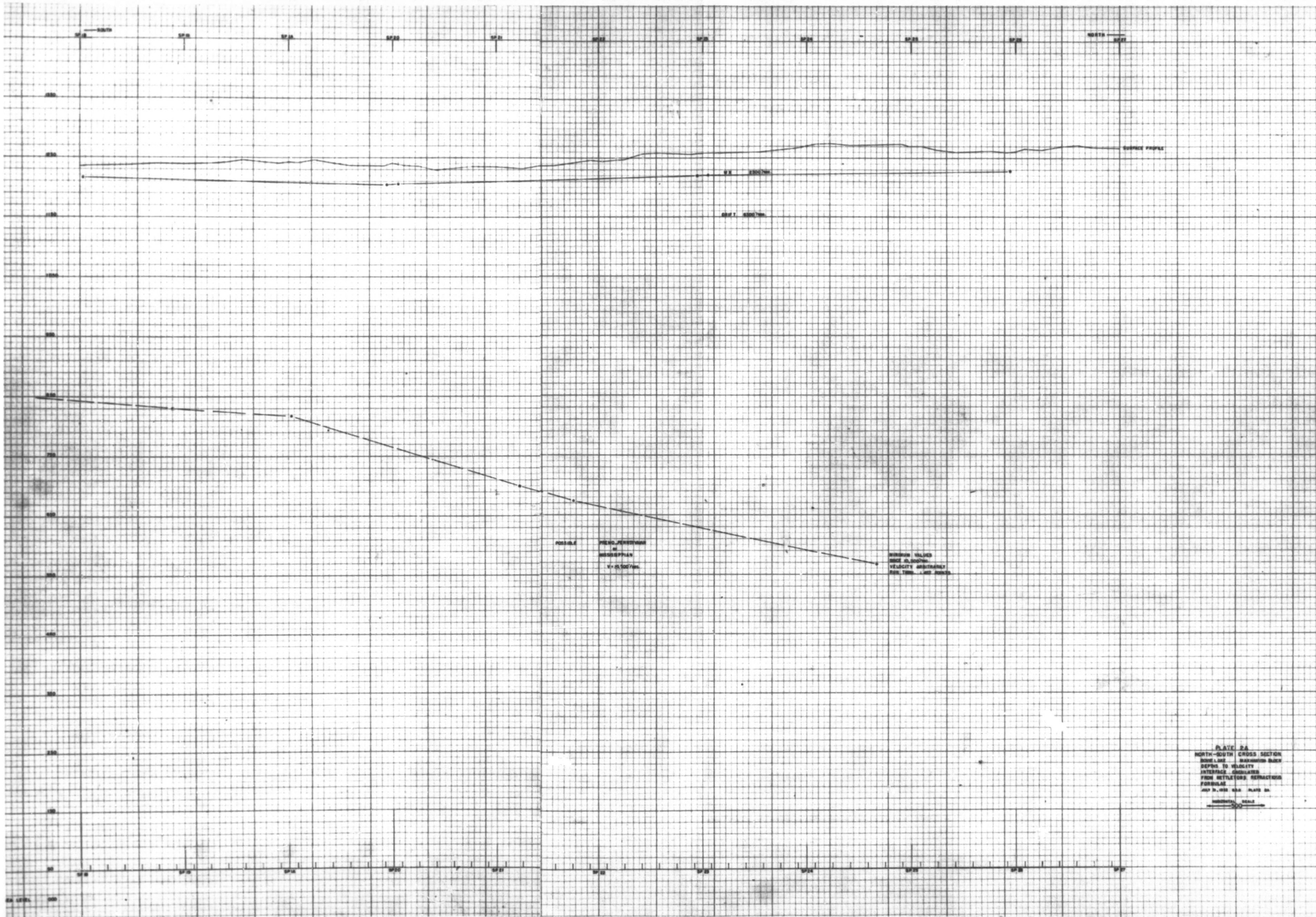
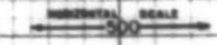


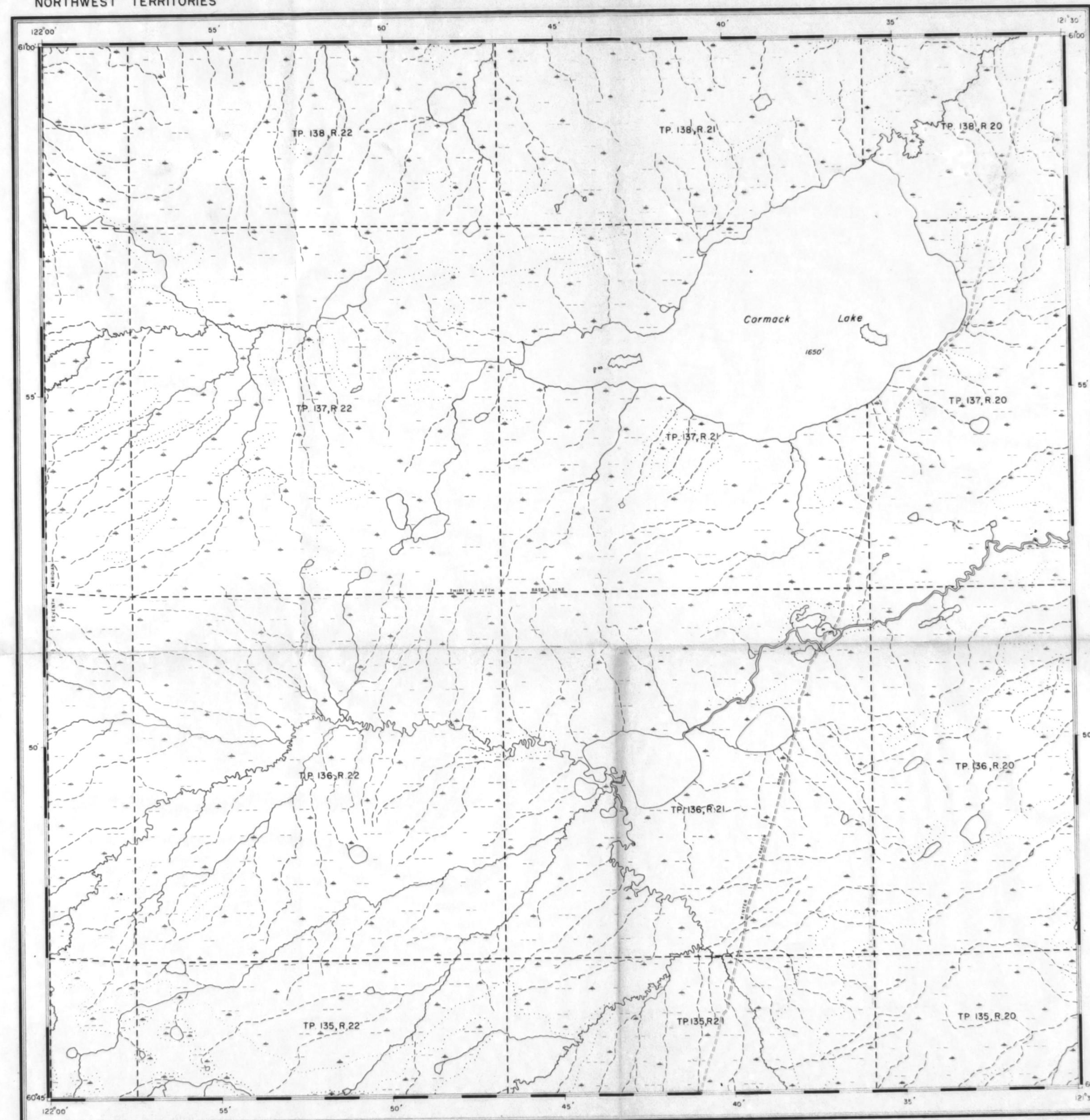
PLATE 2A
 NORTH-SOUTH CROSS SECTION
 BOWLING GREEN, MISSISSIPPI
 DEPTH TO VELOCITY
 INTERFACED GULF
 FROM RETILOCUS SEPARATION
 FORMULAE
 JULY 1958 200 PLATE 2A



OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

SHEET No. 95



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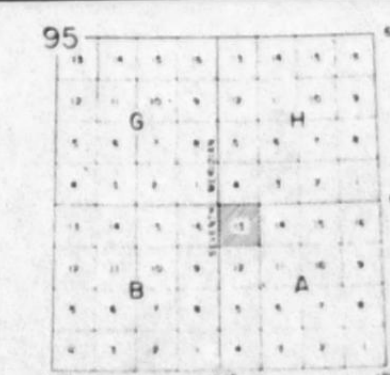
REFERENCE

ROAD	— — — — —
RAIL	— — — — —
UNDEVELOPED SURFACES	— — — — —
CONCRETE OR ASPHALT	— — — — —
GRAVEL OR PAVED	— — — — —
STONE AND LIME	— — — — —
CONCRETE OR ASPHALT	— — — — —
GRAVEL OR PAVED	— — — — —
STONE AND LIME	— — — — —
RAIL	— — — — —
ROAD	— — — — —
RAIL	— — — — —

WEST OF SIXTH MERIDIAN

Scale: One Inch to One Mile = 1:63,360

Published 1955



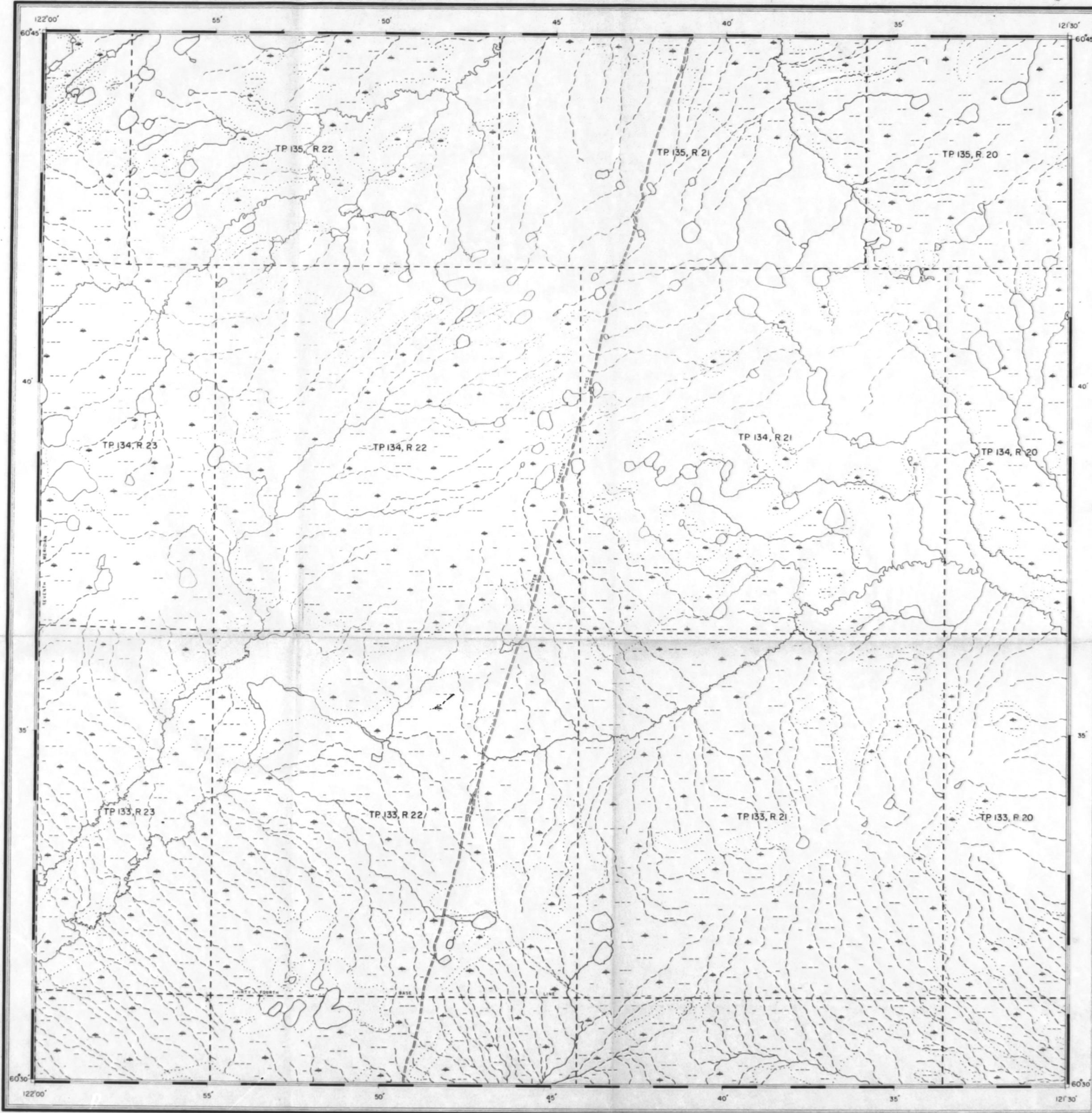
NOTE: The maps in this series have been compiled by aerial survey methods to the best available ground control surveys. Owing to the limited extent of existing surveys in the area, the maps should be considered to be of a reconnaissance type. Township and Range line positions, have been based on the computed coordinates of historical township corners, and are therefore subject to possible revision as new survey data becomes available.



OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

SHEET No. 95 A



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ROADS	00 00 00 00
TRAILS	00 00 00 00
TOWNSHIP LINE SURVEYED	00 00 00 00
TOWNSHIP LINE UNSURVEYED	00 00 00 00
TELEPHONE OR TELEGRAPH LINE	00 00 00 00
RIVER AND LAKE	00 00 00 00
INTERMITTENT STREAM	00 00 00 00
SAND OR MUD	00 00 00 00
SWAMP	00 00 00 00
WATER CLOSET	00 00 00 00

WEST OF SIXTH MERIDIAN

Scale: One inch to One Mile = $\frac{1}{63,360}$

Published 195

NOTE: The maps in this series have been compiled by aerial survey methods to the best available ground control surveys. Owing to the limited extent of existing surveys in the area, the maps should be considered to be of a reconnaissance type. Township and Range line positions have been based on the computed coordinates of theoretical township corners and are therefore subject to possible revision.

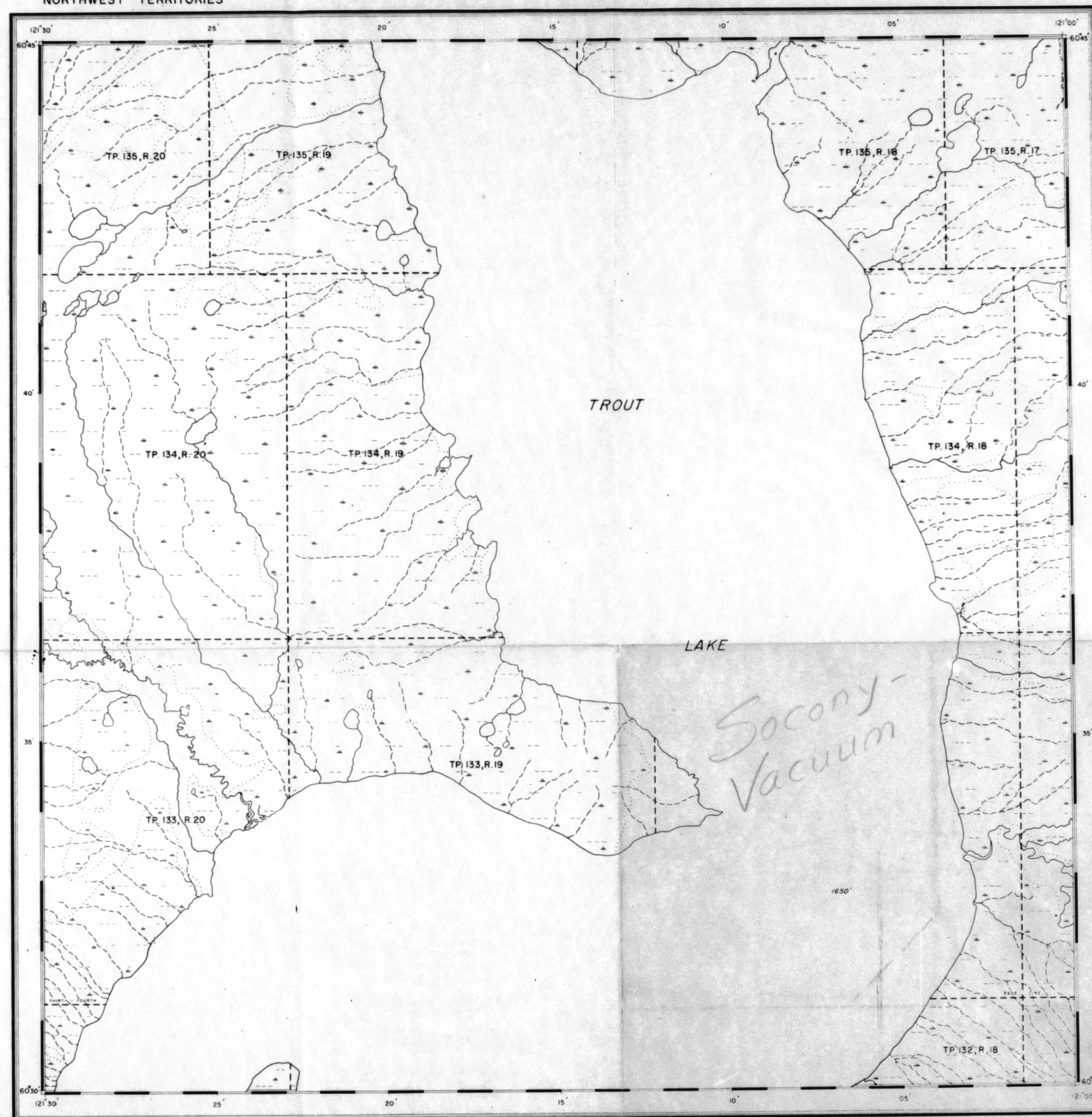
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OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

SHEET No. 95

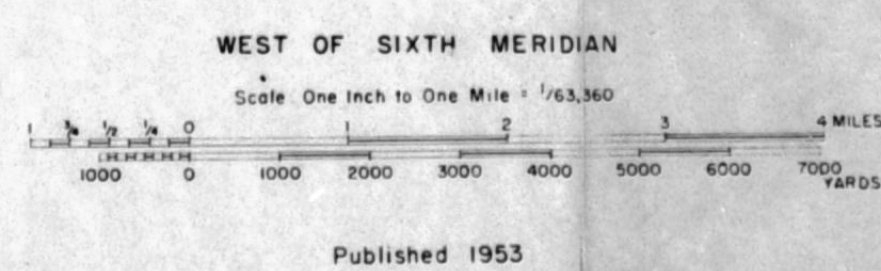


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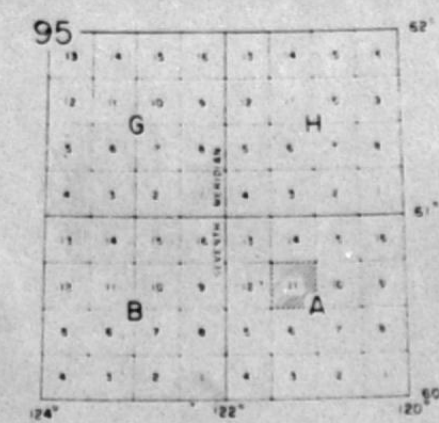
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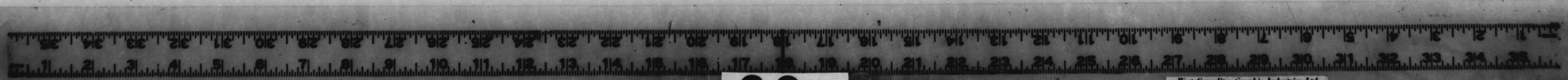
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PERMANENT LINE LOCATIONS	—
PERMANENT LINE LOCATIONS	—
PERMANENT LINE LOCATIONS	—



Published 1955



NOTE: The maps in this series have been compiled by aerial survey methods. The best available ground control surveys, being the most accurate of any in the area, have been used. The maps should be considered to be of a reconnaissance type. Planning and design are required. They have been based on the computed coordinates of the points shown. They are therefore subject to possible revision as new survey data becomes available.



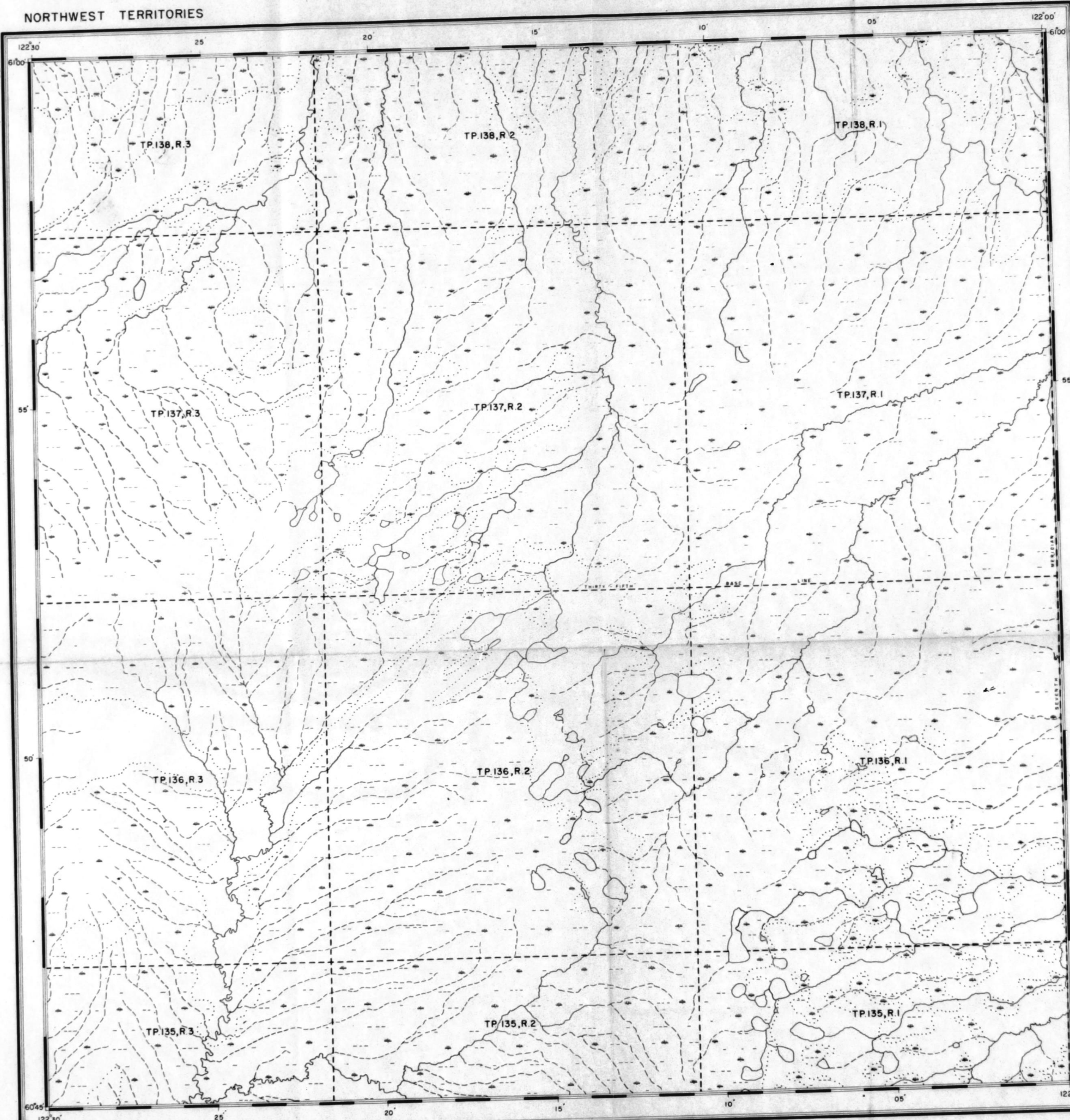
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OIL DEVELOPMENT SERIES

SHEET No. 95

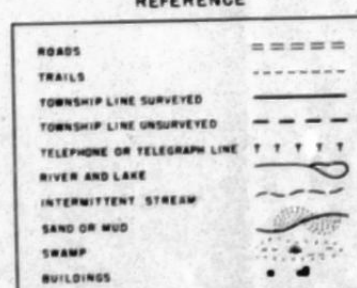
NORTHWEST TERRITORIES



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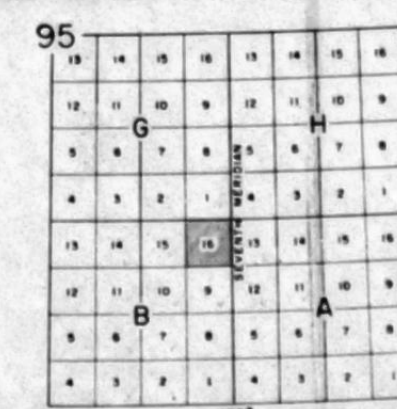
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WEST OF SEVENTH MERIDIAN

Scale: One Inch to One Mile = $\frac{1}{63,360}$

Published 1953



NOTE: The maps in this series have been compiled by aerial survey methods to the best available ground control surveys. Owing to the limited extent of existing surveys in the area, the maps should be considered to be of a reconnaissance type. Township and Range line positions have been based on the computed coordinates of theoretical township corners, and are therefore subject to possible revision as new survey data becomes available.

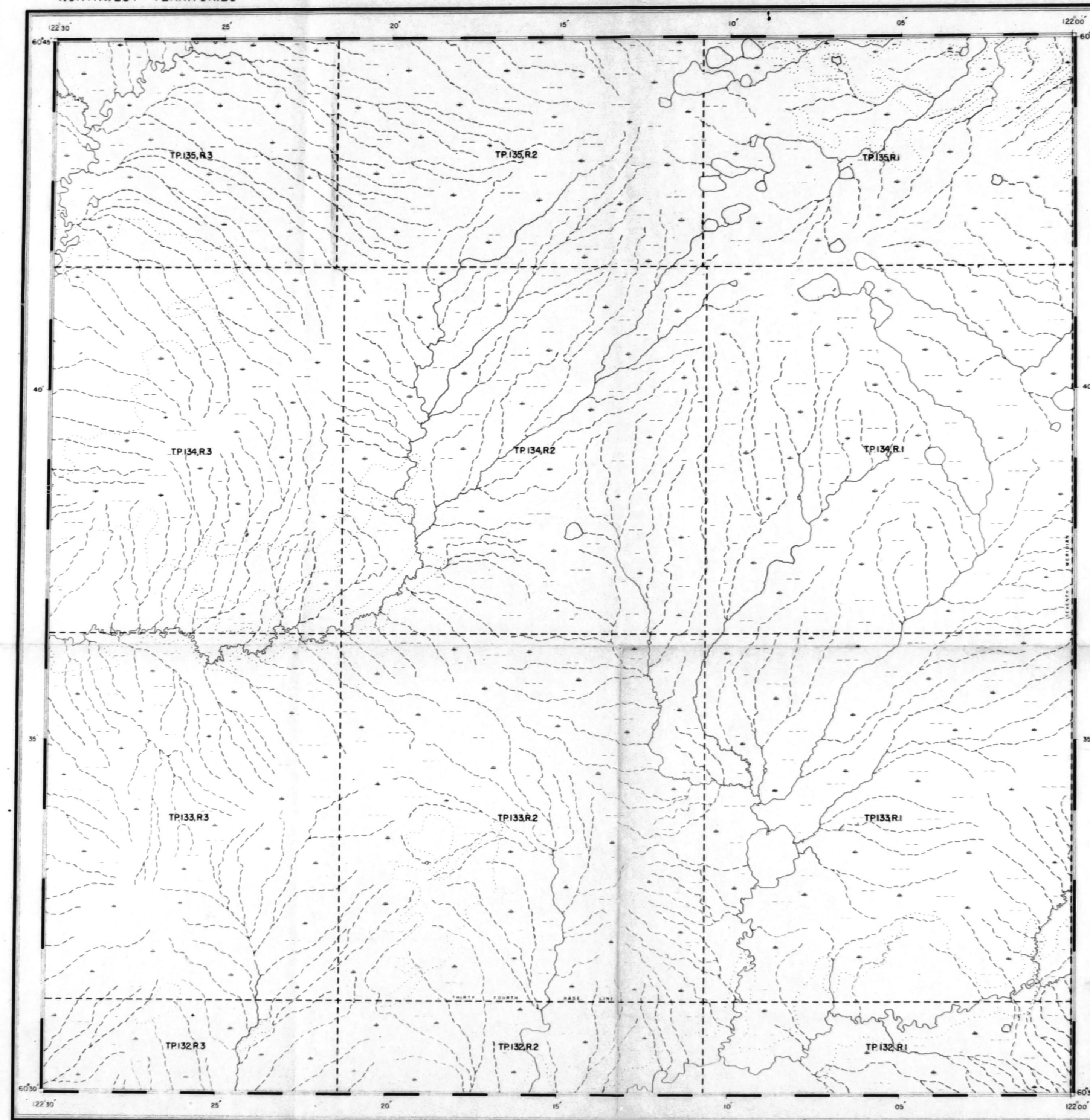
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OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

SHEET No. 95



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REFERENCE	
LINE CURVED	
LINE UNCURVED	
OR TELEGRAPH LINE	
LAKE	
ENT STREAM	
POD	

WEST OF SEVENTH MERIDIA

Scale One Inch to One Mile = $\frac{1}{63,360}$

Published 195

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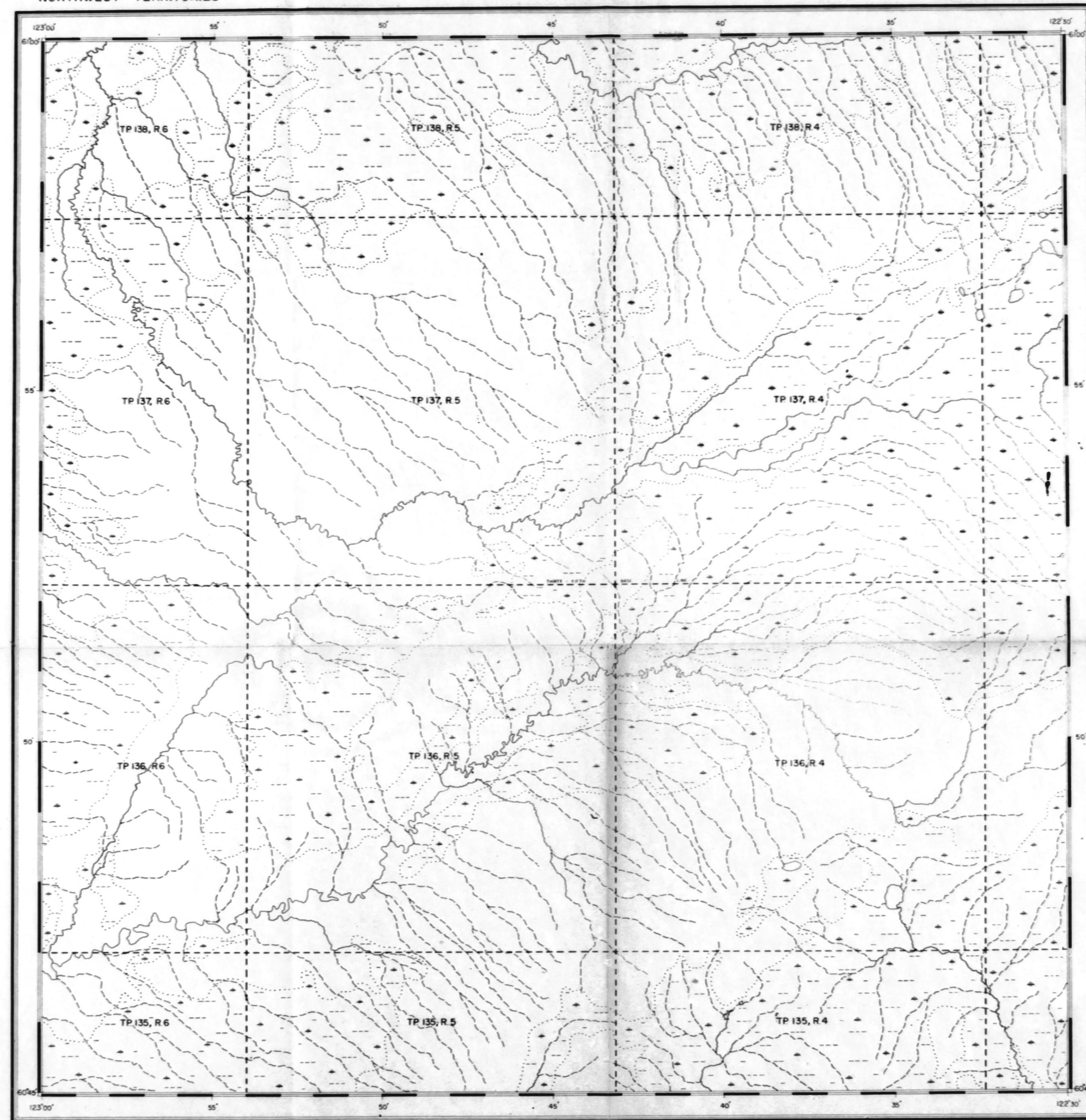
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OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

SHEET No. 95



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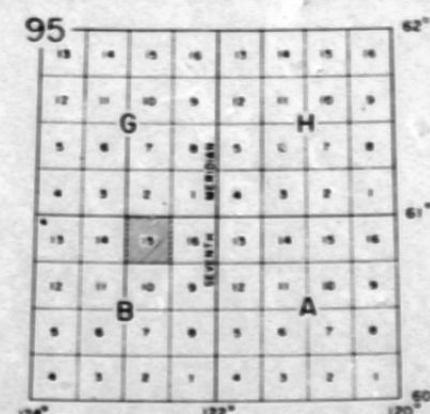
REFERENCE

ROADS	100 100 100 100 100
TRAILS	
FOUNDSHIP LINE SURVEYED	—————
FOUNDSHIP LINE UNSURVEYED	—————
TELEPHONE OR TELEGRAPH LINE	— — — — —
RIVER AND LAKE	
INTERMITTENT STREAM	
SAND OR MUD	
SWAMP	
SHRUBLANDS	

WEST OF SEVENTH MERIDIAN

Scale One inch to One Mile = $\frac{1}{63,360}$

Published 1953



NOTE: The maps in this series have been compiled by aerial survey methods to the best available ground control surveys. Owing to the limited extent of existing surveys in the area, the maps should be considered to be of a reconnaissance type. Township and Range line positions have been based on the computed coordinates of theoretical township corners and are therefore subject to possible revision as new survey data becomes available.

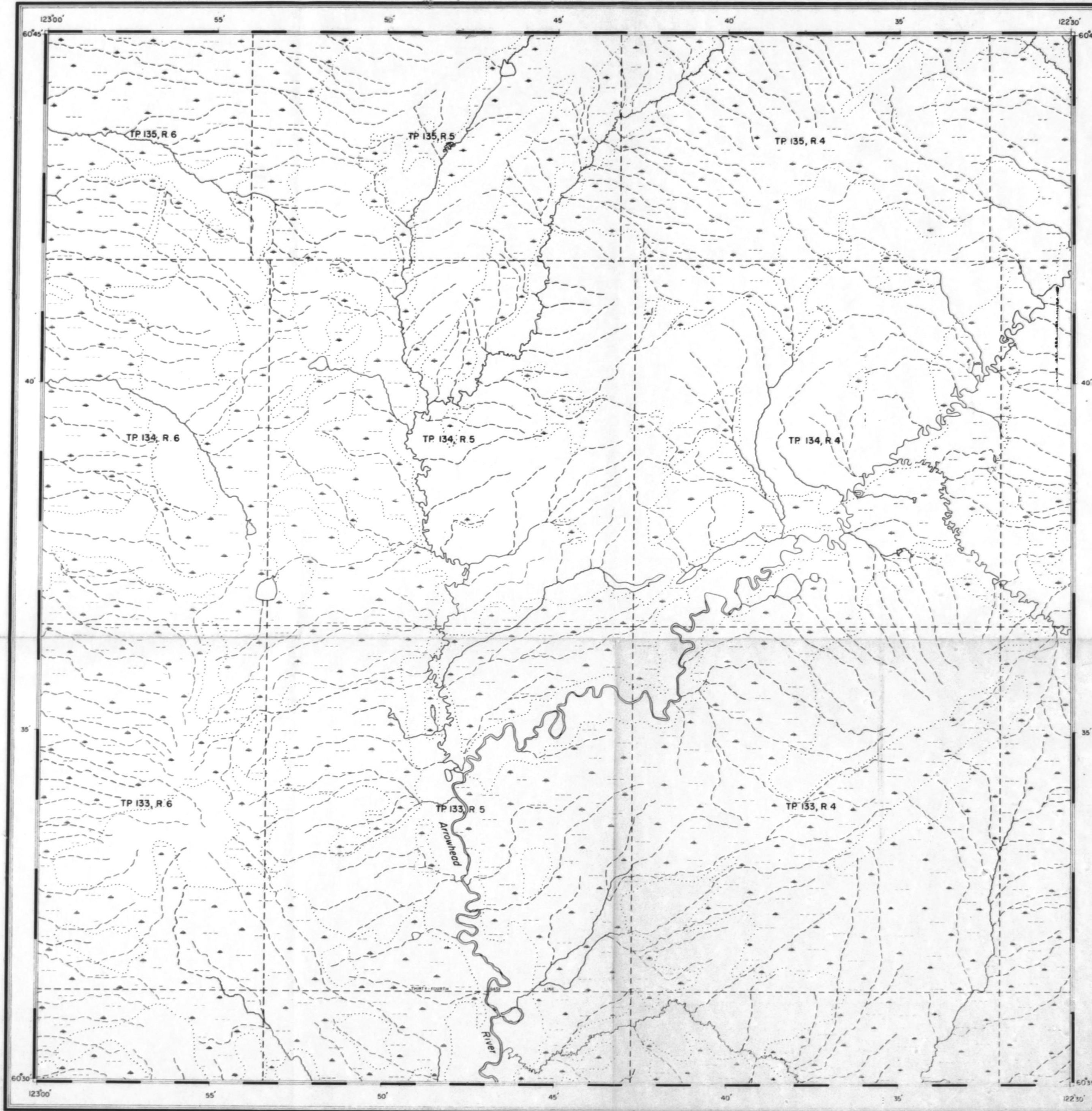
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OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

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REFERENCES

Figure 1 is a schematic diagram of a river network. The top part shows a plan view with a river network and a grid of 100 cells (10x10). The bottom part shows a cross-section of the river bed with labels for 'TOWNSHIP LINE SURVEYED', 'TOWNSHIP LINE UNSURVEYED', 'TELEPHONE OR TELEGRAPH LINE', 'RIVER BED LINE', 'INTERMITTENT STREAM', 'SAND OR MUD', and 'SLOPE'. The cross-section shows a river bed with a central channel and side channels, with a grid of 100 cells (10x10) overlaid.

WEST OF SEVENTH MERIDIAN

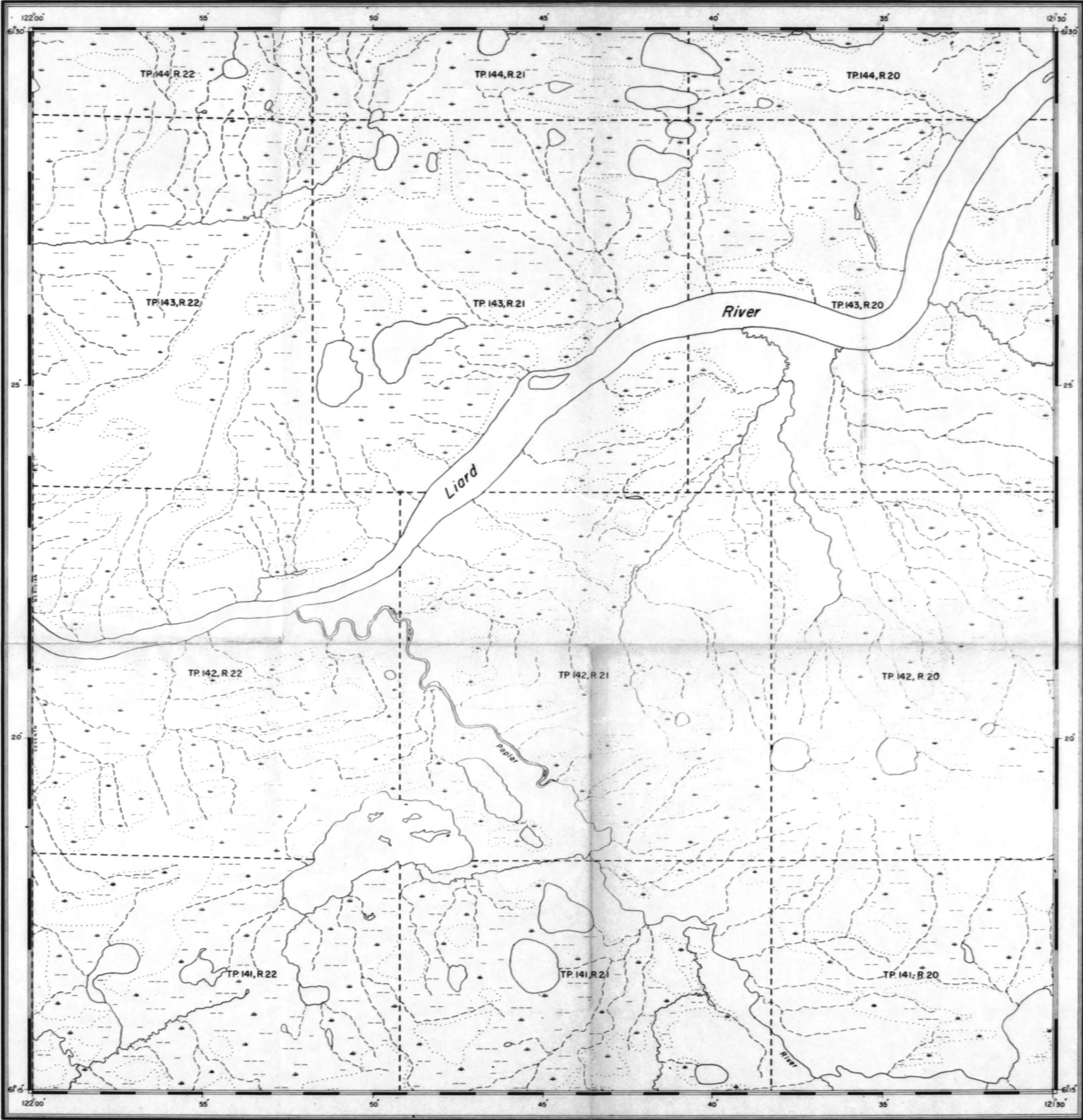
Scale One Inch to One Mile = 1/63,360

Published 195

NOTE: The maps in this series have been compiled by aerial survey methods to the best available ground control surveys. Owing to the limited extent of existing surveys in the area, the maps should be considered to be of a reconnaissance type. Township and Range line positions have been based on the computed coordinates of theoretical township corners and are therefore subject to possible revision if new survey data becomes available.

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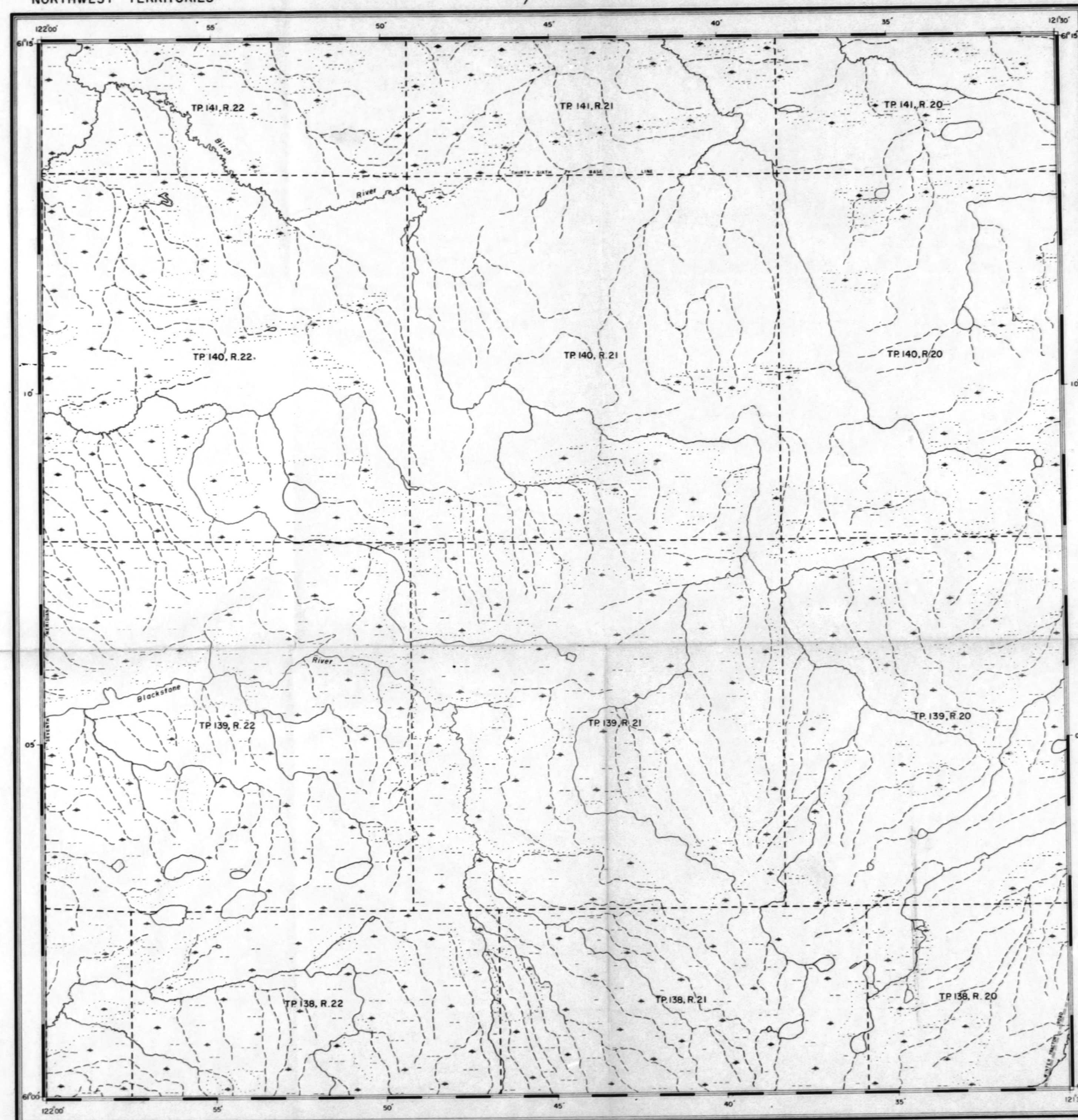
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OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

SHEET No. 95



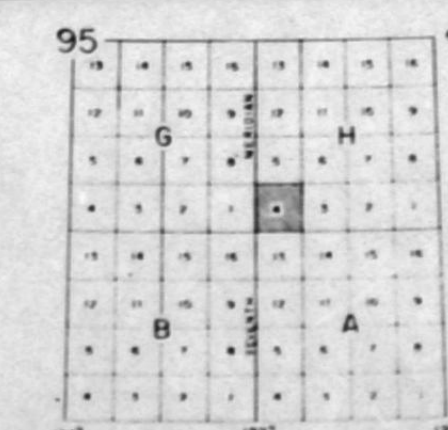
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REFERENCE	
ROADS	—
RAILS	—
BOUNDARY LINE (UNDEVELOPED)	—
BOUNDARY LINE (DEVELOPED)	—
WATER AND LAKE	—
WATER COURSE (STREAM)	—
WATER (SWAMP)	—
WATER (MUDFLAT)	—
WATER (ICE)	—

WEST OF SIXTH MERIDIAN
Scale One Inch to One Mile = 1:62,500
Published 1953

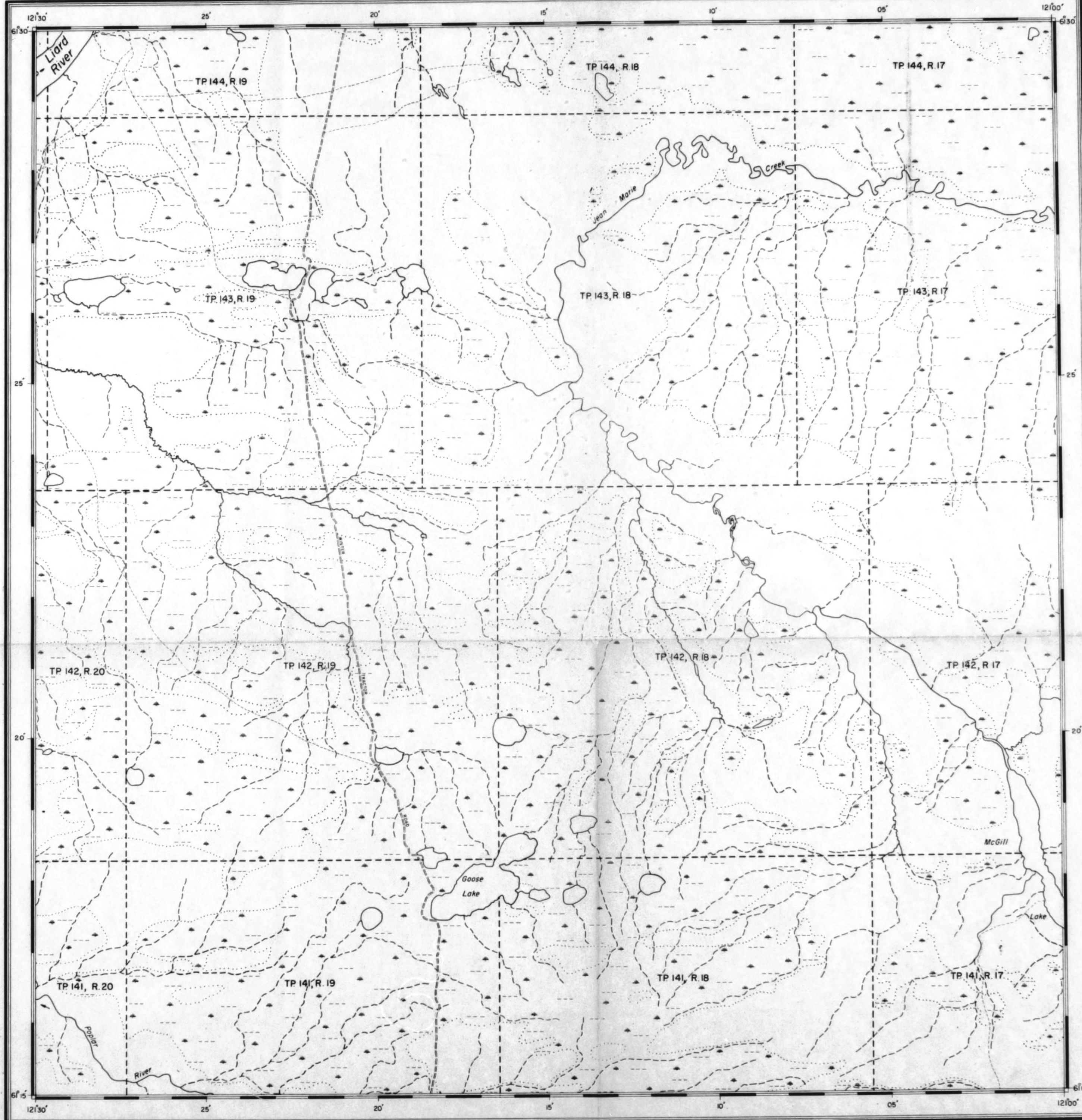


NOTE: The maps in this series have been compiled by aerial survey methods to the best possible ground control surveys. Being in the limited extent of existing surveys in the area, the maps should be considered to be of a reconnaissance type. Township and Range line positions have been based on the computed coordinates of nearest township corners, and are therefore subject to possible revision as new survey data becomes available.



OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

SHEET No. 95^h

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ROADS	— — — — —
TRAILS	— — — — —
TOWNSHIP LINE SURVEYED	— — — — —
TOWNSHIP LINE UNSURVEYED	- - - - -
TELEPHONE OR TELEGRAPH LINE	T T T T
RIVER AND LAKE	
INTERMITTENT STREAM	
SAND OR MUD	
SWAMP	
WELL LOCATOR	

WEST OF SIXTH MERID

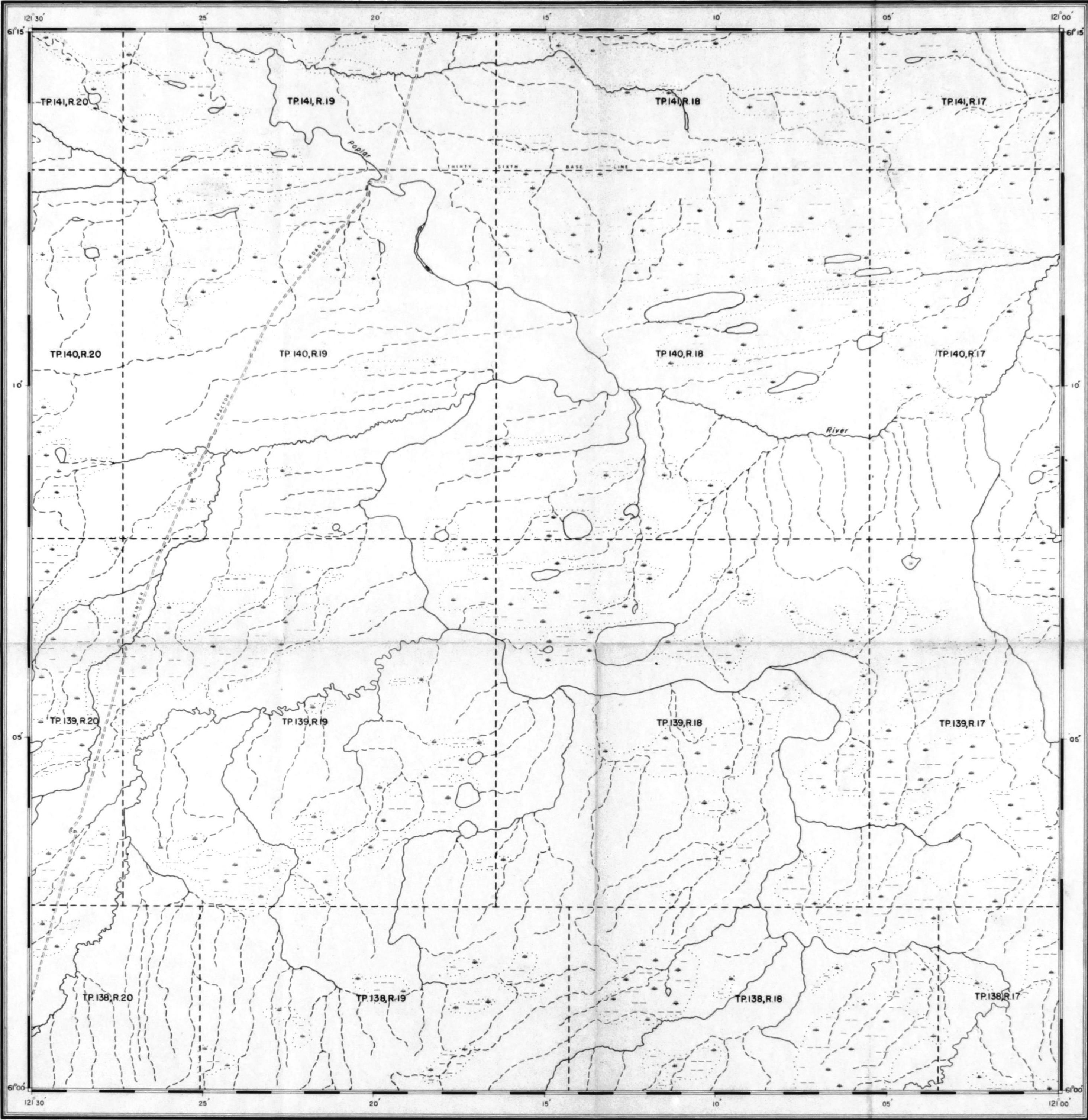
Scale: One inch to One Mile = $1/63$.

Published 1952

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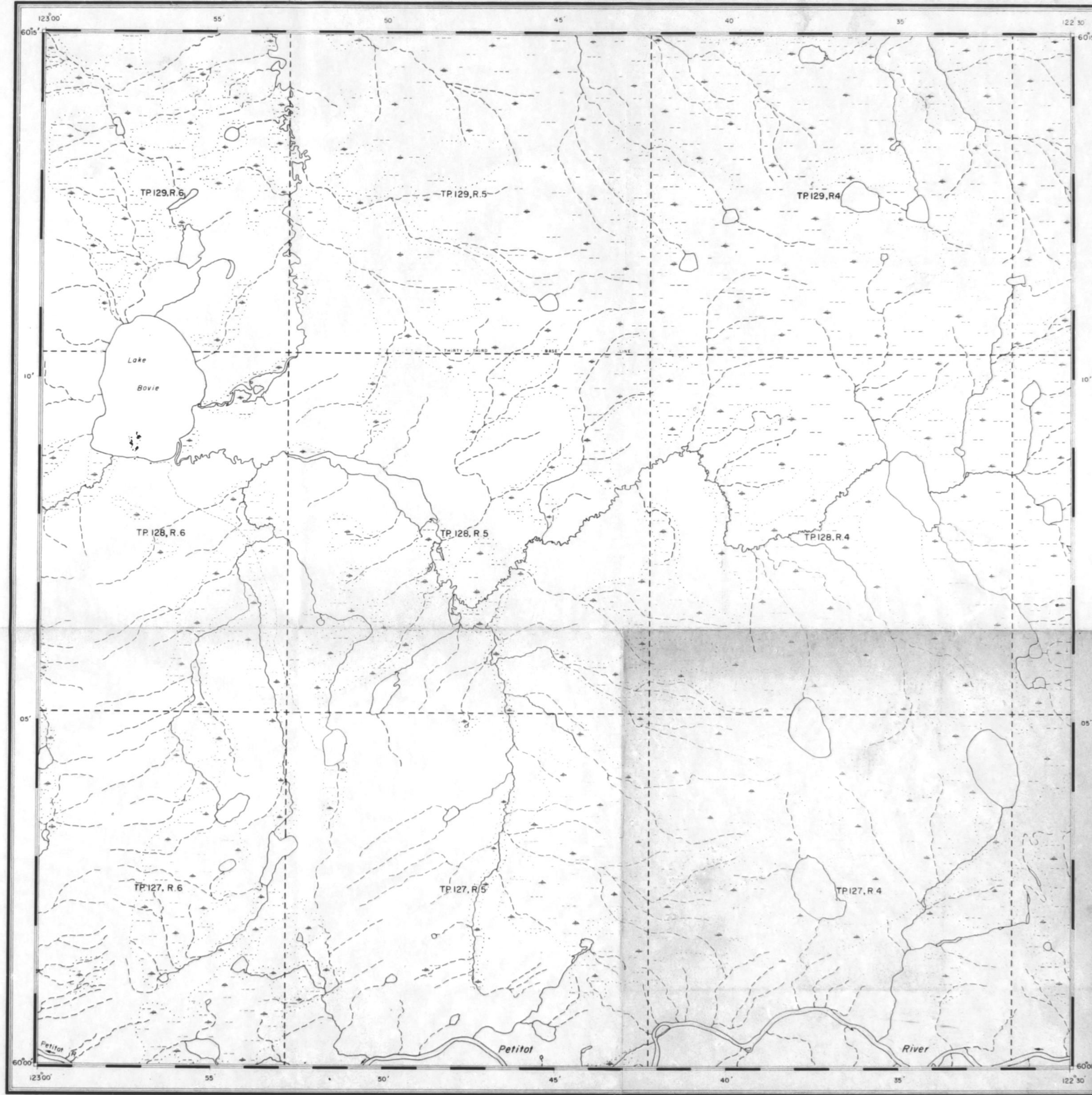
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OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

SHEET No. 95⁸

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ROADS

TRAILS

TOWNSHIP LINE SURVEYED

TOWNSHIP LINE UNSURVEYED

TELEPHONE OR TELEGRAPH LINE

RIVER AND LAKE

INTERMITTENT STREAM

SAND OR MUD

SWAMP

ROCKS

WEST OF SEVENTH MERIDIA

Scale One Inch to One Mile = 1/63,360

Published 195

95

	1	2	3	4	5	6	7	8	9
1	9								
2	1								
3	2								
4	3								
5	4								
6	5								
7	6								
8	7								
9	8								
10	9								

NOTE: The maps in this series have been compiled by aerial survey methods to the best available ground control surveys. Owing to the limited extent of existing surveys in the area, the maps should be considered to be of a reconnaissance type. Township and Range line positions have been based on the computed coordinates of theoretical township corners and are therefore subject to possible revision as new survey data becomes available.

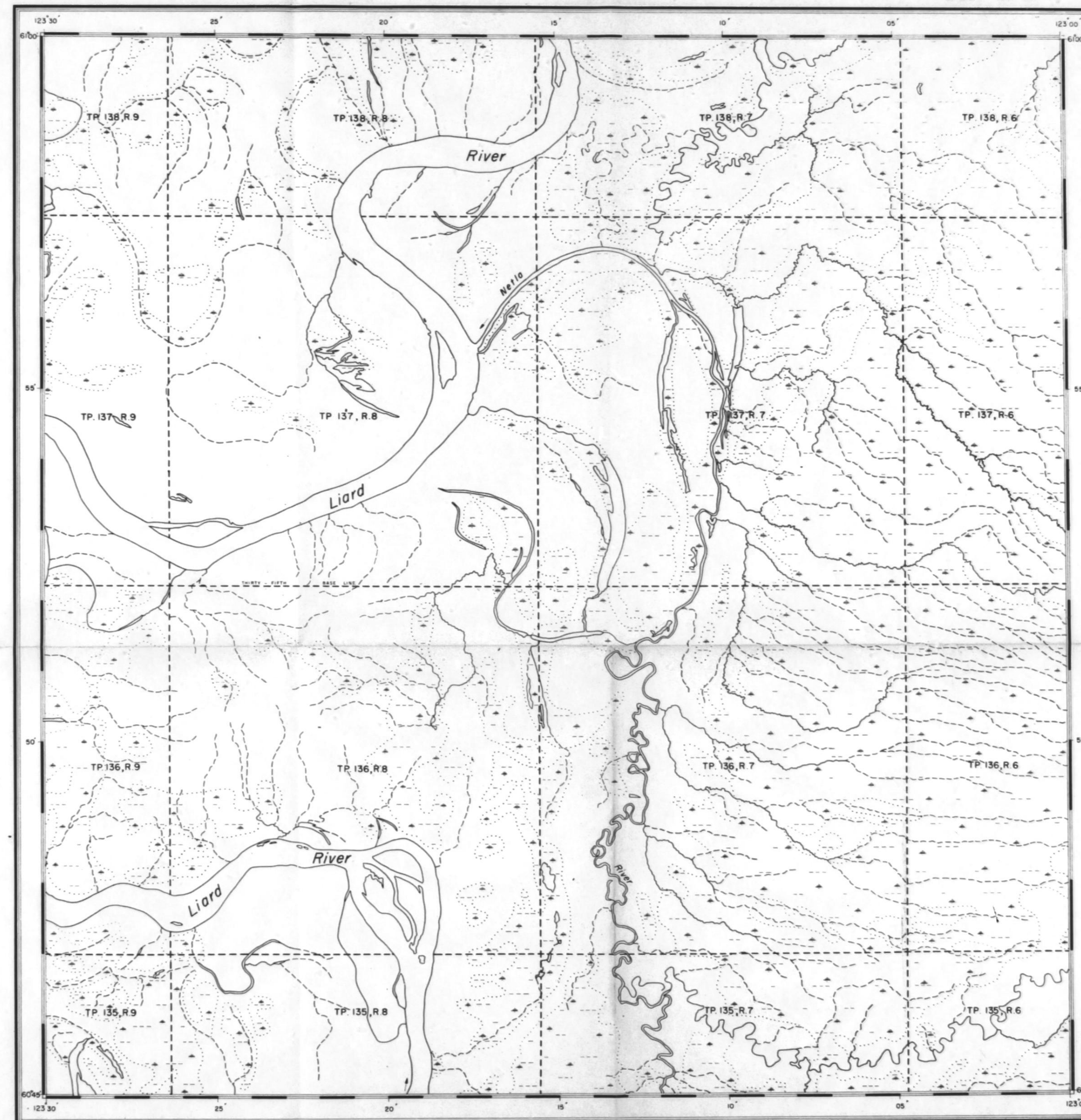
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OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

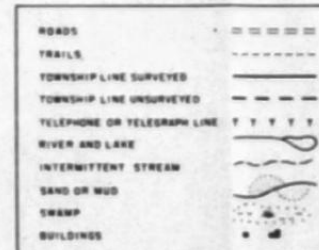
SHEET No. 95



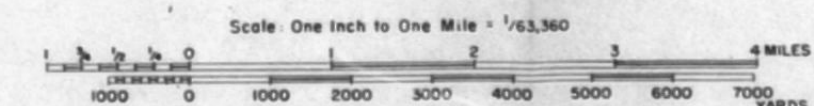
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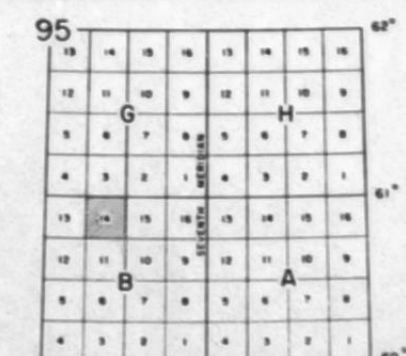
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WEST OF SEVENTH MERIDIAN



Published 1953



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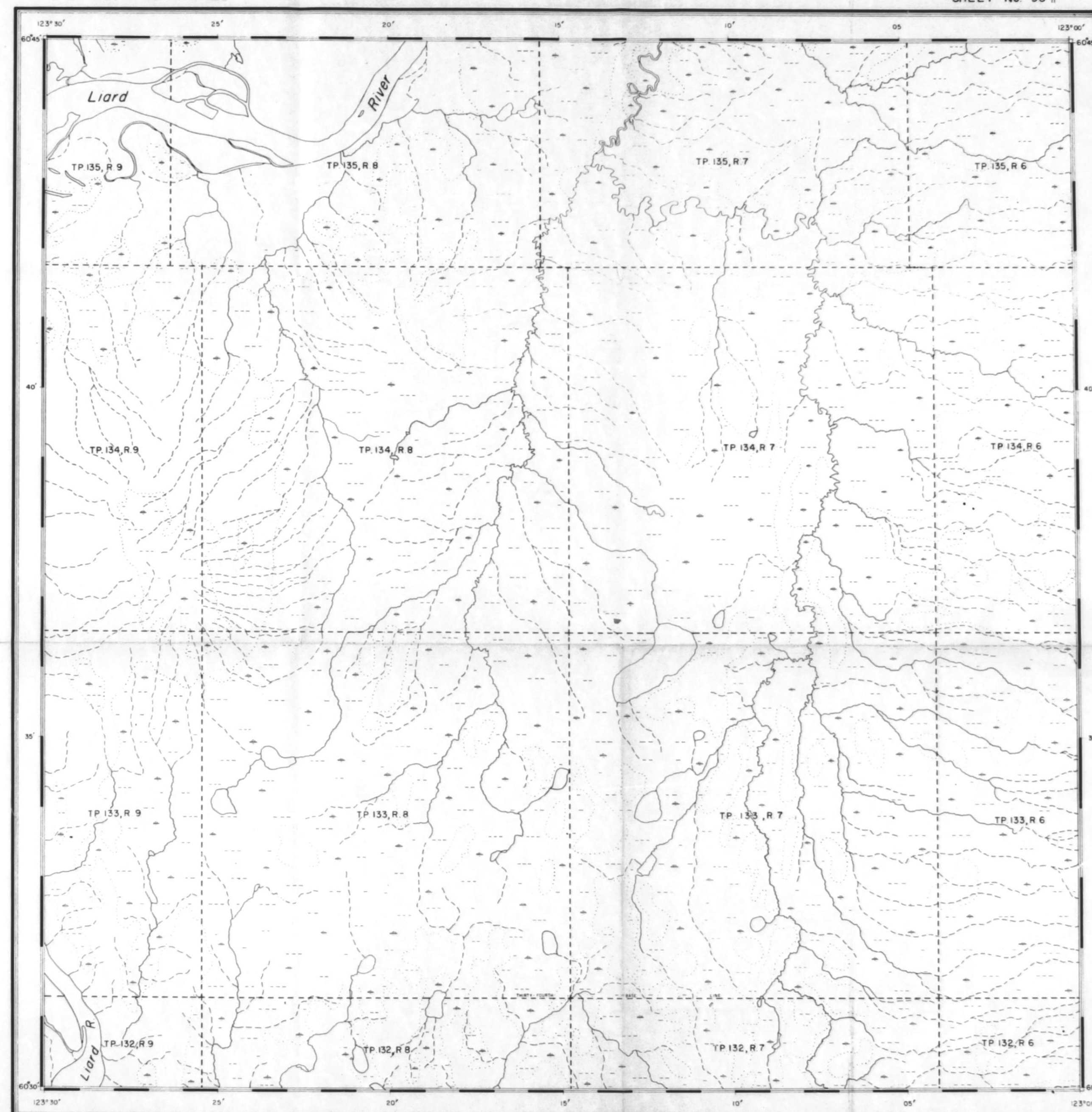
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OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

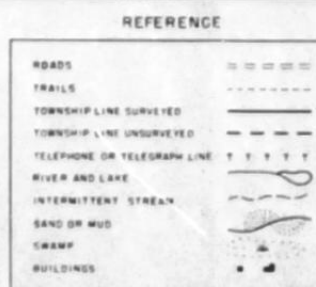
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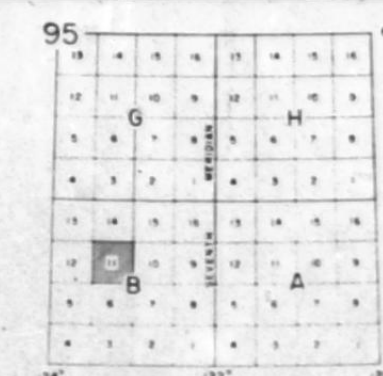
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WEST OF SEVENTH MERIDIAN
Scale: One Inch to One Mile = 1:63,360

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

Published 1953



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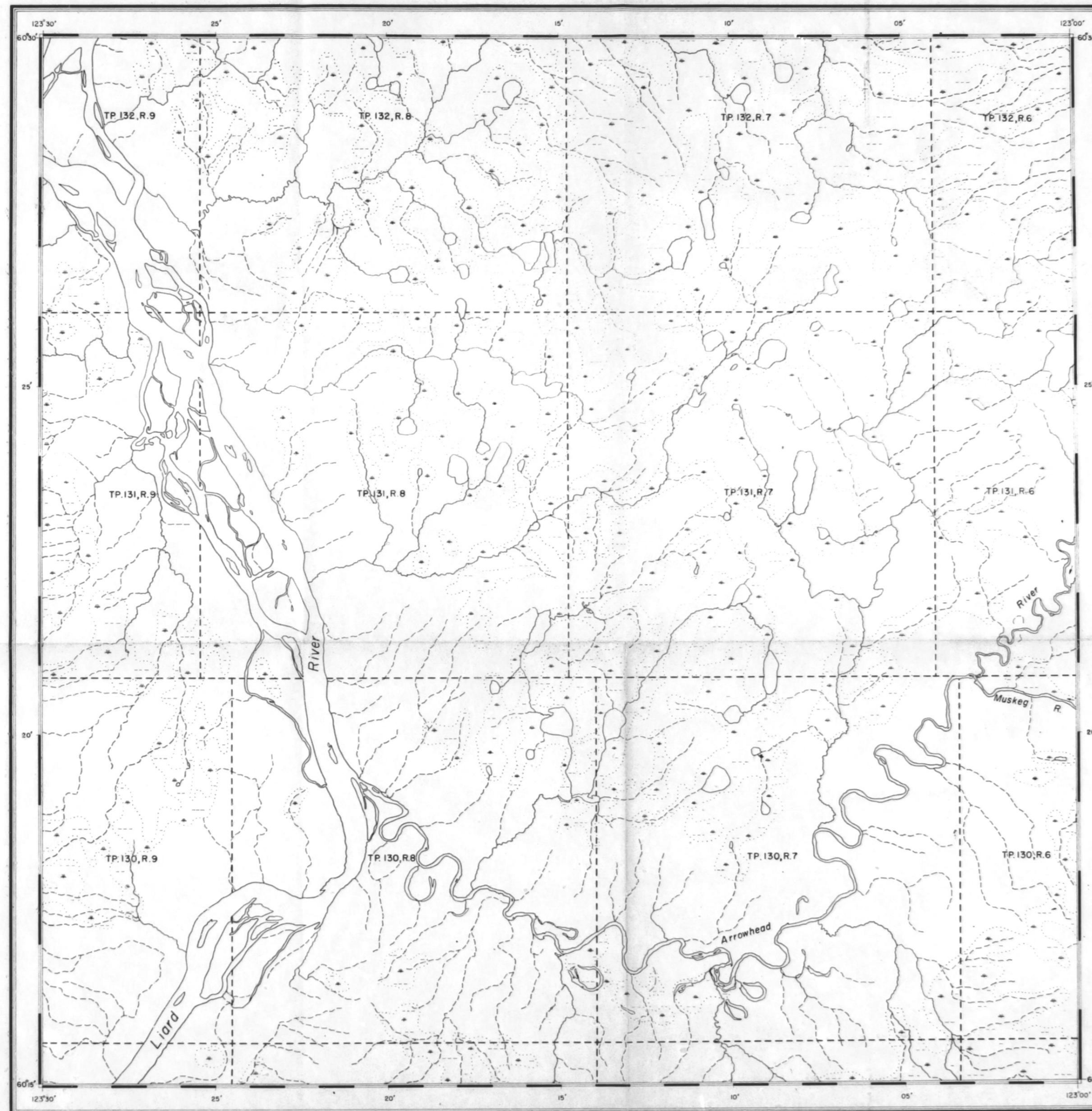
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OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

SHEET No. 95

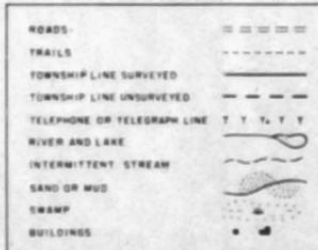


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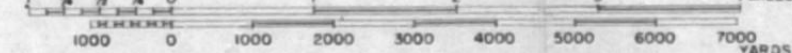
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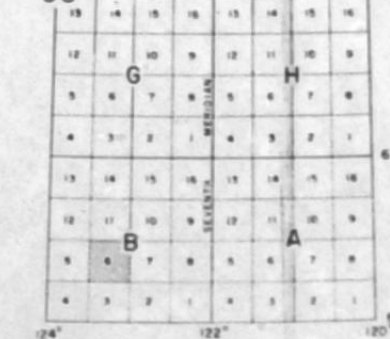


WEST OF SEVENTH MERIDIAN

Scale: One Inch to One Mile = $1/63,360$



Published 1953

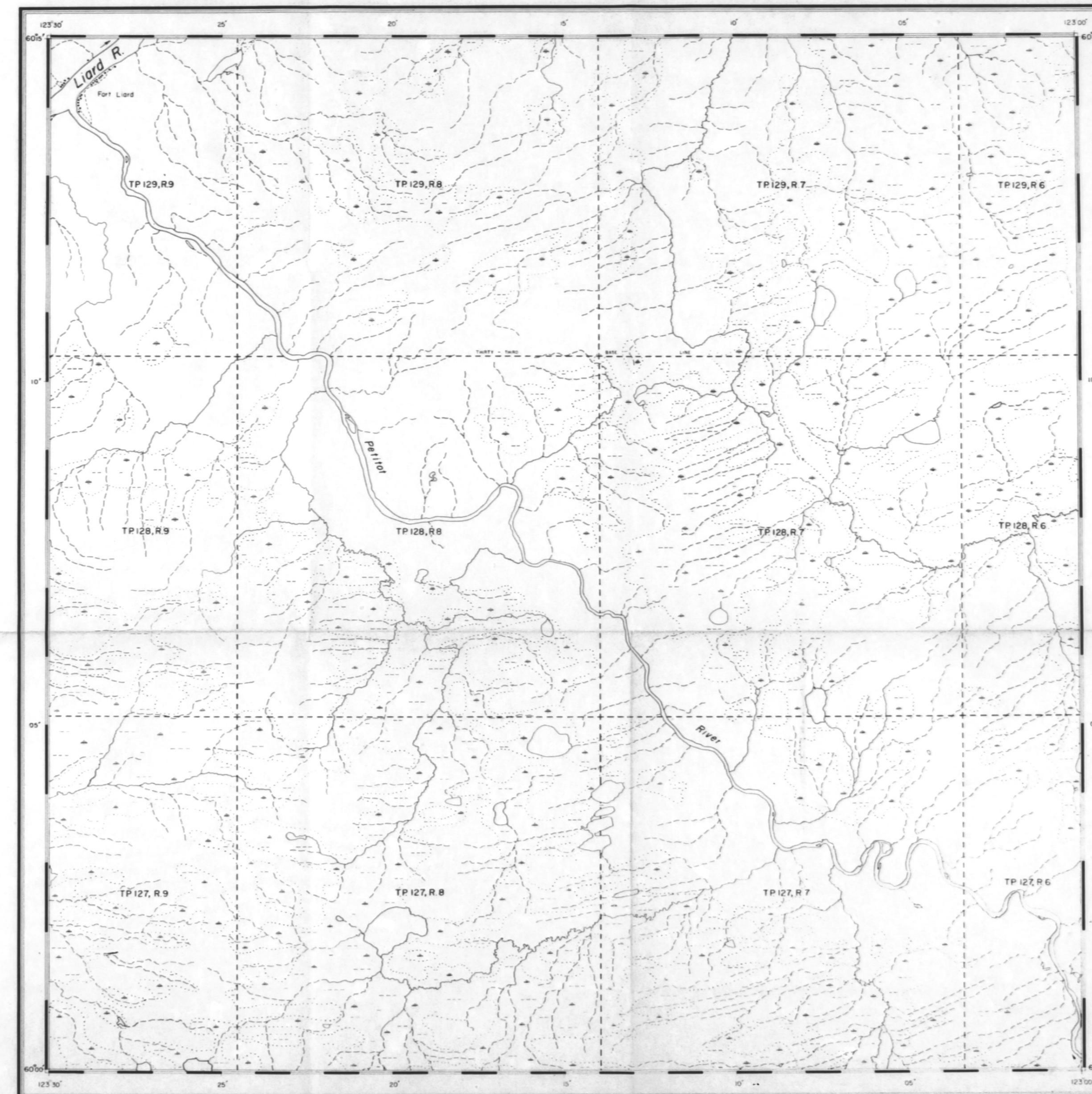


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OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

SHEET No 95

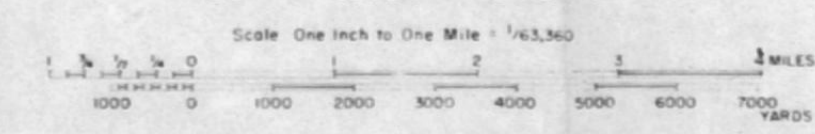


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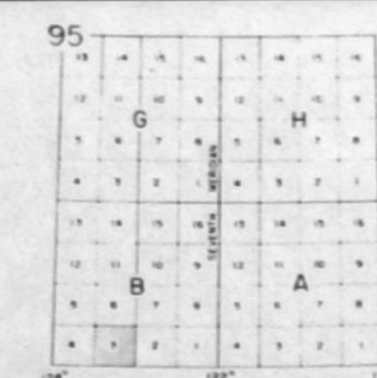
REFERENCE

Water	Blue
Swamp	Green
Shrubland	Yellow
Forest	Brown
Grassland	White
Barren land	Black
Settlement	Red
Boundary	Black
Survey line	Black
Survey point	Black

WEST OF SEVENTH MERIDIAN



Published 1953



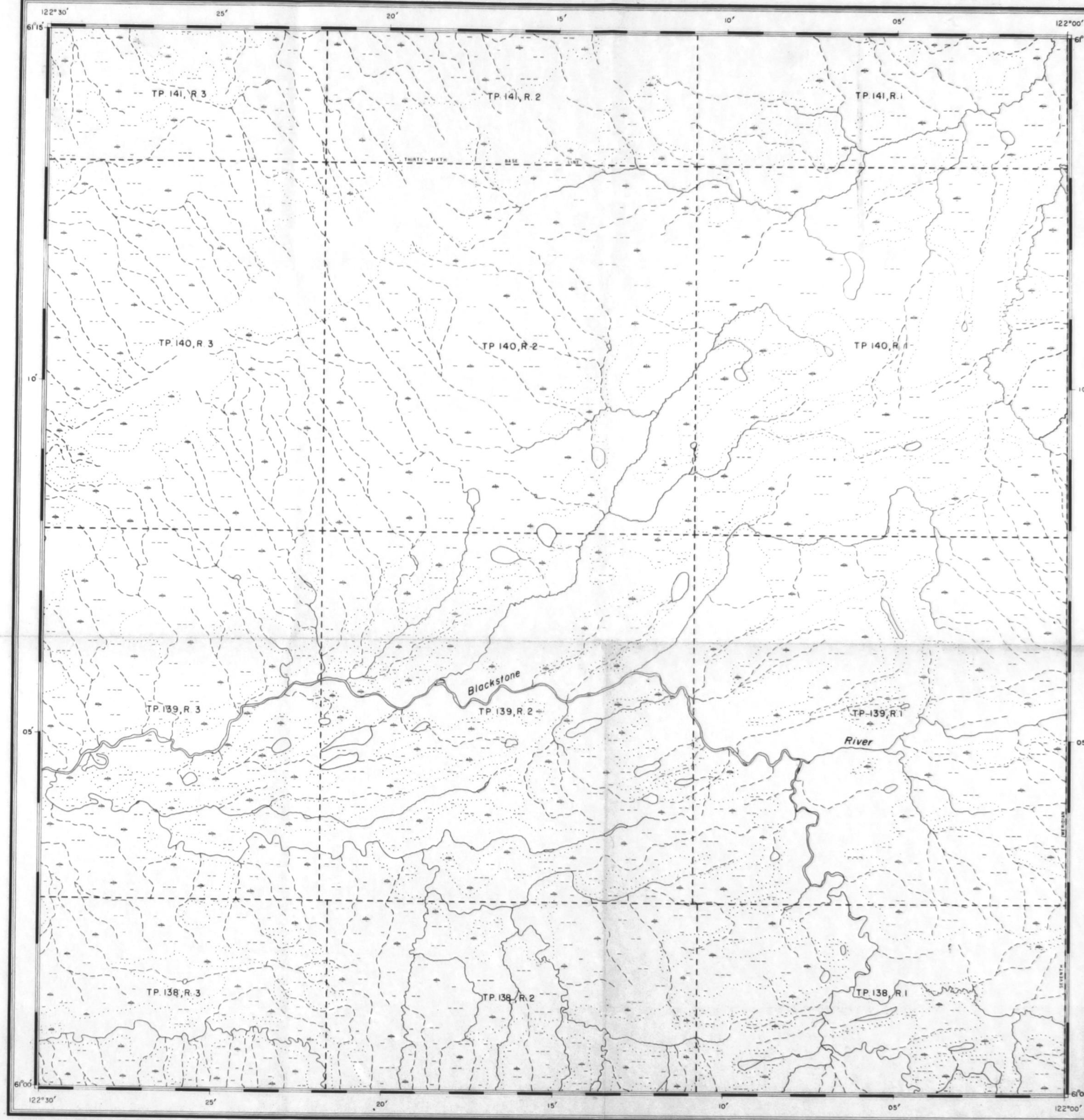
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OIL DEVELOPMENT SERIES

NORTHWEST TERRITORIES

SHEET No. 95 $\frac{6}{1}$



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REFERENCE	
LINE SURVEYED	— — — — —
LINE UNSURVEYED	- - - - -
OR TELEGRAPH LINE	?? ? ? ?
RAIL	— — — — —
WATER STREAM	~~~~~
RAILROAD	— — — — —
RAILROAD	— — — — —

WEST OF SEVENTH MERIDIAN

Scale One inch to One Mile = $1/63,360$

Published 1953

Figure 1 shows a 10x10 grid representing a 100-acre field. The grid is labeled with row numbers 1-10 on the left and column numbers 1-10 on the top. A shaded 2x2 area in the center is labeled '100' and '100'. The grid is divided into four quadrants by a vertical line between columns 5 and 6 and a horizontal line between rows 5 and 6. The quadrants are labeled 'G' (top-left), 'H' (top-right), 'B' (bottom-left), and 'A' (bottom-right). The grid is also labeled with '95' in the top-left corner and '100' in the bottom-right corner.

NOTE: The maps in this series have been compiled by aerial survey methods to the best available ground control surveys. Owing to the limited extent of existing surveys in the area, the maps should be considered to be of a reconnaissance type.

Township and Range line positions have been based on the computed coordinates of theoretical township corners and are therefore subject to possible revision as new survey data becomes available.



3.0 x

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