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PETROLOGY OF CRETACEOUS COALS FROM NORTHERN ALASKA

FINAL TECHNICAL REPORT

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Abstract

Alaska has large coal resources and a major portion of these lie on the Arctic North Slope. A project was initiated with the support of the U.S. Department of Energy to conduct a reconnaissance petrological survey of the Northern Alaska field, in order to get a better idea of the potential for liquefaction of the coals. Approximately 300 samples of coals were collected from surface outcrops, diamond drill holes, auger holes, seismic shot holes and oil exploration test wells, from a 10,000 square mile area. A comparison of vitrinite reflectance with other analytical data showed that outcrop samples, auger hole samples and seismic shot hole samples from a depth less than 40 feet are oxidized, and vitrinite reflectance would be better criterion for rank determination than the other parameters. Coals from Tunalik test well gave a satisfactory correlation of moist, mineral-matter-free heating value with depth, whereas reflectance values showed wide scatter. The macerals counted for quantitative petrology were ulminite/vitrinite, pseudovitrinite, gelinite, phlobaphinite, pseudophlobaphinite, sporinite, resinite, cutinite, alginite, exsudatinite, thick cutinite, suberinite, other liptinites (including liptodetrinite) fusinite, semifusinite, macrinite, globular macrinite, inertodetrinite and sclerotinite.

Trend surface analysis showed that coals with the highest reflectance, lowest inertinite and highest liptinite lie in the foothills region. Some samples in the Cape Beaufort region had inertinite concentrations up to 50 percent. Reflectance and microhardness data are presented for various macerals for the twelve representative coals from the study area.

Acknowledgements

The authors wish to express their appreciation to Mr. James E. Callahan who supplied the coal samples and to Dr. Ernest N. Wolff, Associate Director, M.I.R.L., for his active support of a coal research program. Special thanks are due to Carol Wells and Louella Finch for typing the manuscript. We are also grateful to the U.S. Department of Energy for providing financial support under grant No. DE-FG22-80PC30237 and to John C. Winslow, Project Manager, Advanced Research Contracts Branch, Pittsburg Energy Technology Center. The authors are grateful to Dr. William Spackman, Dr. N.H. Bostick and Mr. James E. Callahan for their kind review and comments of the manuscript.

Introduction

This study is a reconnaissance petrological investigation of coals from the Northern Alaska coal field. Samples are taken from a 10,000 square mile area, and results represent samples from all regions. The principal objectives are:

a. Determination of rank from vitrinite reflectance. The majority of samples are from outcrops and shallow drill holes and are subject to weathering.

b. Determination of regional variation in rank in terms of vitrinite reflectance, indicative of regional tectonic settings.

c. Evaluation of maceral composition to delineate seams rich in reactive macerals that would make feed stock for liquefaction.

d. Regional evaluation of concentrations of reactive and inert macerals in coals.

e. Evaluation of coal petrology as an indicator of environments of coal desposition.

f. Determination of the variability of reflectance and microhardness of the principal macerals within the same sample and between samples of varying rank as an aid in the interpretation of coal liquefaction yields.

Sample Collection

Coal in northern Alaska (Figure 1) occurs in two sedimentary rock sequences, the Nanushuk group of Early to Late Cretaceous age and the Colville group of Late Cretaceous age (Callahan 1980, Chapman and Sable 1960). Figure 2 is a generalized facies diagram of Cretaceous rocks in the Utukok-Corwin region by Chapman and Sable (1960).

Most of the samples used in this investigation were collected between 1967 and 1980 by the U.S. Geological Survey, Anchorage, under the direction of

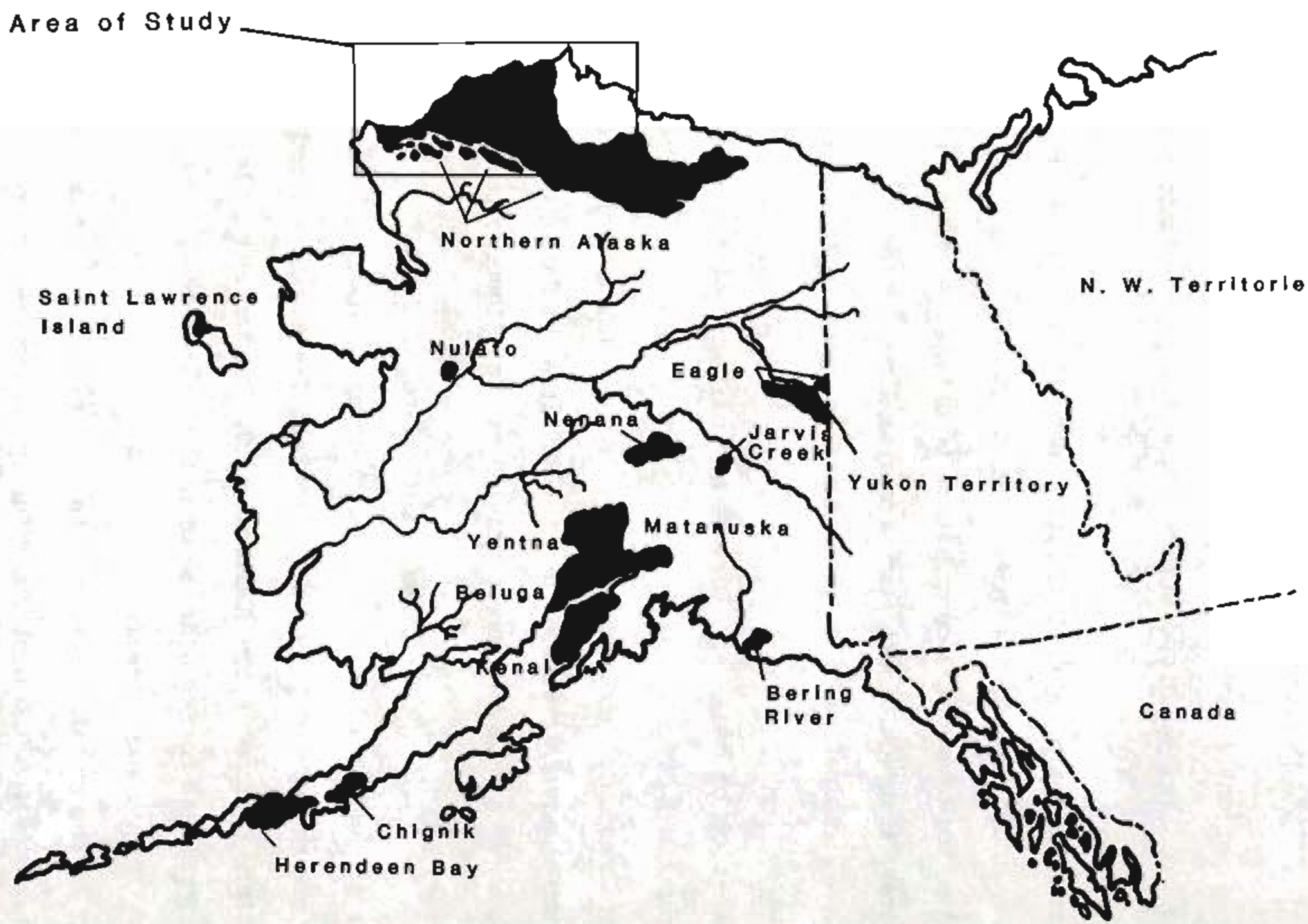


Figure 1 Major Coal Resource Areas in Alaska.

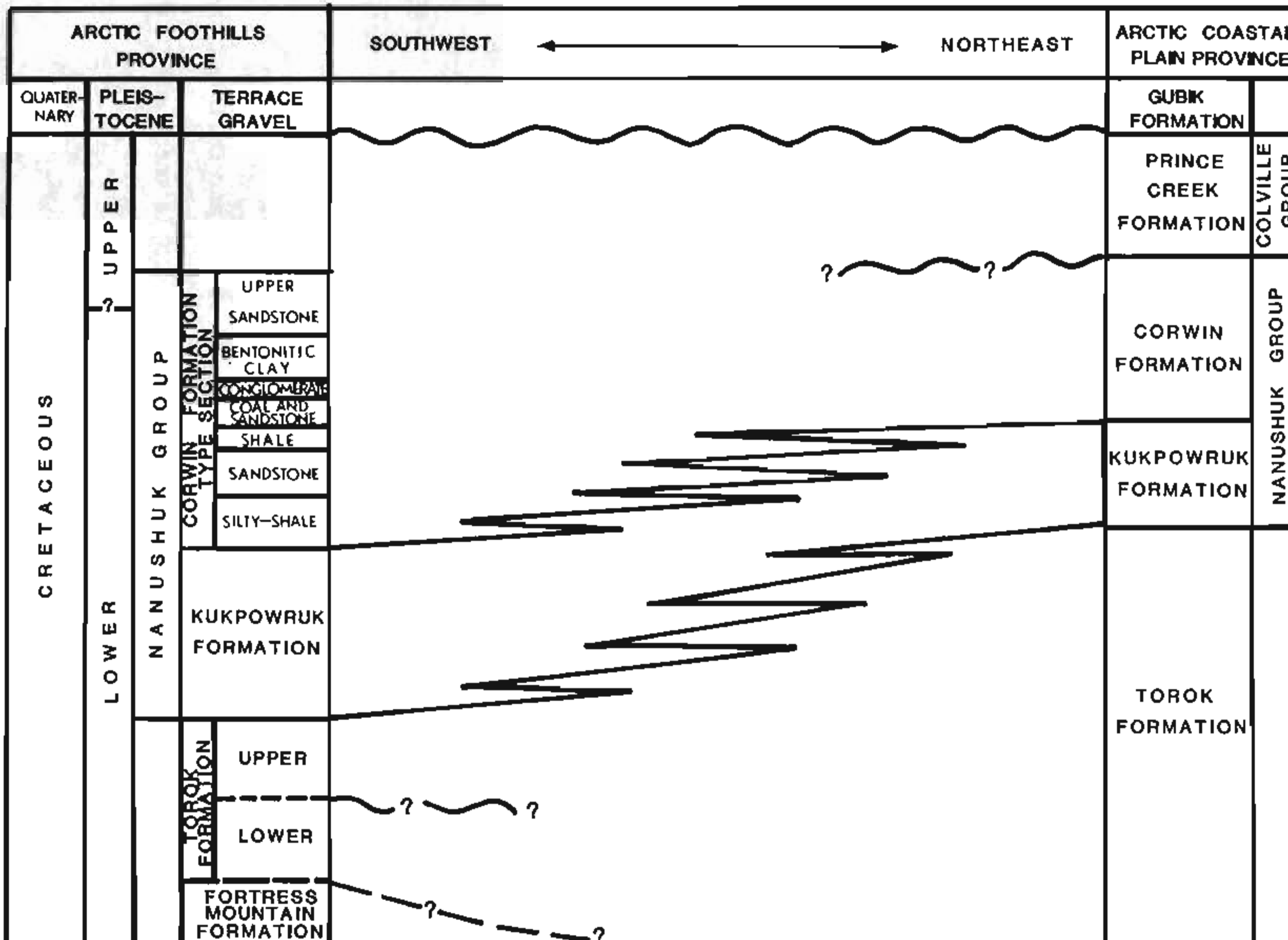


Figure 2 Generalized Facies Diagram of Cretaceous Rocks and Surficial Deposits in the Utukok-Corwin Region (wavy lines represent unconformities). Chapman and Sable (1960), p. 69.

Mr. James E. Callahan. The study area reaches from the foothills of the Delong Mountains to the Arctic Ocean. Most of the sampling locations lie between Kuk River and the Chukchi Sea, although a few are spread as far east as Umiat (Figure 3). There is no surface transportation and the helicopter was the principal access to the sampling locations. Methods of sample collection included: 1) sampling of surface outcrops, 2) diamond drill cores, 3) auger holes, 4) seismic shotholes drilled primarily for oil exploration programs and 5) oil exploration test wells.

Plate I-1 shows sampling by auger. Much of the terrain in the study area is gentle and the coal outcrops are hidden by tundra cover. The best observable evidence of outcrops is coal powder produced when ground squirrels dig into the coal seam for a home. Coal seams are preferred as they are easier to dig than associated rocks. The coal dust can be seen from a helicopter. Coal dug by ground squirrels may be seen in the foreground of the photograph (Plate I-1). The Auger holes are located close enough to the subcrop revealed by ground squirrels so that the auger can penetrate the total thickness of the seam. Maximum penetration depth for the auger is approximately 35 feet.

Chemical Analysis of the Coal Samples

Chemical analyses of most of the samples were done by the U.S. Dept. of Energy; much of the analytical data were published as U.S. Geological Survey open-file reports and publications (Callahan et. al, 1969, 1971, Callahan 1975, Callahan and Sloan 1978, Martin and Callahan 1978, and Callahan and Martin 1980). These are included here for the sake of completeness and ready availability for the user of this report (Tables 4 through 19). The data are recalculated and presented on an equilibrium moisture basis for proximate and ultimate analyses. Volatile matter and fixed carbon are presented on a dry,

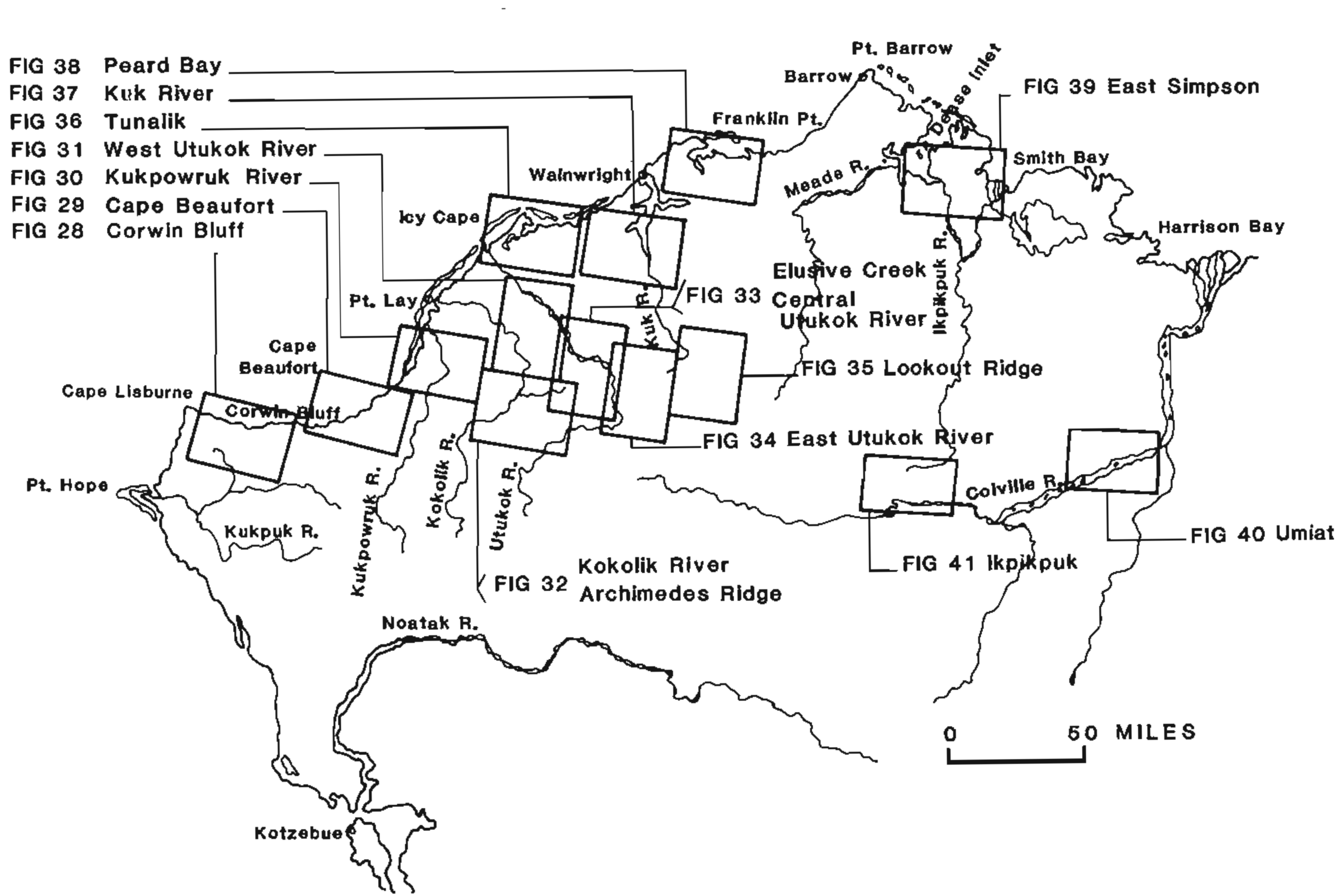


Figure 3 Study Area Showing Locations of Enlarged Maps.

Plate I

1. Auger sampling of coal seams by U.S. Geological Surveys crews in the National Petroleum Reserve in Alaska. Coal dug by ground squirrels may be seen in the foreground, and is used to locate outcrops hidden under the tundra from the air.

2. Leitz Orthoplan microscope with MPV-3 system.

mineral-matter-free (Mm-free) basis, and heating value on a moist, mineral-matter-free basis, for ready comparison to ASTM rank parameters. Such comparisons are only feasible for fresh samples obtained from deep drill holes. Surface samples and certain auger samples and seismic shot holes too close to the surface (< 40') would likely have low heating value due to weathering. Reflectance would still be usable as a guide to rank for these coals, as it is generally accepted that vitrinite reflectance is influenced only to a minor extent by weathering, but severely effects the heating value of coals (Stach, 1982). Table 1 shows a comparison of various rank parameters and ASTM rank classification. This chart was prepared using Stach (1982), Tables 4 and 4a except mean reflectance values were converted to maximum values using ICCP handbook rank, Figure 4. It is of particular value as a guide for assigning apparent rank for weathered outcrop samples using vitrinite reflectance.

Table 1 Comparison of Various Rank Parameters to a ASTM Rank Classification.

Source: Coal Petrology, E. Stach (1982), p. 47 and ICCP handbook (1963), Rank Fig. 4.

Rank		Vitrinite Reflectance Rmax oil %	Volatile Matter Dry, Mm free %	Heating Value Btu/lb. Moist, Mm free	Carbon Dry, Ash free %	Bed Moisture %
Peat		0.2			60	75
Lignite		0.3		8 300		35
Sub-Bit.	C	0.4		9 500		
	B				71	25
	A	0.5		10 500		
High Volatile Bituminous	C	0.6		11 500	77	8-10
	B	0.7		13 000		
	A	0.8 0.9 1.0 1.1	31	14 000		
Medium Volatile Bituminous		1.2 1.4 1.6	30 28 26 24		87	
Low Volatile Bituminous		1.7	22 20 18 16			
Semi-Anthracite		2.2	14 12 10			
Anthracite		2.8 3.0	8 6 4		91	
Meta- Anthra		6.0	2			

Previous Investigations

Coal was mined in this region for whaling ships as early as 1879 (Schroder 1904, p. 109). A.J. Collier (1906) made a reconnaissance study of coastal coal bearing areas in 1904. Detailed exploration began after the establishment of naval petroleum reserve No. 4 (Now National Petroleum Reserve - Alaska) in 1923. Since then several U.S. Geological Survey field parties have worked in the region and have had their results published, such as Paige, Foran and Gilluly (1925), Smith and Mertie (1930). The most comprehensive description of the geology of the region was presented by Chapman and Sable (1960). Between 1966 and 1980 the U.S. Geological Survey and the U.S. Bureau of Mines undertook extensive investigation of the coal deposits of the region. These included sampling of coals from the Kukpowruk River exposures, Corwin Bluff, Lagoon, Ikikileruk Creek, Akulik Creek, and the Cape Beaufort region by drill holes and auger holes; and the Kuk, Utukok and Kokolik river regions by auger hole and shallow seismic shot holes. U.S. Bureau of Mines contributions included investigations by Tongues and Jolley (1947), drilling and sampling of coal beds by Warfield (1966) and by Warfield and Boley (1969). The 1972 drilling of Cape Beaufort coals was a collaborative effort of Callahan and Warfield. Earliest petrological investigations of Northern Alaska coals were done by Dutcher, Trotter and Spackman (1957). These included coals from Meade River, Kuk River and Umiat. Rao (1980) gave detailed petrology, mineralogy and chemistry of raw coals and float-sink products of 1972 Cape Beaufort drill samples, and Rao and Wolff (1980) gave data for certain raw coals including seams from Mead River and Wainwright and of the washability products.

Laboratory Procedures

Sample Preparation

Samples were crushed to minus 20 mesh and made into duplicate one-inch diameter pellets using epoxy binder. The pellets were polished using a 30 micron metal bonded diamond lap followed by a one micron and a .05 micron alumina slurry.

The reflectance of vitrinite (pseudovitrinite excluded) was determined using ASTM standard procedures, using an orthoplan microscope equipped with an MPV-3 photometry system, a peak reader and a motorized stage attachment (Plate I-2). In general a 5 um square sensing field was used for all macerals with the exception of cutinite where a rectangular aperture is used to fit the size and shape of the maceral in the field with the stage locked in one position. The illumination field was closed down to 130 um.

The maceral analyses of the samples were done by point counting duplicate pellets, using ASTM standard procedures. Normal incident light illumination was used for huminite and inertinite macerals. The pellets were again counted using blue-light excitation for the fluorescent liptinite macerals. The Leitz orthoplan microscope was equipped with an ultra-high pressure 100w mercury arc lamp, a heat absorbing filter, a red suppression filter (BG38), and a blue-light excitation filter (BG12), vertical illuminator fitted with a TK510 dichroic beam splitter, followed by a suppression filter (K530).

Vicker's microhardness was determined using a Leitz Microhardness Tester. A weight of 50 pounds was used for all measurements.

Photographs of the samples were taken using a Leitz vario-orthomat photomicrography system, using a 35 mm camera with Tri-x pan film for black and white and Ecktachrome 400 film for color photography of fluorescent macerals.

A 50x oil objective was used for most of the photographic work and a 20x oil objective was used in cases where larger structures needed to be presented.

Characteristics of Macerals and Their Classification

Coals in the study region range in rank from subbituminous B to high volatile A bituminous, with most of the samples falling within a vitrinite reflectance range of 0.50 to 0.90 (Figure 5). Of all the sixteen regions in the study area only two areas, i.e., Tunalik test well and Peard Bay test well sample contained subbituminous coals and samples from all other areas can be classified as bituminous coals. Even those coals that may be classed as bituminous from their vitrinite reflectances have recognizable phlobaphinite and suberinite (may be lacking fluorescence) usually associated with lignites and subbituminous coals. Petrological descriptions follow ICCP (1963, 71, 76) and Stach's textbook of Coal Petrology (1982) with a few exceptions as noted (Table 2).

Pseudovitrinite has all the characteristics outlined by Benedict and his collaborators (1968), and differs from vitrinite by its higher reflectance, slightly curved slit-like openings indicating the presence of cell structures, and the stepped boundaries of the grains.

In the inertinite group, macrinite occuring as rounded globules is significantly different from macrinite without a form. The globular material (Plate VIII-5) was counted separately, and is termed globular macrinite (Rao, 1980). In the liptinite group, exsudatinite, a highly fluorescent material, occurs as secondary fillings in fusinites (Plate IV-1), semifusinites, partings etc. In general, exsudatinite exhibited very bright fluorescence (in contrast to resinite) ranging from pale yellow to bright gold or orange gold. Resinites on the other hand had duller brown to yellowish brown fluorescence (Plate IV-6). The samples in the study area had a significant concentration

Table 2 Maceral Classification for Northern Alaskan Coals

Low Rank Coal Classification: Maceral Group	Maceral Subgroup	Maceral	Maceral Class for this study	Bituminous Coal Classification: Maceral Type	Maceral	Maceral Group
huminite	humo-telinite	ulminite	vitrinite	telinite		vitrinite
				vitro-detrinite		
	humo-detrinite			telo-collinite	collinite	
	humo-collinite	gelinite	gelinite	gelo-collinite		
		corpo-huminite	phlobaphinite	corpo-collinite		
			pseudo-phlobaphinite			
	———		pseudo-vitrinite		pseudo-vitrinite	

Classification applicable to all Coals

Maceral Group	Maceral Class for this study
inertinite	fusinite
	semifusinite
	macrinite 1
	globular macrinite 2
	inertodetrinite
	sclerotinite
	micrinite

Maceral Group	Maceral Class for this study
liptinite	sporinite
	resinite
	exsudatinite 3
	cutinite
	thick cutinite 4
	alginite
	other liptinite 5
	suberinite

1 Macrinite occurs as amorphous gelified material binding such macerals as sporinite enclosed within it. Macrinite can also occur as isolated angular or rounded particles with irregular shapes and distinct boundaries.

2 Globular macrinite occurs as isolated spherical particles or as an agglomeration of particles, that are usually associated with vitrinite and frequently display oxidation rims, dessication cracks or differential compaction. They are also associated with semifusinite and can be found filling cell lumens.

3 Exsudatinite occurs as fillings of small cracks or partings within the bedding planes of the vitrinite, or as cell lumen fillings in semifusinite and fusinite. Exsudatinite in fluorescence light exhibits a variety of color from pale yellow to a bright gold or an orange gold.

4 Thick cutinite occurs as wide, banded lenses with thick cuticular ledges, and are usually strongly folded. Some thick cutinite exhibits multiple layers. In fluorescent light thick cuticles emmit a bright yellow color similar to the color of fluorescing alginite.

5 Other liptinites include liptodetrinites and other liptinitic materials such as waxes, fats and oils that cannot be identified under one of the other liptinite classes.

of thick walled cutinite that is considerably thicker (approximately 20 to 30 microns) than normal thin walled cutinite (1-2 microns thick). These were termed thick cutinite. They had very bright yellow fluorescence (Plate III-2) similar in visual color and intensity to alginite (Plate II-8). Reflectance of this thick cutinite has been found to be considerably lower than that of normal cutinite and is comparable to the reflectance of alginite. For example, for sample SS-67-10 from Kukpowruk, reflectance of the three macerals were: cutinite, 0.3 percent, thick cutinite, 0.1 percent and alginite, 0.08 percent (Table 3). All material counted as suberinite did not show fluorescence and the classification was based on morphology. Any fluorescing material that could not be classified under any of the liptinite macerals is grouped under the category "other liptinite". Due to lack of fluorescence spectral data, positive identification of fluorinite and bituminite could not be made and are probably counted under exsudatinite or other liptinite group.

Coal Rank

Corwin Bluff

Analyses of Corwin Bluff coals are shown in Table 4. Sample no's. SS 70-17 thru 33L are from the Thetis mine and samples SS 70-73 thru 88 are from the Corwin mine. All samples were from surface outcrops and the heating values would not truly reflect the rank of the coal. The highest moist, Mm-free heating value of this group of samples is 13,197 Btu/lb obtained for SS 70-W73. This sample had a free swelling index (F.S.I.) of 1.5 and was the only sample in this group that showed agglomeration. Mean maximum reflectance of vitrinite in oil (Vmoil) is shown in Table 20, indicating that the coals range in apparent rank from high volatile C to B bituminous. Sample 70-W73 has a reflectance of .69%, which clearly places it in high volatile B bituminous

Plate II

Sporinite, cutinite and alginite in fluorescence

1. Sporinite (s) embedded in vitrinite (v). Cape Beaufort coal (UA 87).
2. Same as 1., but taken under blue - light excitation.
3. Cutinite (c) and sporinite (s) in vitrinite (v). West Utukok River coal (630 SP 413).
4. Same as 3., but taken under blue - light excitation.
5. Cutinite (c), sporinite (s) and inertodetrinite (i) in vitrinite (v). Kukpowruk River coal (SS 67-8).
6. Same as 5., but taken under blue - light excitation.
7. Alginite (a) in vitrinite (v). Cape Beaufort coal (UA 83).
8. Same as 7., but taken under blue - light excitation.
9. Alginite (a) in vitrinite (v). Cape Beaufort coal (UA 87).
10. Same as 9., but taken under blue - light excitation.

Photomicrographs 1, 3, 5, 7, 9 taken in normal incident light, oil immersion, width of field 140 microns.

Plate II

Sporinite, cutinite and alginite in fluorescence

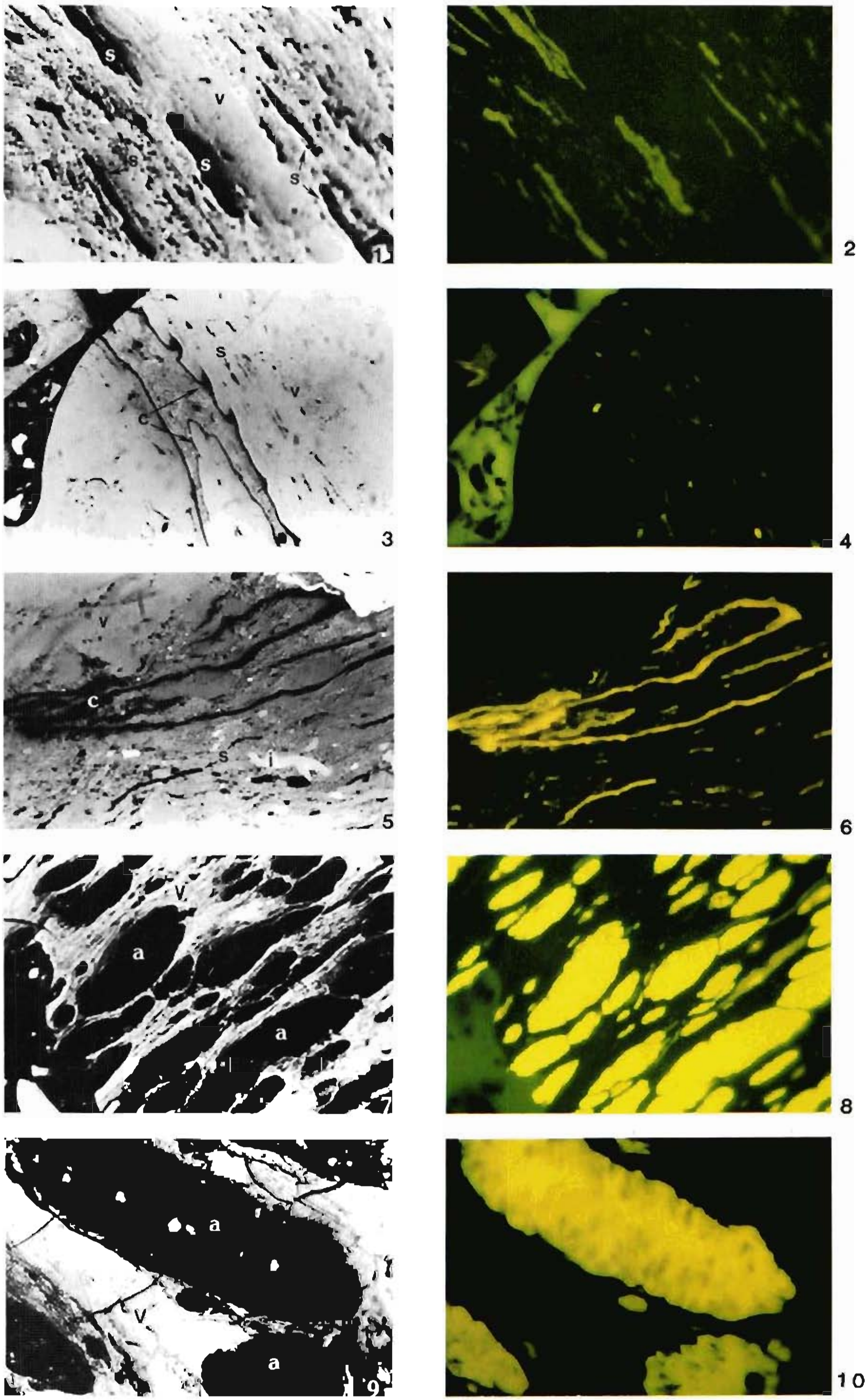


Plate III

Thick cutinite and sporinite in fluorescence

1. Sporinite (s) derived from megaspore exine in vitrinite (v) with embedded sporinite (s). Kukpowruk River coal (SS 67-5).

2. Same as 1., but taken under blue - light excitation.

3. Thick cutinite (tc) in vitrinite (v). Kukpowruk River coal (SS 67-8).

4. Same as 3., but taken under blue - light excitation.

5. Thick cutinite (tc) showing thickened "intercellular" projections and vitrinite (v). West Utukok River coal (R5XN SP368).

6. Same as 5., but taken under blue - light excitation.

7. Thick cutinite (tc) showing thickened "intercellular" projections and vitrinite (v). Kukpowruk River coal (SS 67-10).

8. Same as 7., but taken under blue - light excitation.

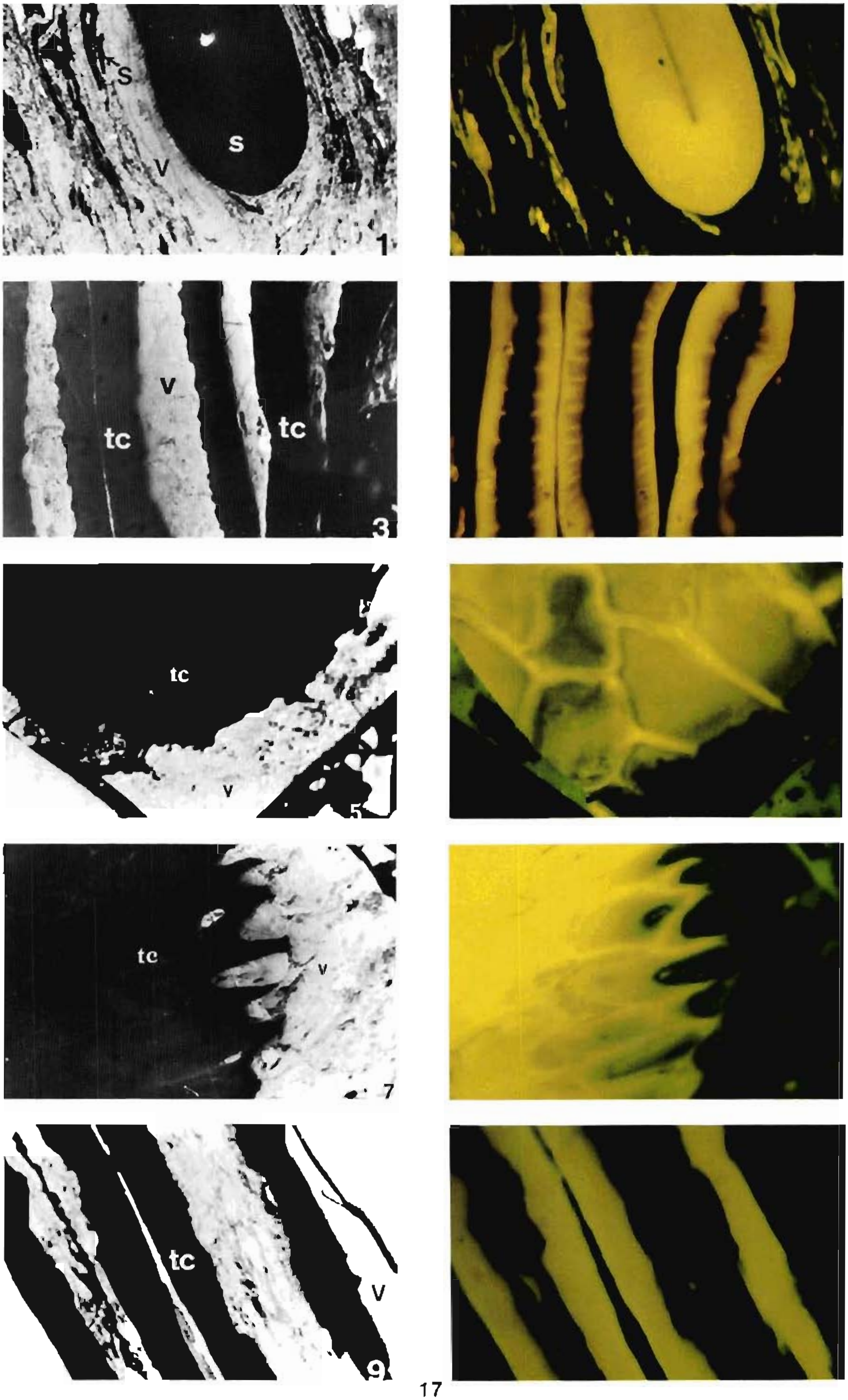
9. Thick cutinite (tc) in vitrinite (v). Elusive Creek coal (AH 37-78 upper).

10. Same as 9., but taken under blue - light excitation.

Photomicrographs are taken in normal incident light, oil immersion. Width of field, Figures 3 - 350 microns, Figures 1, 5, 7, 9 - 140 microns.

Plate III

Thick cutinite and sporinite in fluorescence



2

4

6

8

10

Plate IV

Exsudatinite and resinite

1. Exsudatinite (e) filling cell lumens in semifusinite (sf) from Corwin Bluff coal (SS 70-32B)

2. Same as 1., but taken under blue - light excitation.

3. Fusinite (f) cell lumens filled by vitrinite (v) and exsudatinite (e), vitrinite with sporinite (s) and inertodetrinite (i). Archimedes Ridge coal (133X SP 431).

4. Same as 3., but taken under blue - light excitation.

5. Resinite (r) and vitrinite (v) from Kukpowruk River coal (SS 67-9).

6. Same as 5., but taken under blue - light excitation.

7. Exsudatinite (e) in ulminite (u) from Peard Bay Test Well (135-145').

8. Same as 7., but taken under blue - light excitation.

9. Resinite (r) and exsudatinite (e) in vitrinite (v) from West Utukok River coal (R 5XN SP 340).

10. Same as 9., but taken under blue - light excitation.

Photomicrographs (1, 3, 5, 7, 9) taken in normal incident light, oil immersion, width of field 140 microns.

Plate IV
Exsudatinite and resinite

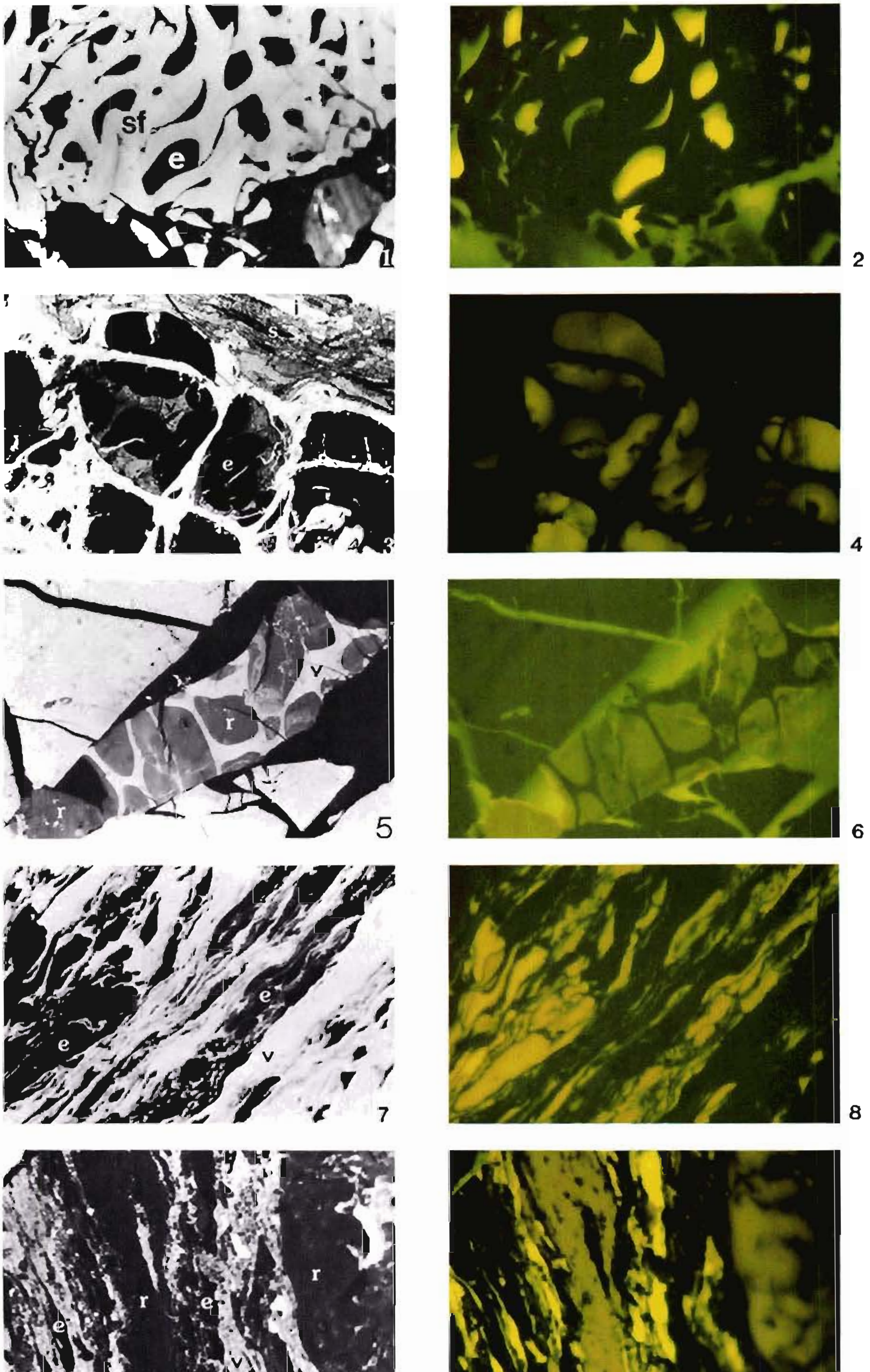


Plate V

Cutinite, thick cutinite and resinite

1. Sporinite (s) and inertodetrinite (i) and micrinite (mi) in vitrinite (v). Kukpowruk River coals (SS 67-4).

2. Cutinite (c), corpocollinite (cc) in vitrinite (v). Cape Beaufort coal (UA 82).

3. Cutinite (c) with long cuticular ledges and sporinite (s) and liptodetrinite (lp) in vitrinite (v). West Utukok River coal (630 SP 413).

4. Cutinite (c) and sporinite (s) in vitrinite (v). Lookout Ridge coals (R7XN SP 488).

5. Semifusinite (sf), macrinite (m), inertodetrinite (i) sporinite (s), cutinite (c), and resinite (r). East Simpson test well #2 (87343-45').

6. Corpocollinite (cc), desmocollinite (dc) and sporinite (s). Lookout Ridge coal (R 7XN SP 531).

7. Thick cutinite (tc) in vitrinite (v) with inertodetrinite (i) and resinite (r). Kukpowruk River coal (SS 67-8).

8. Thick cutinite (tc) in ulminite (u). Corwin Bluff coal (SS 70-32B).

9. Resinite (r) in ulminite (u) with sporinite (s). Corwin Bluff coal (SS 70-30D).

10. Resinite (r) in ulminite (u) with sporinite (s). Corwin Bluff coal (SS 70-32C).

Photomicrographs are taken in normal incident light, oil immersion, width of field, Figures 1, 2, 3, 4, 5, 6 - 140 microns, Figures 7, 8, 9, 10 - 350 microns.

Plate V
Cutinite, thick cutinite and resinite

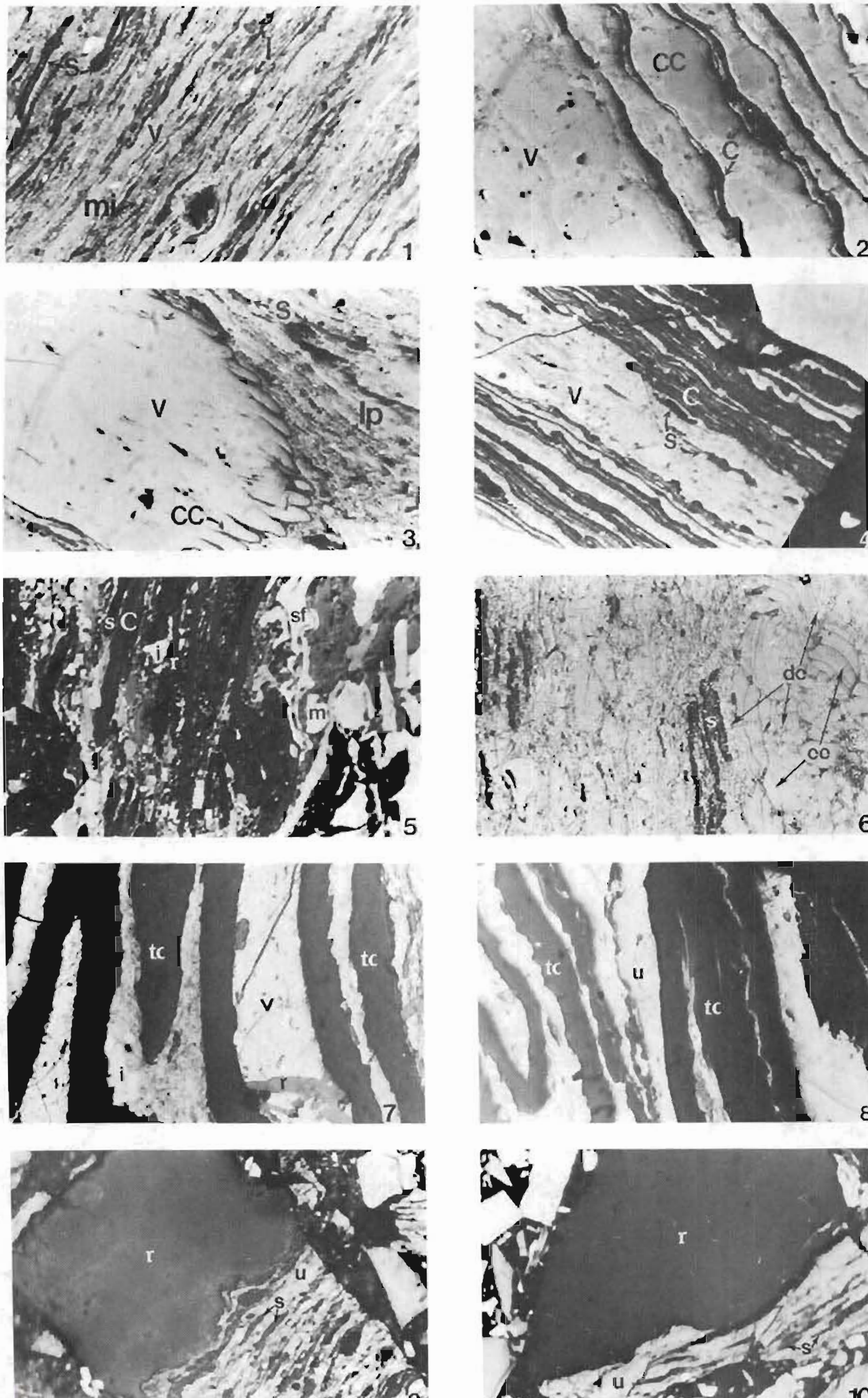


Plate VI

Alginite, resinite and cutinite

1. Alginite (a) embedded in vitrinite (v) with semifusinite (sf) showing differential compaction. Central Utukok River coal (725 SP 230).

2. Alginite (a) embedded in vitrinite (v). Elusive Creek coal (AH 37-78 upper).

3. Alginite (a), sporinite (s) and inertodetrinite (i) in ulminite (u). Kuk River coal (712 SP 11).

4. Alginite (a), sporinite (s) and sclerotinite (sc) embedded in vitrinite. Central Utukok River coal (725 SP 230).

5. Thick cutinite (tc) embedded in vitrinite (v). Cape Beaufort coal (AH 73-29).

6. Thick cutinite (tc) and sporinite (s) embedded in vitrinite (v). Elusive Creek coal (78-35).

7. Thick cutinite (tc), resinite (r), and inertodetrinite (i) in vitrinite. Kokolik River coal (AH 21-78).

8. Thick cutinite (tc), and cutinite (c) in vitrinite (v). Cape Beaufort coal (AH 73-29).

9. Sporinite (s) in vitrinite (v). Central Utukok River coal (725 SP 230).

10. Sporinite (s) and inertodetrinite (i) in vitrinite (v). Archimedes Ridge coal (137X SP 666).

Photomicrographs are taken in normal incident light, oil immersion, width of field 140 microns.

Plate VI
Alginite, resinite and cutinite

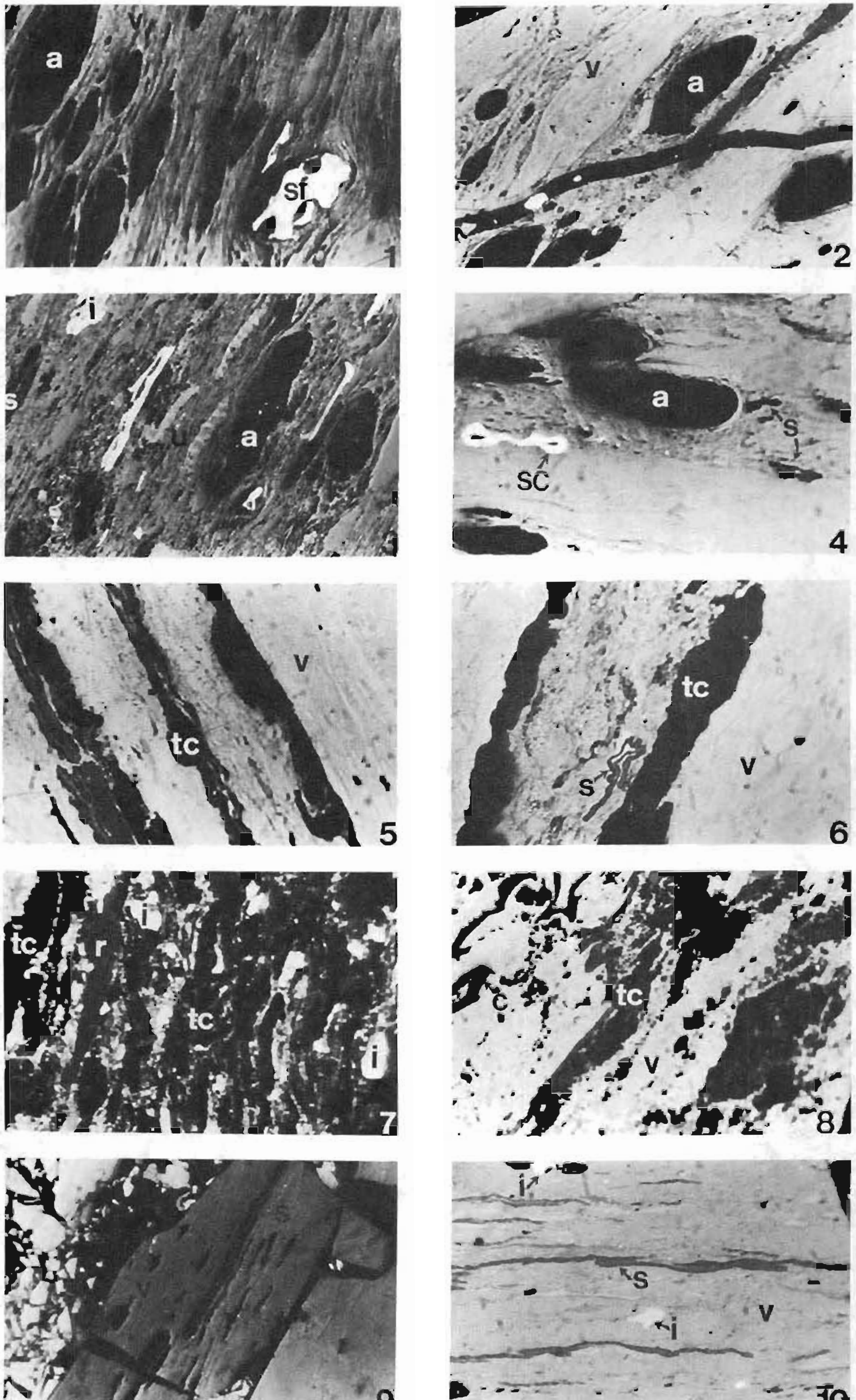


Plate VII

Huminite and Vitrinite

1. Ulminite (u) showing higher reflecting cell walls while cell lumens are filled with lower reflecting corpohuminite. Peard Bay test well coal (190-200').

2. Ulminite (u), corpocollinite (cc) and sporinite (s) in vitrinite (v). West Utukok River coal (725 SP 135).

3. Telinite (t) with cell lumens filled with low reflecting corpocollinite (cc). Cape Beaufort coal (DH 72-11).

4. Vitrinite (v) and low reflecting corpocollinite (cc). Elusive Creek coal (78-35).

5. Inertodetrinite (i) and sporinite (s) in ulminite (u) and a stem or root section showing corpohuminite (ch) cell fillings and subernite (sb) cell walls. Corwin Bluff coal (SS 70-W80).

6. Corpohuminite (ch) cell fillings and suberinite (sb) cell walls. Tunalik test well coal (225-735').

7. Corpocollinite (cc) and suberinite (sb) in vitrinite (v). Elusive Creek coal (78-35).

8. Corpocollinite (cc) and suberinite (sb) in vitrinite (v). Kokolik River coal (AH-21-78).

9. Corpohuminite (ch) and porigelinite (pg) cell fillings and suberinite (sb) cell walls. Tunalik test well coal (225-735').

10. Gelocollinite (gc) and corpocollinite (cc). Kokolik River coal (AH-1-79).

Photomicrographs taken in normal incident light, oil immersion, width of field. Fig. 5 is 350 microns and all others are 140 microns.

Plate VII
Huminite and vitrinite

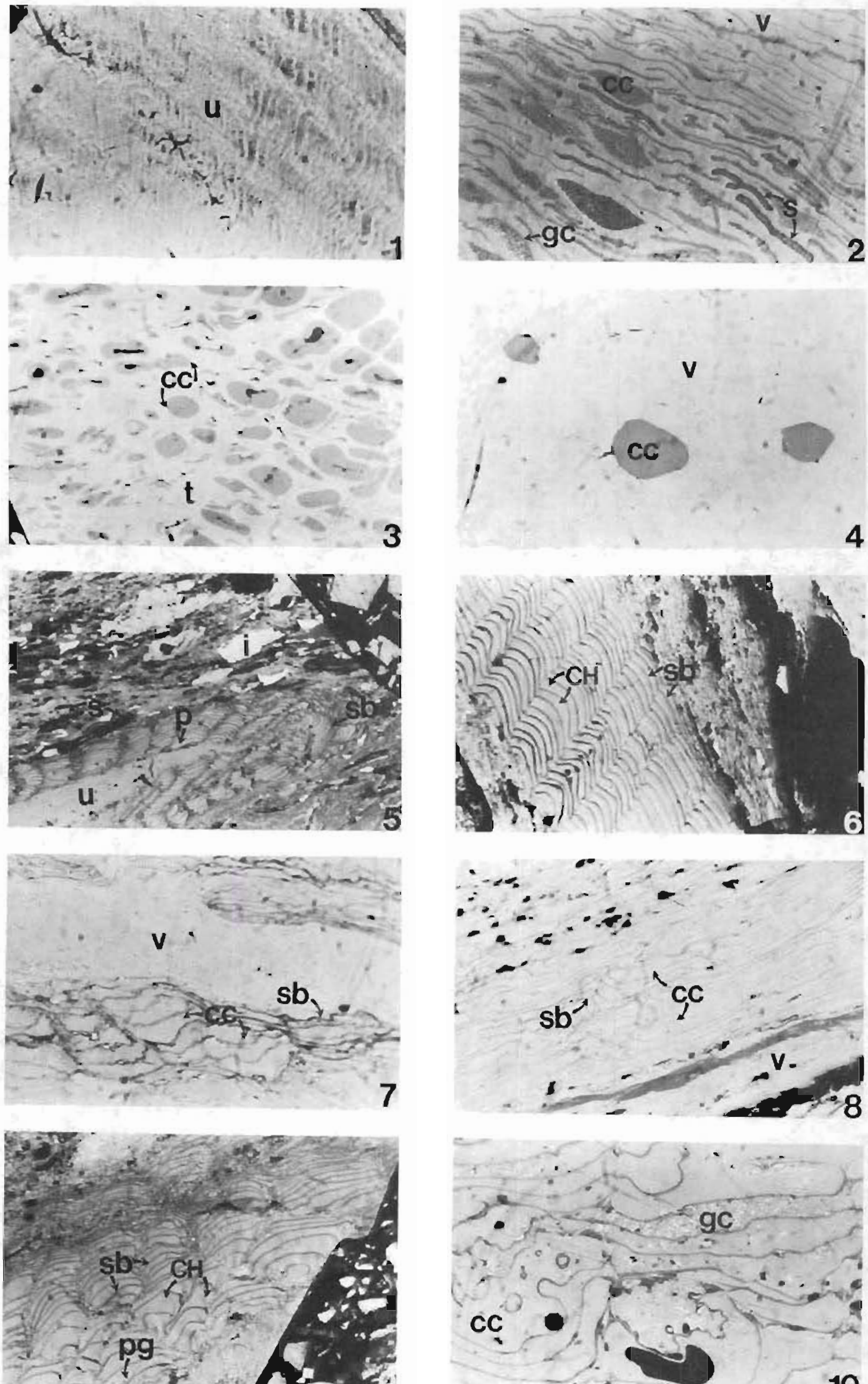


Plate VIII

Globular macrinite

1. Semifusinite (sf) of varying reflectances and vitrinite (v). Cape Beaufort coal (UA 82).

2. Semifusinite (sf) and vitrinite (v) with sporinite (s) and inertodetrinite (i). Central Utukok River coal (725 SP 222).

3. Macrinite (m) and vitrinite (v) with sporinite (s) and thick cutinite (tc). Central Utukok River coal (725 SP 222).

4. Macrinite (m) and vitrinite (v) (showing differential compaction) with sporinite (s) and thick cutinite (tc). Central Utukok River coal (632 SP 383).

5. Macrinite (m) in vitrinite (v) showing differential compaction and displaying concentric growth rings. Central Utukok River coal (632 SP 383).

6. Macrinite (m) in vitrinite (v). Cape Beaufort coal (AH 73-29).

7. Globular macrinite (gm) and porigelinite (pg) with semifusinite (sf). Kuk River coal (712 SP 11).

8. Globular macrinite (gm) with oxidation rims and dessication cracks. Central Utukok River coal (725 SP 216).

9. Globular macrinite (gm) in ulminite (u). Kuk River coal (703 SP 98).

10. Globular macrinite (gm) showing differential compaction. Elusive Creek coal (137X SP 808).

Photomicrographs taken in normal incidents light, oil immersion, width of field 140 microns.

Plate VIII

Globular macrinite

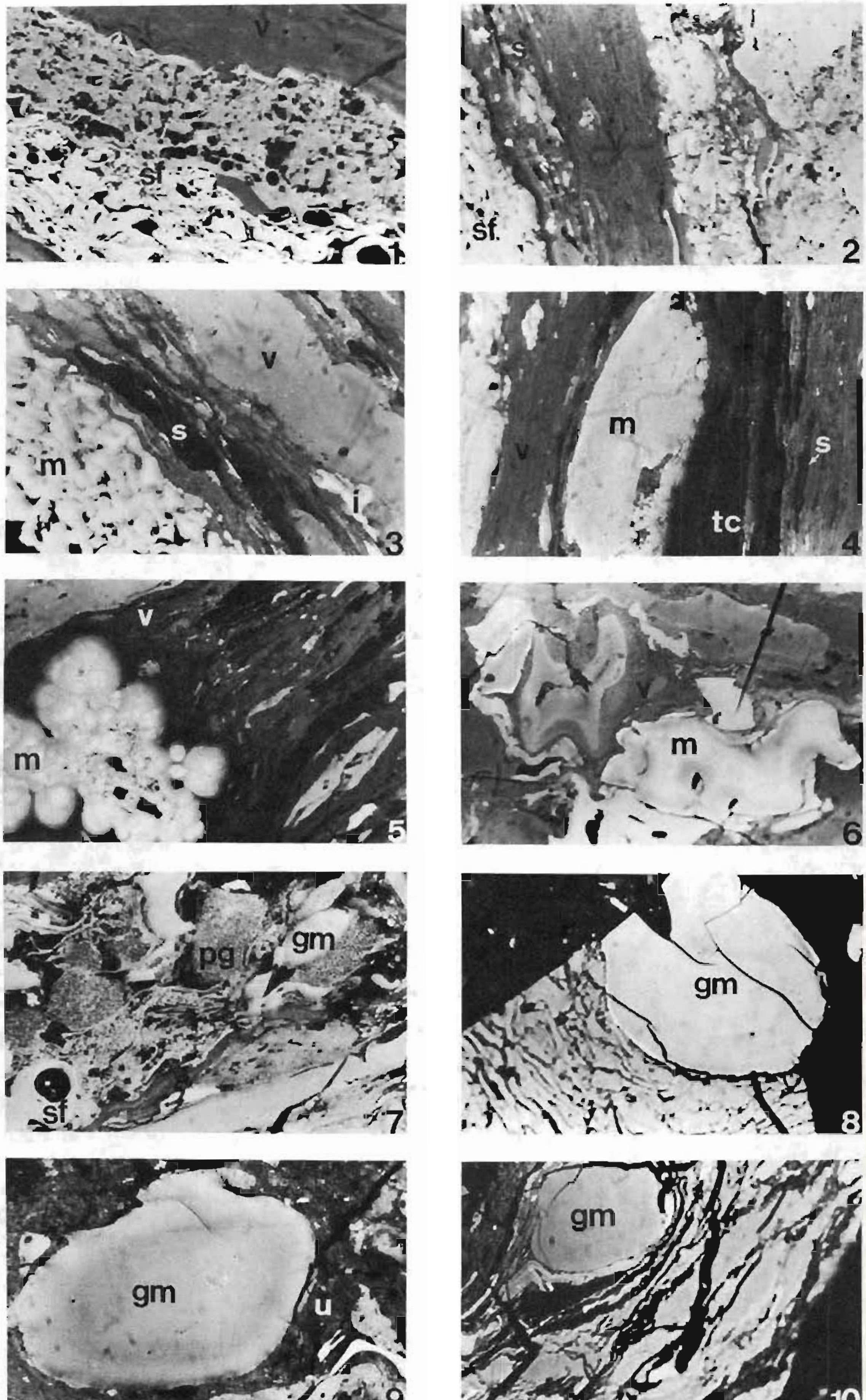


Plate IX

Macrinite and globular macrinite

1. Vitrinite (v) with inertodetrinite (i) macrinite (m), corpocollinite (cc) and sporinite (s). Central Utukok River coal (632 SP 383).

2. Vitrinite (v) with inertodetrinite (i), macrinite (m), sporinite (s) and corpocollinite (cc). Central Utukok River coal (725 SP 222).

3. Ulminite (u) with dessication cracks. Peard Bay test well coal (345-350').

4. An agglomerate of globular macrinite (gm) with mineral matter (mm). Cape Beaufort coal (UA 84).

5. Semifusinite (sf) with globular macrinite (gm) and vitrinite (v) with sporinite (s) and inertodetrinite (i). Kokolik River coal (AH 21-78).

6. Vitrinite (v) with thick cutinite (tc), sporinite (s), exsudatinite (e) and inertodetrinite (i). Central Utukok River coal (632 SP 383).

7. Fusinite (f) and globular macrinite (gm). Tunalik Test Well coal (225-735').

8. Fusinite (f), globular macrinite (gm) and gelocollinite (gc). Cape Beaufort coal (AH 73-6).

9. Macrinite (m), gelocollinite (gc), corpocollinite (cc) inertodetrinite (i) and sporinite (s). Elusive Creek coal (632 SP 321).

10. Globular macrinite (gm) of varying reflectances with gelocollinite (gc) exsudatinite (e), sporinite (s) and corpocollinite (cc). Central Utukuk River coal (632 SP 447).

Photo micrographs taken in normal incident light, oil immersion, width of field 140 microns.

Plate IX

Macrinite and globular macrinite

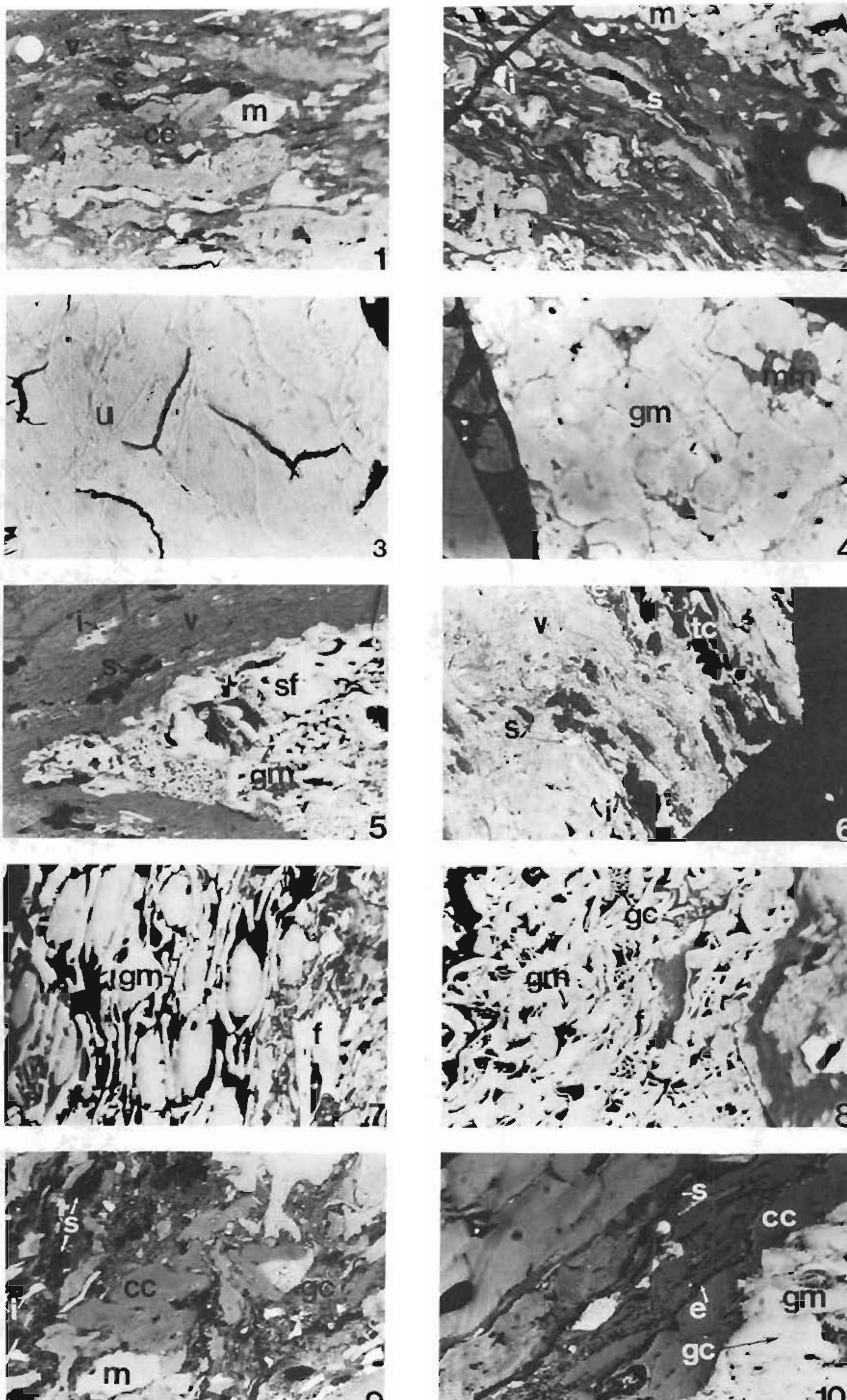


Plate X

Fusinite and semifusinite

1. Semifusinite (sf) from Kokolik River coal (AH-21-78)

2. Semifusinite (sf) with gelocollinite (gc). Elusive Creek coal (605 SP 331).

3. Semifusinite (sf) with gelocollinite (gc). West Utukok River coal (R5XN SP 368).

4. Vitrinite (v) with semifusinite (sf), sporinite (s) and exsudatinite (e). Central Utukok River coal (725 SP 222).

5. Fusinite (f) with exsudatinite (e). Archimedes Ridge coal (133 SP 431).

6. Fusinite (f) with exsudatinite (e). Kokolik River coal (AH 21-78).

7. Fusinite (f) with bogen structure and exsudatinite (e). Elusive Creek coal (137X SP 745).

8. Semifusinite (sf) and fusinite (f) with bogen structure. Lookout Ridge coal (R7XN SP 531).

9. Fusinite (f) and semifusinite (sf). Cape Beaufort coal (UA 84).

10. Semifusinite (sf) and exsudatinite (e). Central Utukok River coal (725 SP 216).

Photomicrographs taken in normal incident light, oil immersion, width of field 140 microns.

Plate X

Fusinite and semifusinite

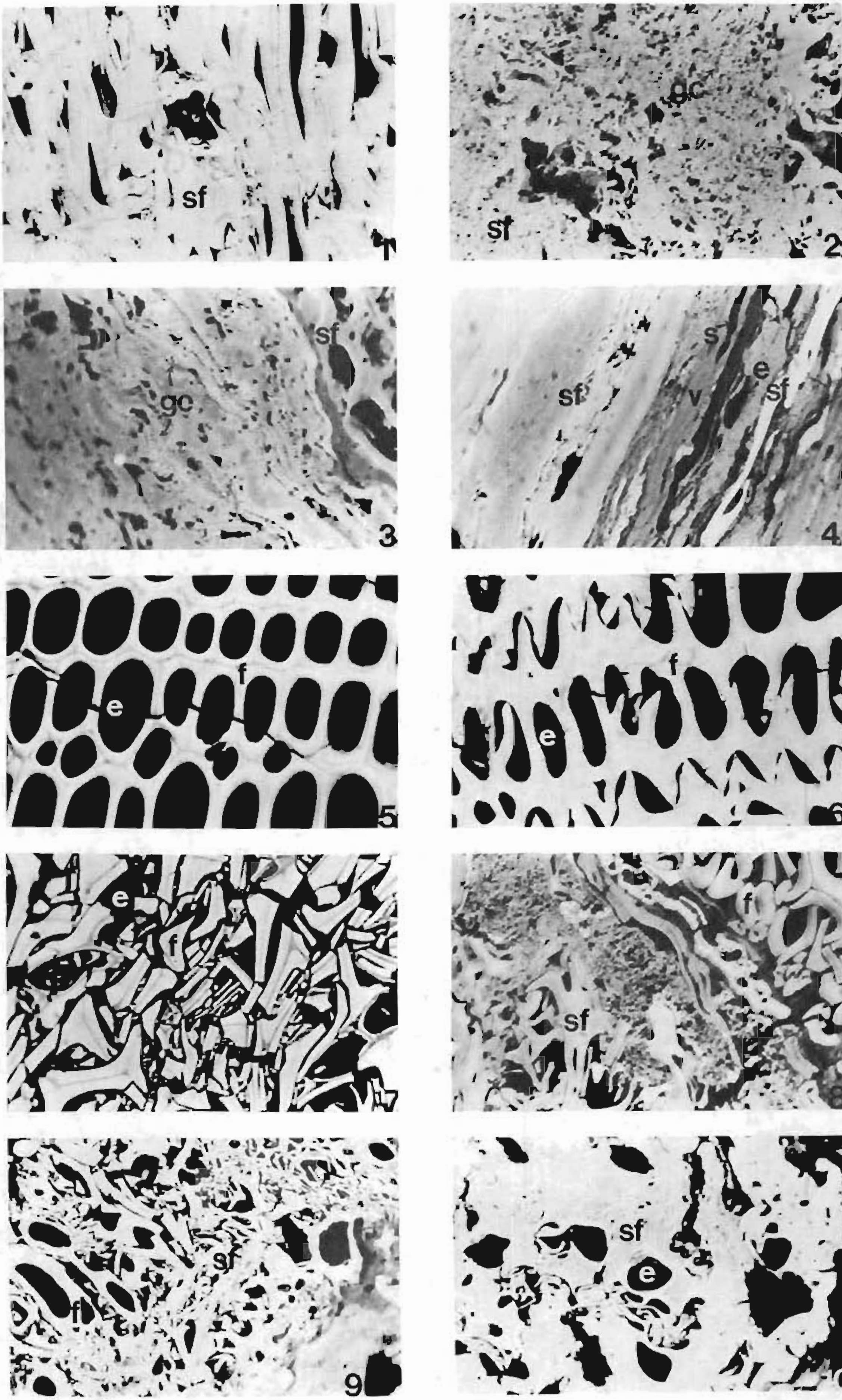


Plate XI

Fusinite, pyrite and pseudovitrinite

1. Ulminite (u) cell walls altered to form micrinite like material, some of the cell lumens are filled with yellow fluoresing exsudatinite (e). Kuk River coal (602 SP 152).

2. Fusinite (f) with bogen structure and exsudatinite (e). Kukpowruk River coal (SS 67-9).

3. Semifusinite (sf), globular macrinite (gm) and exsudatinite (e) filling cell lumens. Elusive Creek coal (632 SP 321).

4. Vitrinite (v) and non-fluoresing mineral matter (mm). Cape Beaufort coal (UA 84).

5. Pyrite (py) and sporinite (s) in vitrinite (v). West Utukok River coal (R5XN SP 368).

6. Globular sclerotinite bodies (sc) with mineral matter (mm) filling cell lumens and vitrinite (v). Kukpowruk River coal (SS 67-9).

7. Semifusinite (sf) with exsudatinite (e) filling cell lumens and cracks in vitrinite (v). Cape Beaufort coal (DH 72-11).

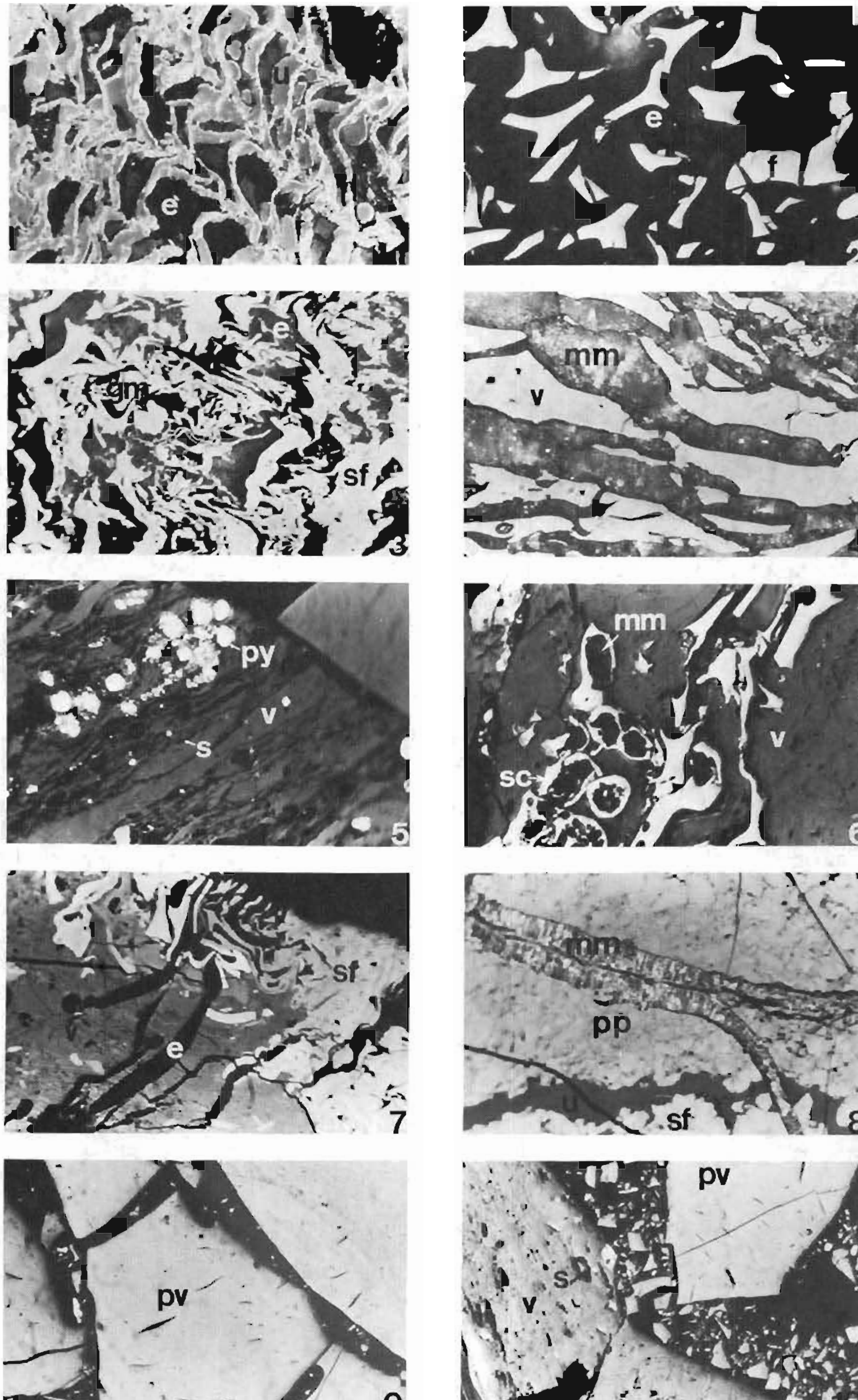
8. Mineral matter (mm) in semifusinite (sf), ulminite (u) and pseudophlobaphinite (pp). Corwin Bluff coal (SS-70-32B).

9. Pseudovitrinite (pv) with serated edges and slits. Cape Beufort (UA 83).

10. Pseudovitrinite (pv) showing higher reflectance than the associated vitrinite (v) with sporinite (s). Cape Beaufort coal (UA 83).

Photomicrographs taken in normal incident light, oil immersion, width of field, Figures 9, 10 - 350 microns, all others 140 microns.

Plate XI
Fusinite, pyrite and pseudovitrinite



rank. Other coals with reflectance less than .6% would be high volatile C bituminous rank. Samples from the Corwin mine, (SS 70-W73 to 88) were slightly lower in rank compared to those from the Thetis mine (SS W17 to 33L) (Figure 28).

Cape Beaufort

Proximate and ultimate analyses of Cape Beaufort (Figure 29) coals are shown in Table 5. Vitrinite reflectance (Vmoil) values are shown in Table 21. The reflectance values seem to indicate that the coals range in rank from high volatile B to A bituminous. The moist, Mm-free heating values do not reflect this. All the samples reported here (Except DH 72-11) were obtained by auger holes. Since the maximum depth to which the auger holes can be drilled is limited to about 35 feet and weathering effects the heating value of coals down to a depth of 25' to 30', it is best to preclude the use of heating value of shallow samples as a parameter for rank determination of the deeper parts of the coal (Callahan, 80, p. 49-51). Analyses of samples obtained during the 1972 drilling program (Callahan, 80) gave moist, Mm-free heating value (for low ash float products) were mostly in excess of 14,000 Btu/lb or slightly lower (Rao, 80) indicating that the general rank of these coals was at the border of high volatile B and A rank. The reflectance values (Table 21) ranging from 0.61 to 0.87 percent appear to support this.

Kukpowruk River coal

Proximate and ultimate analyses of Kukpowruk coals (Figure 30) are presented in Table 6. Table 22 shows vitrinite reflectance values. Samples SS 67-1, 2, and 3 were obtained from a tunnel and the remaining were surface samples. The tunnel samples had moist, mm-free heating values comparable to drill samples of the same seam and were the least weathered of the group.

Only one sample had a heating value high enough to be classed as high volatile A bituminous. The reflectance values, however, indicate that samples SS 67-1 through 8 are probably equivalent to high volatile A bituminous, whereas samples located further north i.e., SS 67-9 through 12 would more likely be of high volatile B bituminous rank (Figure 30).

West Utukok River Coals

Most of the coals in this group were collected during drilling for seismic shot holes (Figure 31). The samples were separated at 1.62 specific gravity to remove extraneous rock particles (Callahan, 80, p. 49) the depth of the sample could vary from a few feet below the surface to as much as 100 feet. The coals sampled along seismic line 725 (Figure 31) are of lower rank, high volatile C bituminus. The coals sampled further south, along seismic line 5 X N are of high volatile B to A bituminous rank (Reflectance, Table 23). Only one sample in this group showed heating value in excess of 14,000 Btu/lb. Even the shot hole samples seemed to have suffered loss of heating values due to weathering. Sample depth interval data for most of the samples in this group, which would have served as a guide for assessment of weathering effects, are not available.

Kokolik River Coals

Sampling of this group of coals was done both by auger holes and seismic shot holes (Figure 32 upper half). Sample UA-126 was a channel sample of an outcrop on Kokolik River. Many of the samples from seismic shot holes gave moist, Mm-free heating values in excess of 14,000 Btu/lb; Auger hole and outcrop samples, however, generally ranged between 10,500 to 12,000 Btu/lb with only a few samples exceeding this value (Table 8) indicating that weathering significantly effects the coal samples obtainable by auger holes. Vitrinite reflectance (Table 24) showed a majority of the sample would probably be high volatile B bituminous rank. Sample UA-126, a surface sample collected by the senior author, is clearly high (0.96% $\bar{R}$ max) compared to others in the region.

Archimedes Ridge

Table 9 shows proximate and ultimate analyses of samples from Archimedes Ridge (Figure 32, lower half). Samples designated with prefix G, the surface samples, had moist, Mm-free heating values ranging from 11,222 to 13,826 Btu/lb. However several seismic shot hole samples had higher than 14,000 Btu/lb. Reflectance values of these coals (Table 25) clearly place the majority of them in high volatile A bituminous rank. The coals in this region had the highest reflectance rank of all the coals in the study area (East Simpson test well excluded). In the axial zone of Archimedes Ridge Anticline and close to the sampling location there are several folds, the limbs of which generally dip 15° but in place dip as much as 35°. There are areas where the limbs dip as much as 85° indicating possible faulting (Chapman and Sable, 1960, p. 140).

Elusive Creek

The Elusive Creek coals were sampled both from seismic shot holes and auger holes (Figure 33). Reflectance rank (Table 26) indicates that most of the coals fall in high volatile B bituminous rank. A few coals had higher or lower rank than this. Analysis of the coal data presented in Table 10 shows that seismic shot hole samples generally agree with this conclusion, with moist, ash-free heating values exceeding 13,000 Btu/lb. and in cases exceeding 14,000 Btu/lb. Shot hole samples collected from shallow depths, i.e., samples 605 SP 307 and 605 SP 342 gave heating values less than 12,000 Btu/lb. The same is true for most of the auger hole samples. Sample UA-125 was a channel sample of an outcrop on Elusive Creek.

Central Utukok River Coals

Most of the samples in this group are located along the seismic line 632 (Figure 33). There is a general trend of decreasing reflectance (Table 27) northward and a range in rank from high volatile A to B bituminous. Only a few of the samples in this group showed heating values greater than 13,000 Btu/lb. (Table 11) indicating the greater effects of weathering on these samples.

East Utukok River Coals

Two samples, R3XNSP 390 and 397 located near the northeast corner of Figure 34 appear to be of fairly low rank. Reflectance data (Table 28) suggest subbituminous A rank while analytical data (Table 12) suggest even lower rank, subbituminous C. The low heating values are attributable to abnormally high equilibrium moisture, and the suggested rank for these two coals is subbituminous A to high Volatile C bituminous.

Lookout Ridge

All the samples were collected along the seismic line R7XN (Figure 35). Samples at the southern end of the line are of high volatile B bituminous rank (Table 13). The rank decrease northward very rapidly to subbituminous A at the northern end of the seismic line. Reflectance data are presented in Table 29.

Tunalik Test Well

Moist, Mm-free heating values show a gradual increase with depth. Heating values increase from 10,134 Btu/lb for sample at depth interval 220' to 300', to 12,209 Btu/lb for the deepest sample collected between 2,580-

2,600' (Table 14). Vitrinite reflectance also showed a trend of general increase in reflectance with depth (Table 30). The rank increased from subbituminous B for the sample closest to the surface to high volatile C at a depth of 2,600'.

Figure 4 shows increase of rank with depth, expressed as a function of carbon content, vitrinite reflectance and heating value of samples from the Tunalik test well. Heating values showed excellent correlation with depth (r = 0.98). Carbon content was a fairly good indicator. Reflectance was least satisfactory, and illustrates the need to develop alternate petrographic criteria for determining rank of outcrop samples.

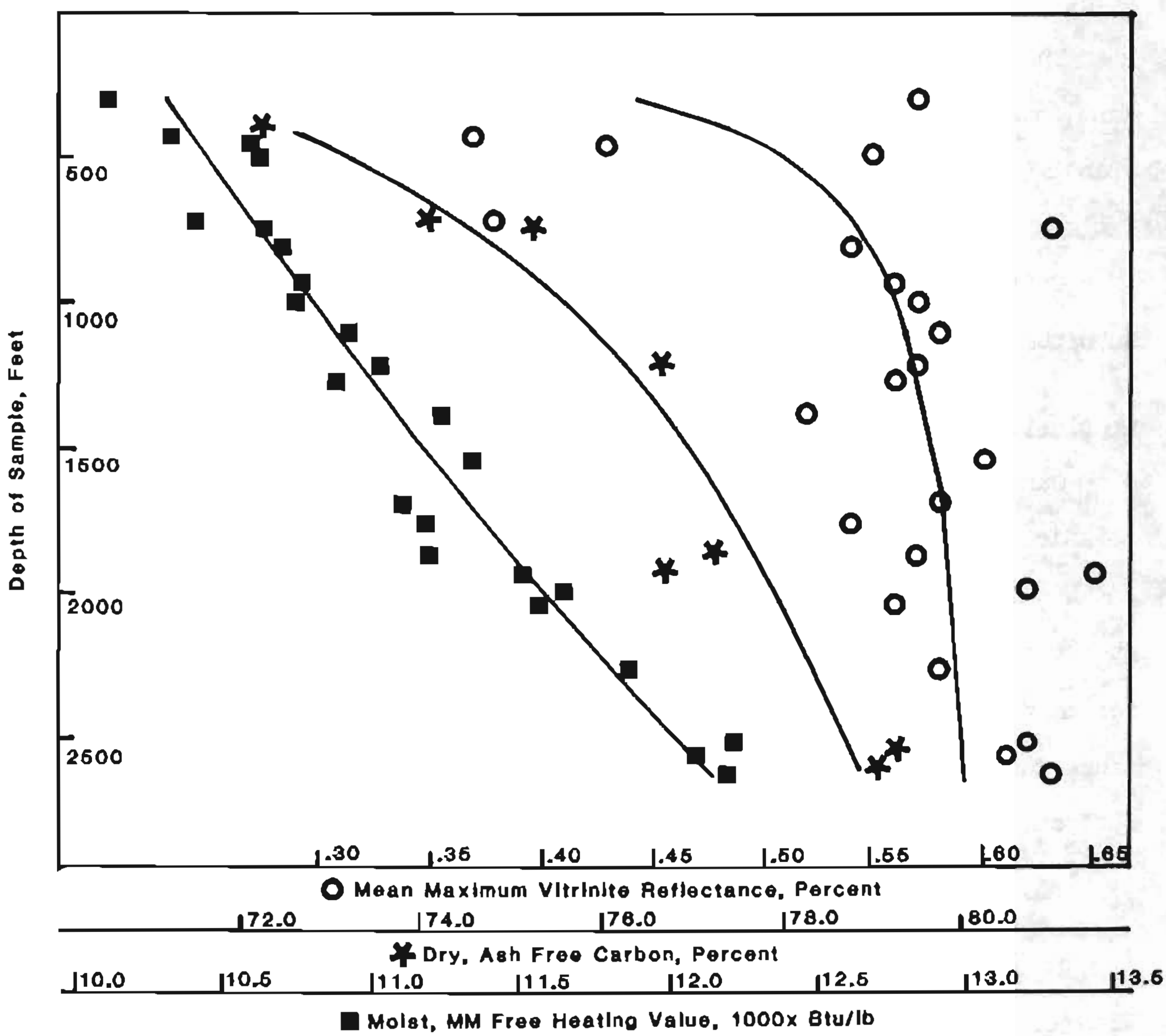
Kuk River

Kuk River coals (Figure 37) are generally of low ash (Table 15). Although the two available heating values indicate the rank to be subbituminous B, reflectance seems to indicate that all coals sampled are of subbituminous A rank (Table 31).

Peard Bay Test Well

Samples of coal from the Peard Bay Test Well (Figure 38) were obtained to a depth of 800'. Heating values showed a gradual increase with depth (Table 16) whereas vitrinite reflectance (Table 32) failed to show a similar trend. Reflectance values ranged from 0.51 to 0.58 percent. This shows, at least in this case, the superiority of heating value over vitrinite reflectance as an indicator of the diagenetic stage of coal. This supports views generally held on this subject and underlines the need to develop alternate petrographic criteria such as fluorescence spectra of liptinite, in order to be able to accurately evaluate the diagenesis of weathered low rank coals from petrographic data.

Figure 4 Increase of Coal Rank with Depth, expressed as a Function of Carbon Content, Vitrinite Reflectance and Heating Value of Samples from Tunalik Test Well.



East Simpson Test Wells

The coal sample from this test well (Figure 39) was very high in ash (Table 17) and ASTM rank determination from such analytical data would not be accurate. Reflectance value of 1.11 percent (Table 33) places the rank of this coal at the border between high volatile A bituminous and medium volatile bituminous.

Umiat

The coal sample from Umiat (Figure 40) is high volatile B bituminous in rank, as indicated by its heating value (Table 18) as well as reflectance (Table 34).

Ikpikpuk

Coal from Ikpikpuk (Figure 41) is of lower rank than Umiat coal and is of subbituminous B rank. Reflectance data are presented in Table 35.

Conclusions on Determination of Rank of Exploration Samples

Outcrop samples, auger hole samples (maximum depth 35' from surface) and seismic shothole samples from less than 40' depth are liable to be oxidized, and heating values of such coals cannot be used for rank determination. In such cases vitrinite reflectance was found to be the most suitable criterion for rank determination. For low rank coals ($\bar{R}$ max oil <0.6) vitrinite reflectance was inadequate to accurately define rank. For weathered surface samples reflectance is still the best available means for rank.

Petrology of Various Localities

Petrographic characteristics of Northern Alaska coals are summarized in Figures 5, 6, 7 and 8, as histograms showing the frequency distributions of vitrinite reflectance and the concentrations of maceral groups, vitrinite, inertinite and liptinite. Most of the samples lie within a reflectance range

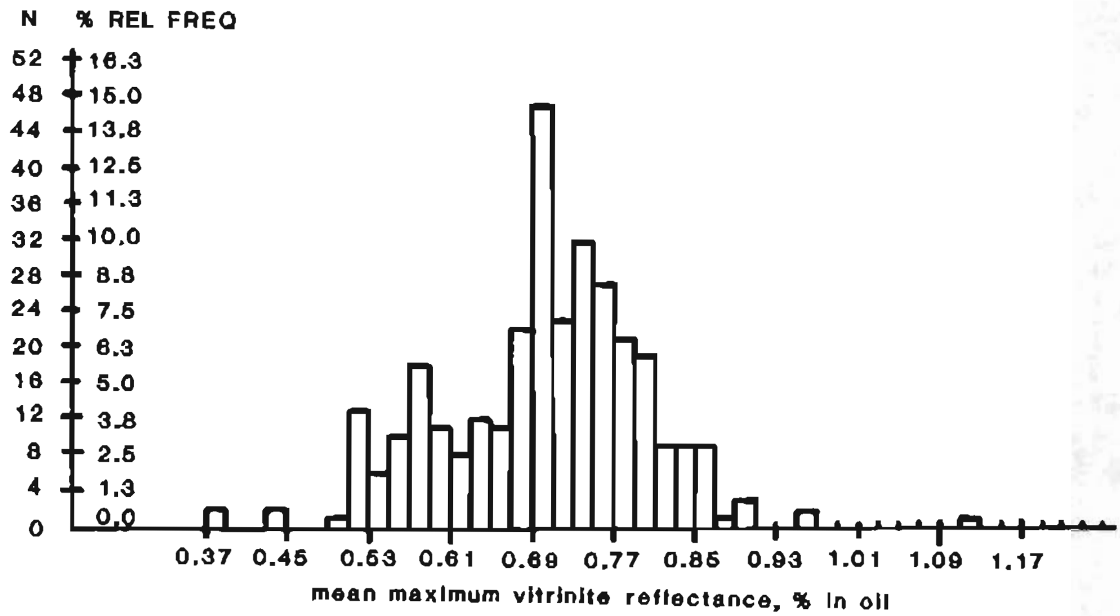


Figure 5 Frequency Distribution of Reflectance for the Coals from Northern Alaska.

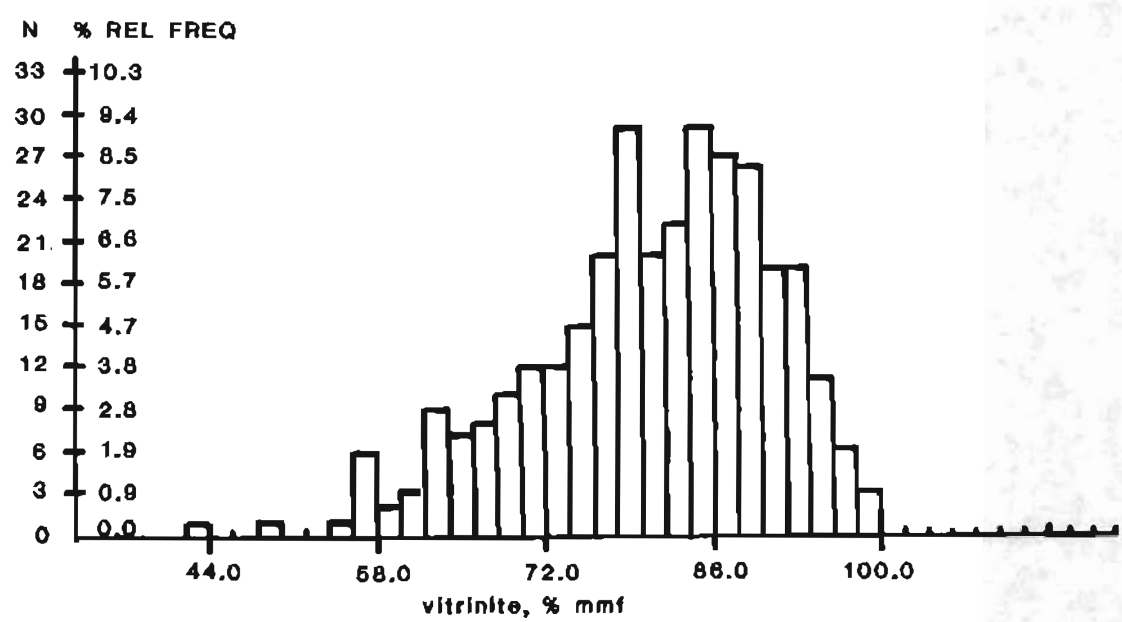


Figure 6 Frequency Distribution of Vitrinite for the Coals from Northern Alaska.

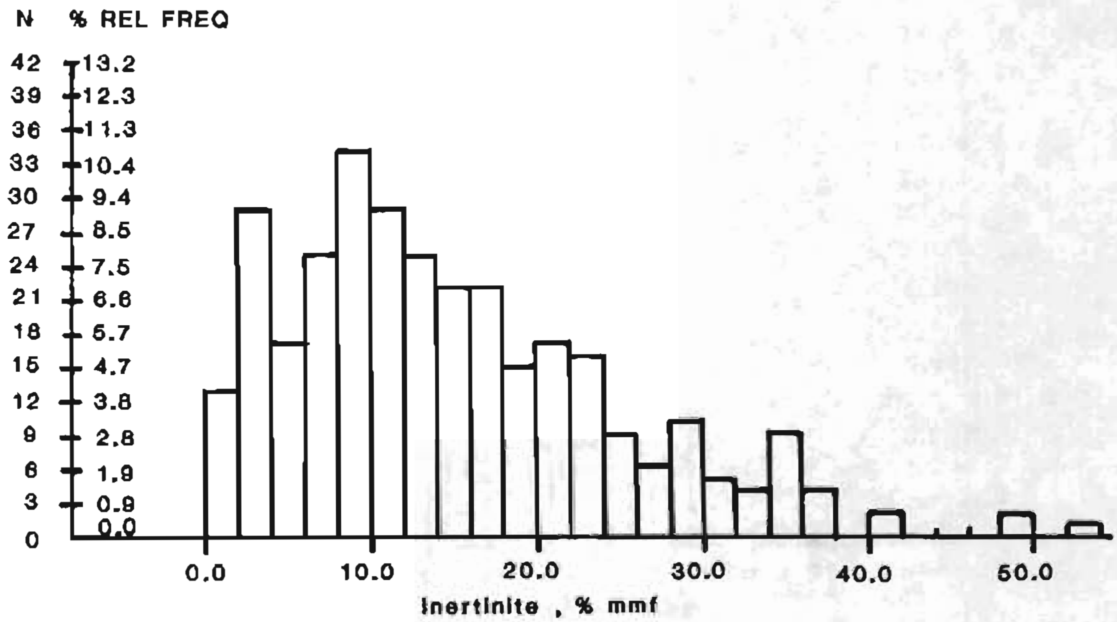


Figure 7 Frequency Distribution of Inertinites for the Coals from Northern Alaska.

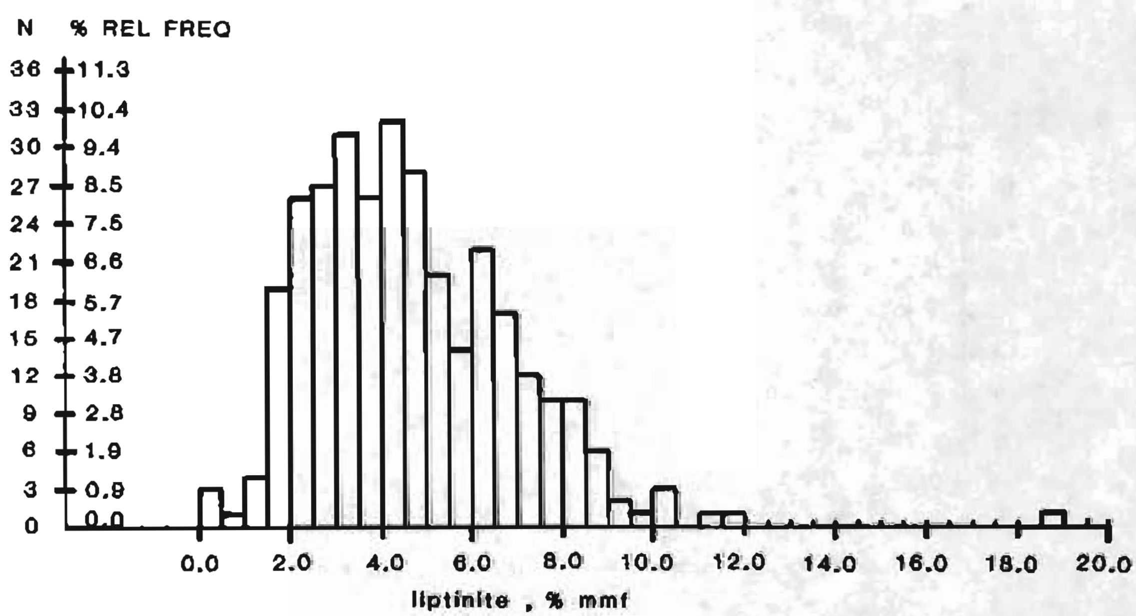


Figure 8 Frequency Distribution of Liptinites for the Coals from Northern Alaska.

($\bar{R}$ max) of 0.51 to 0.87 with 0.69 to 0.71 as modal values. The frequency distribution of vitrinite concentrations (Figure 6) shows positive skewness, indicative of the general observation that these coals more often have high concentrations of vitrinites. The frequency distributions of inertinite (Figure 7) and liptinite (Figure 8) display negative skewness showing that these two maceral groups tend to have lower concentrations in the coals studied. Excluding statistical outliers, inertinite ranges up to 38 percent and liptinite ranges up to 10.5%. The modal value for inertinite is 8 to 10% and for liptinite, 4 to 4.5%. These histograms present a generalized picture of the entire population studied. A more specific discussion of the characteristics of individual localities will follow.

Corwin Bluff

Corwin Bluff coals are quite variable in petrology (Table 36). Concentration of inertinite macerals ranged from a low of 1.9 percent to a high of 36.1 percent. Liptinite macerals varied similarly from a low of 1.5 percent to a high of 10.0 percent. High inertinite concentrations are found in SS 70-31, 32 and 33U while liptinite concentrations varied from a high of 10 percent for sample no. SS 70-28 to a low of 1.5 percent for SS 70-33M.

Cape Beaufort

Coals from this region have been the most thoroughly investigated of all the coals in the study area. The coals in general are high in inerts (Table 36, Figure 14). Semifusinite is the principal inertinite maceral in these coals. Most samples contain significant amounts of fusinite, macrinite and inertodetrinite. Samples that are low in semifusinite have high concentrations of psuedovitrinite. Exinite concentration in these coals is characteristically low, ranging from none (< .1%) to a high of 5.2 percent.

These coals are particularly high in macrinites. Several samples had significantly high concentrations of globular macrinite (5.9 percent in sample AH-73-31 A). This sample also had the highest concentration of inertodetrinite (15.7%). High inertinite, particularly fusinite, is indicative of charring, oxidation, mouldering and fungal attack of plant material before deposition, and the presence of macrinite signifies the oxidation effects upon a strongly gelified plant material (Stach, 1982, p. 281).

Kukpowruk River Coals

A 21 foot coal seam on Kukpowruk river has been the subject of intensive study. First investigation of coals in this region was undertaken by J.S. Robbins and Associates, Inc., for Morgan Coal Company. They drove a 70 foot adit and took a fairly large sample for testing. Morgan Coal Co. is still investigating the commercial feasibility of development of the deposit. Warfield et. al (1960) sampled the 21 foot coal seam in the adit and found that the top portion had poorer coking qualities compared to the bottom portion; this was attributed to the effects of weathering. Callahan et. al (1969) sampled the lower 5 ft. (SS-67-1), Middle 5 ft. (SS-67-2), and top 5 ft. (SS-67-3). Free swelling indices of the three samples were 6 for lower 5 feet, 2-1/2 for middle, 5' and 1-1/2 for top 5 ft. (Rao, 1975). It can be seen from figure 16 that the difference in free swelling properties is attributable to differences in the petrographic composition of the coals. Concentrations of inertinite for the three samples are: lower, 5.4%, middle, 20.8% and upper 35.0% respectively (Figure 8). In order to obtain a fresh sample Warfield et. al (1969) drilled four holes. In all drill holes the lower half gave an F.S.I. of 4-1/2 while the upper half gave 2 to 2-1/2. Since these samples were from a depth of 200 feet below the surface and unweathered, the differences were not due to weathering effects. A comparison of ultimate analyses and heating values of Callahan's samples from the adit (Callahan et. al, 1969) and Warfield's drill hole samples (1969) were alike and showed that weathering did not affect the adit samples. Lower moist-mineral matter free heating values of some of the other outcrop samples reflect effects of weathering of these surface samples (Table 6).

The concentration of psuedovitrinite in the Kukpowruk River samples is quite high, most samples having in excess of 13.0 percent (Table 38). Liptinites in these coals are low, ranging from 1.9 to 6.7 percent.

West Utukok

Sample No's. 725 SP 63, 66, 69 and 77, all located along the seismic line 725 (Figure 31) showed similar petrographic composition (Table 39). Concentration of semifusinites ranged from 12.1 to 14.6 percent, the highest of all the samples in the region. These four samples had the highest total inertinites and lowest liptinites (Figure 20). All of the samples along the seismic line R5XN contained some concentration of exsudatinite, and lower concentrations of semifusinite (2.5 to 7.6 percent) and fusinite (1.5 to 4.6 percent).

Kokolik River

Coals from the Kokolik River region showed extremely varied concentrations of inertinite as well as liptinite macerals (Figure 18, Table 40). Inertinite macerals ranged from a low of 0.4 percent to a high of 31.3 percent. The Liptinite content in these samples ranged from 1.8 percent to a high of 11.6 percent in sample number R5XNSP462, which contained the highest concentration of cutinite (2.4 percent). The two samples with over 11 percent liptinite were also very low in inertinite, indicating a wet, reducing environment and lower pH level, resulting in preservation of liptinite, which was not so for the majority of the coals of the study region.

Archimedes Ridge

Archimedes Ridge coals are, in general, of highest rank of all the coals in the study region, indicating their deepest burial before their uplift to their current position at the foothills of the Brooks Range. Inertinite showed a very wide range of concentrations from a low of 0.2 to a high of 40 percent (Figure 19). Semifusinite and fusinite are the principal inertinite macerals. Liptinite concentration is quite low, ranging from 0.2 to 8.3. The principal liptinite is resinite and in most samples exceeds every other liptinite maceral (Table 40). These coals generally have a fairly high concentration of pseudovitrinite.

Elusive Creek

Most of the Elusive Creek coals have a fairly low concentration of liptinites (Figure 21). Only a small portion of the samples exceeded 5 percent liptinite. Most of the sample contained thick cutinite and exsudatinite. However, resinite and sporinite were the principal liptinites (Table 42). The inertinite was of intermediate concentration, ranging from 1.4 to 33.4 (18 percent of this being fusinite). All samples from seismic line 632 contained exsudatinite and alginite and were generally high in pseudophlobaphinite.

Central Utukok River

Liptinite and inertinite concentrations in coals in this region were quite variable. Coals along seismic line 725 had a lower concentration of inertinites as well as liptinites compared to those of seismic line 632. A majority of the samples along this seismic line (632) had fusinite as the principal inert maceral (Figure 22). In a majority of the sample, thick cutinite exceeded normal thin walled cutinite (Table 42).

East Utukok

Samples along seismic line 603 (Figure 34) had very low inertinites and high liptinites (Figure 17). Sample number R3XNSP449 had an unusually high liptinite maceral content (18.5 percent), and 11.3 percent of this was sporinite (Table 44). This sample had the highest exsudatinite concentration (3 percent) supporting the suggestion that this maceral originated from the other primary liptinites.

Lookout Ridge

The coals from Lookout Ridge (Figure 35) had a medium range of concentration of liptinites ranging from 2.4 to 8.0 percent, and inertinite ranging from 3.5 to 24.8 percent (Figure 23). Sample R7XNSP531 had an unusually high concentration of 2 percent thick cutinite (Table 45). Fusinite, semifusinite and inertodetrinite are all equally distributed in these coals. Some samples in this group were unusually low in pseudovitrinite and at the same time high in inertodetrinite and liptodetrinite (under other liptinite) indicative of degradation due possibly to the transportation that these macerals might have undergone.

Tunalik Test Well

The coals from Tunalik Test Well (Figure 36) had intermediate levels of concentrations of liptinites and inertinites (Figure 24). Resinite was by far the most abundant of the liptinites, whereas fusinite was the most abundant of the inertinite group of macerals, (Table 46). Samples toward the top of the test well, from 220 to 490 feet, showed high concentration of inertodetrinite and liptodetrinite (as other liptinites) indicative of a changing environment and eventual cessation of deposition of coal. Compared to other samples in the study area, pseudovitrinite concentration is generally low.

Kuk River

Kuk River coals (Figure 37) had low liptinite, ranging from 1.3 to 6.0 percent and high inertinite, ranging from 5.4 to 53 percent (Figure 25). Sporinite is the principal liptinite (Table 47). Thick cuticles are rare. Semifusinite was the principal inertinite maceral. Sample 712SP11 with highest inertinite had 36.6% semifusinite, 2.7% globular macrinite and 8.4% inertodetrinite. All of these were in the highest concentration of all the Kuk River coals sampled.

Peard Bay Test Well

The coals from the Peard Bay Test Well (Figure 38) are generally high in vitrinite, with intermediate concentration of liptinite (2.8 to 7.6 percent) and lower inertinites (0.9 to 11.0 percent) (Figure 26, Table 48).

East Simpson Test Well, Umiat and Ikpikpuk Coals (Figures 27, 39, 40 & 41)

The East Simpson Test Well sample had an unusually high concentration of resinite (6.6 percent). Semifusinite was the principal inertinite. Inertodetrinite was in fairly high concentration (8.2 percent) (Table 49).

Coal from Umiat had very low inerts (Table 50). Fusinite is the principal inertinite maceral in Ikpikpuk coal. The principal liptinite is resinite (Table 51).

Trend Surface Analysis

Trend surface analysis was done for vitrinite reflectance (Figure 10), inertinite concentration (Figure 11) and liptinite concentration (Figure 12). These analyses were conducted on statistically valid samples using Surface II, a computer software system, and an HP 7221 plotter. Trend surface analysis consists of fitting a 3rd degree polynomial equation of the geographic coordinates to a third variable, such as reflectance, using a method of least squares. These values are then graphically depicted by contour lines.

Samples included in trend surface analysis were either surface or near surface drill samples. Test well samples were excluded from this analysis. Reflectance curves in Figure 4 show an increase in reflectance from 0.50 in the NE to 0.80 in the SW, indicating several thousand feet greater depth of burial, uplift and erosion in the foothills than in the coastal plains.

Figure 13 by Callahan (1980) is a block diagram of principal depositional environments, influencing the distribution of coal facies during deposition of the Nanushuk group, and trend surface analysis supports the ideas presented in the diagram.

Figure 11 shows a general trend of low inertinite in the coals of the foothills, i.e., those that have been buried by gradual and continuous subsidence apparently maintained a higher water table that preserved reactive macerals. This is in contrast to coals of Cape Beaufort and the coastal plains that are high in inert macerals resulting from lowering of the water table by several tens of feet, exposing the peaty material to dry oxidizing conditions. Trend surface analysis of liptinite (Figure 12) shows a higher concentration of liptinite toward the foothills region, coinciding with a low concentration of inertinite.

Reflectance and Microhardness of Macerals

Table 3 and Figure 9 shows the variation of reflectance and microhardness of macerals for 12 coals that vary in vitrinite reflectance from 0.55 to 0.86 percent. The large range of reflectance and microhardness for inertinite macerals is obvious. Any prediction of coal liquefaction yields, based on concentration of inertinite for these coals, needs to take into account the role of lower reflecting, and possibly reactive, inertinite macerals.

Table 3 Maceral Reflectance and Vickers' Microhardness Analyses for Representative Coal Samples

Sample Number		vitrinite		pseudovitrinite		fusinite		semifusinite		macrinite		globular macrinite		gelinite	phlobaphinite	pseudo phlobaphinite	sporinite	resinite		cutinite	thick cutinite		alginite
		R	VH	R	VH	R	VH	R	VH	R	VH	R	VH	R	R	R	R	R	VH	R	R	VH	R
632 SP400	x̄	.69	26.6	.70	33.3	2.27	742	1.44	339	2.19	440	2.17	442	.88	.66	.69	.22	.26	—	—	.081	18.8	—
	s	.050	3.1	.026	3.1	.42	—	.14	—	.46	—	.42	—	.12	.069	.11	.041	.075	—	—	.009	.58	—
137xSP808	x̄	.76	34.4	.85	41.9	2.69	754	1.74	75.2	2.44	564	2.45	533	.88	.73	.70	.25	.18	15.0	—	.13	--	—
	s	.040	2.9	.046	2.8	1.17	—	.34	—	.63	—	.63	—	.081	.032	.057	.043	.033	—	—	.028	—	—
726 SP216	x̄	.73	36.1	.92	43.1	2.75	—	1.78	83.2	2.50	226	2.56	391	.76	—	.85	.22	.34	—	—	.12	—	.08
	s	.03	4.7	.05	3.7	.65	—	.50	—	.79	—	.96	—	.10	—	.19	.04	.14	—	—	.04	—	.03
SS 70-80	x̄	.61	40.6	.68	44.7	2.82	268	1.62	81.5	2.06	117	1.66	—	.57	—	.62	.15	.24	—	.42	.09	—	.06
	s	.04	5.0	.04	2.1	.48	—	.49	—	.57	—	.28	—	.04	—	.03	.02	.05	—	.05	.02	—	.01
R7xNSP428	x̄	.76	31.0	.78	40.5	2.22	222	1.34	45.1	2.02	152	2.80	515	.82	.76	.78	.27	.21	21.0	.36	.095	20.4	—
	s	.060	2.0	.061	4.3	.52	108	.14	11.7	.58	—	.35	—	.089	.043	.084	.057	.050	2.9	.113	.012	3.2	—
Peard Bay 345-350	x̄	.58	23.9	.59	29.2	1.81	277	1.27	64.9	1.31	145	1.55	532	.65	.57	.55	.17	.18	18.1	.11	.093	—	—
	s	.090	3.9	.015	4.5	.38	155	.23	24.5	.22	—	.31	—	.055	.076	.058	.025	.056	—	.015	.024	—	—
Tunalik 470-490	x̄	.55	25.5	.58	41.2	1.97	341	1.32	57.6	1.51	356	1.99	330	.57	.53	.56	.16	.20	18.6	—	.078	—	—
	s	.035	2.3	.0072	13.0	.92	67	.25	27.0	.26	96.2	.62	--	.031	.058	.036	.033	.059	2.3	—	.0091	—	—
Tunalik 2480-2490	x̄	.62	27.7	.66	40.4	1.84	486	1.25	126	1.69	516	2.50	324	.73	.56	.59	.15	.17	12.9	—	—	—	—
	s	.080	2.5	.035	3.1	.60	241	.15	43.1	.25	—	.80	66.6	.15	.055	.022	.016	.066	.9	—	—	—	—
AH 73-29	x̄	.86	38.9	1.04	44.4	3.55	235	2.26	58.1	2.82	116	2.69	259	--	1.01	.98	.25	2.8	29.5	—	.15	26.6	—
	s	.05	3.9	.09	3.6	1.35	—	.60	—	.64	—	.56	13.2	—	.11	.11	.02	.07	.7	—	.01	4.6	—
AH 74-9C	x̄	.75	39.3	.93	45.1	3.91	292	2.06	62.5	2.79	—	2.28	148	.84	.82	.85	.23	.30	26.3	—	.10	—	.09
	s	.03	6.0	.06	2.2	.45	--	.55	—	.58	—	.21	—	—	.06	.18	.05	.11	3.81	—	.01	—	.02
DH-72-11	x̄	.65	43.2	.87	48.5	3.39	539	2.01	47.8	2.72	577	2.23	—	.75	.74	.73	.17	.29	32.3	.17	—	—	.08
	s	.04	2.7	.07	2.0	.71	—	.41	4.3	—	—	.68	—	.06	.04	.03	.04	.07	3.7	.05	—	—	.02
SS 67-10	x̄	.70	32.9	.84	38.8	2.39	219	2.04	55.3	2.38	180	224	--	.84	.78	.79	.21	.26	--	.30	.10	19.9	.08
	s	.04	9.8	.04	6.5	.84	—	.33	8.8	.83	—	.54	—	.04	.05	.05	.04	.04	—	.07	.01	1.3	.01

R - Mean and maximum reflectance in oil percent
VH - Vicker's microhardness
x̄ - Mean
S - Standard deviation
Number of measurements - Reflectance vitrinite 100, all others 50. Microhardness vitrinite 30, all others 25 or less.
No standard deviation was calculated for the ones with less than 25 measurements.

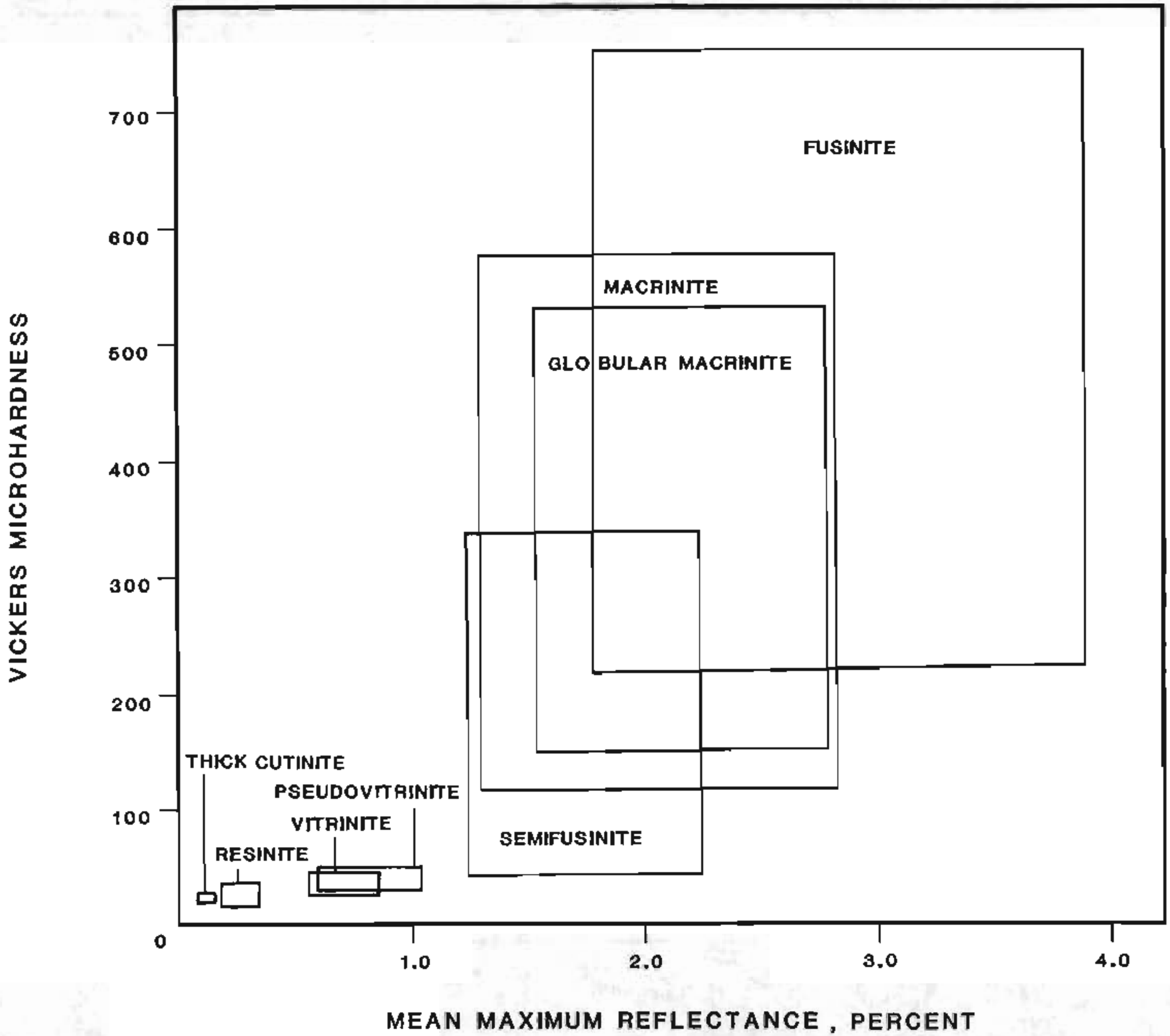


Figure 9 Diagram Showing the Ranges of Microhardness and Reflectance Value of Major Macerals in Twelve Selected Coals.

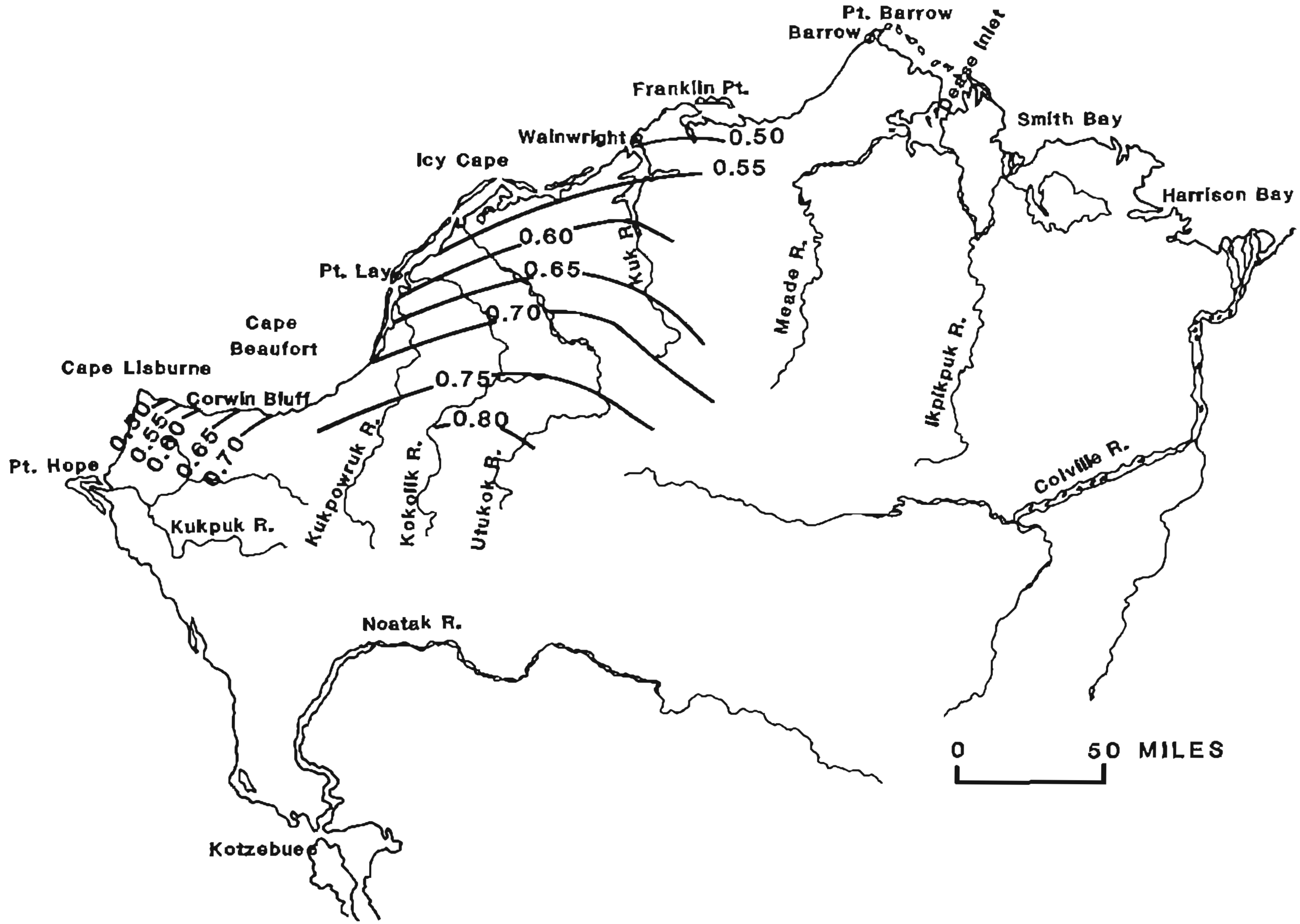


Figure 10 Plot of Trend Surface Analysis of Mean Maximum Reflectance of Vitrinite in Oil.

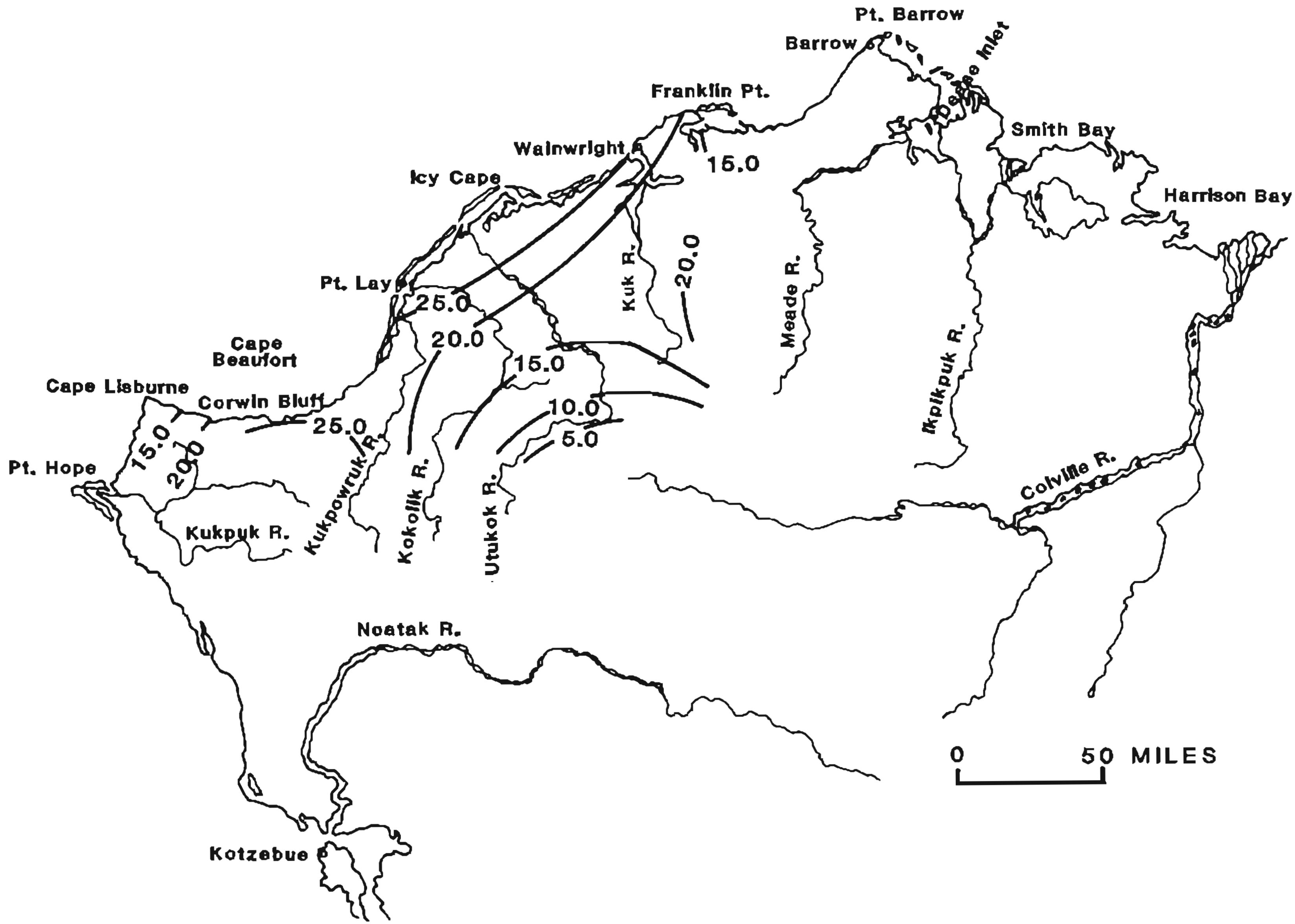


Figure 11 Plot of Trend Surface Analysis of Concentration of Inertinites.

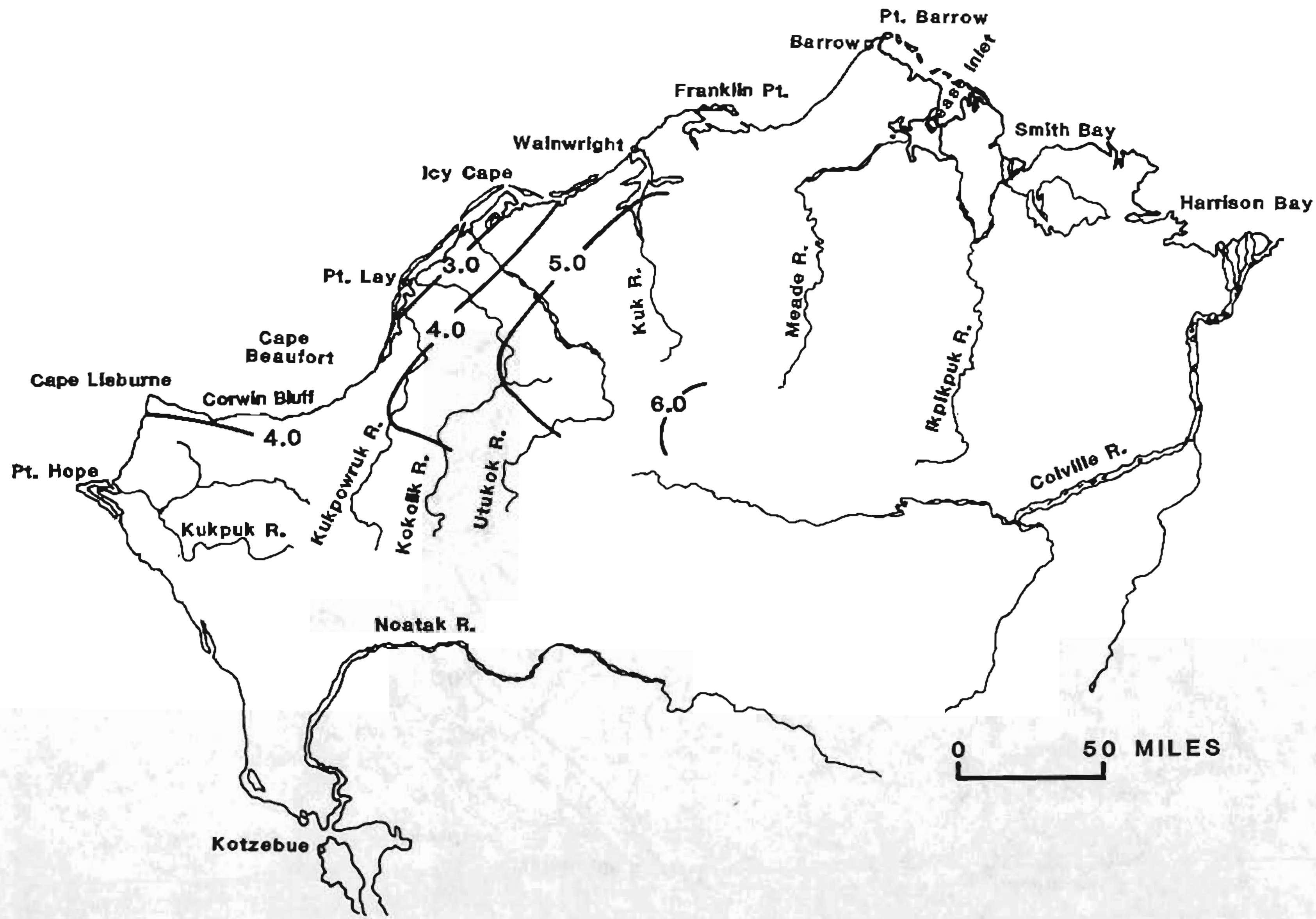


Figure 12 Plot of Trend Surface Analysis of Concentration of Liptinites.

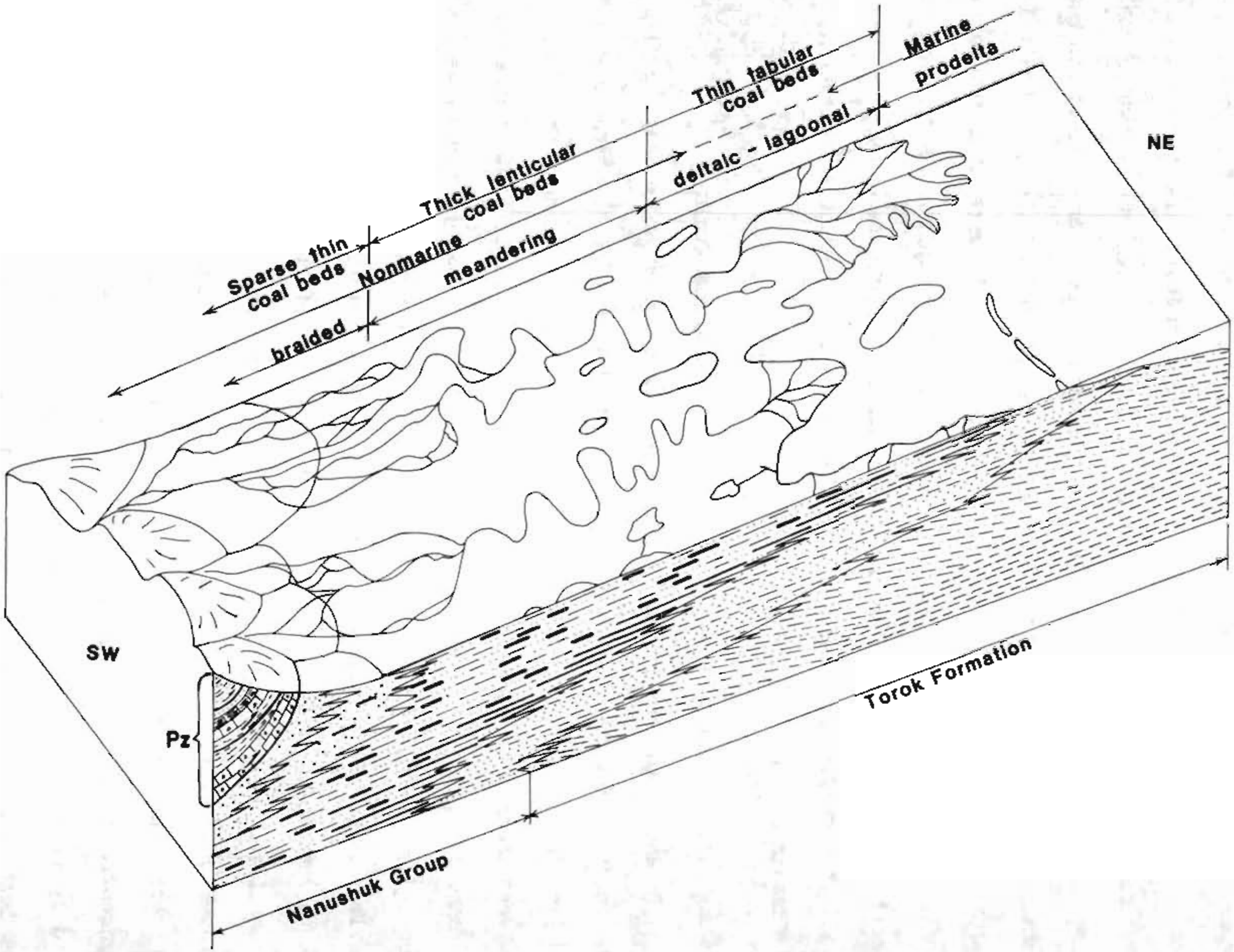


Figure 13 BLOCK DIAGRAM OF PRINCIPAL DEPOSITIONAL ENVIRONMENTS INFLUENCING THE DISTRIBUTION OF COAL FACIES DURING DEPOSITION OF THE NANUSHUK GROUP .

The microhardness and vitrinite reflectance data from the twelve representative coal samples were compared with similar data from other U.S. coals used by Davis (1978, Fig. 17) to demonstrate the variation of microhardness with respect to vitrinite reflectance. Ten of the twelve coal samples compared favorably with those coals used by Davis, and fell within the established limits, but SS 70-80, a surface sample and DH 72-11, a drillhole sample exhibited higher microhardness values than their related vitrinite reflectance values would imply. This abnormality cannot be related to weathering since one is a weathered surface sample and the other is a fresh drill core sample, and therefore would more likely represent an extention of the limits of the microhardness values.

Liquefaction Potential of Northern Alaska Coals

Extensive investigations conducted, Davis, Spackman and Given, (1976) at the Pennsylvania State University on the correlation of coal characteristics to liquefaction yields have concluded the existance of a linear relationship between concentration of total reactive macerals (vitrinite and exnite) and percent conversion. Conversion is also strongly influenced by rank as well as geological province as shown by Yarzab, Given, Spackman and Davis (1980). Davis et. al (1976) suggest that coals ranging in vitrinite reflectance ($\bar{R}$ max) from 0.5 to 1.0% and containing an excess of 70% of total reactive maceral (volume percent mineral contain basis) are predicted to have optimum liquefaction yields. Most of the coals in the study area meet the rank criteria and majority of them will meet total reactive macerals criteria. Concentrations of total reactive macerals in northern Alaska coals varied widely from a low of 47 percent to a high of 99 percent. However, Cape Beaufort coals are generally lower in total reactive macerals than those coals from the Utukok River and Archimedes Ridge areas. The coals from these two areas would therefore be preferable as feed stock for coal liquefaction. The detailed petrological information present in this report would be of special significance for preliminary screening of the coal seams for consideration as liquefaction feed stocks.

Conclusions

A reconnaissance petrological investigation of Northern Alaska coals revealed:

a) Vitrinite reflectance of most of the coals in the study area ranged from 0.5 to 0.9 percent. Rank indicated by moist, mineral-matter-free heating values as compared to rank indicated by vitrinite reflectance revealed that many of the auger hole samples and seismic shot hole samples taken from less than 40' depth were weathered. This is in support of conclusions reached by Callahan and Martin (1980).

b) Coals in the foothills region are of highest rank, i.e., have highest vitrinite reflectance. This indicates greater depth of burial, uplift and erosion in this region, and to a lesser extent possible thermal effects associated with the tectnics and uplift of the Brooks Range as indicated by severe folding of beds in this region.

c) Trend surface analysis showed that coal seams in the foothills region are more highly concentrated in vitrinite and liptinite macerals that are considered reactive for liquefaction.

d) Trend surface analysis further showed that inertinite concentration is lower in the foothills region and increases in northward and westward directions.

e) The high concentration of semifusinites and macrinites in the Cape Beaufort region could be indicative of lower water table and drier environment. The coals in the foothills region have lower inertinite, in indicating that the water table kept pace with coal formation, through progressive subsidence. Scarcity of pyrite in coal emphasises the absence of marine incursions during coal formation.

f) Inertinite macerals, particularly semifusinites and macrinites, showed wide variation in reflectance and microhardness that could be indicative of possible reactivity of these macerals in part during liquefaction processes.

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TABLE 4 Proximate and Ultimate Analyses of Corwin Bluff Coals

Sample No.	*Basis	Location	Thickness (feet)	Moisture %	Ash, %	Volatile Matter, %	Fixed Carbon, %	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
SS 70-W17	1	T 6S R54W SEC28.	2.5	8.8	13.3	30.8	47.1	10,038	58.6	4.9	1.8	21.0	0.4
	2					38.7	61.4	11,729	75.3	5.0	2.3	16.9	0.5
SS 70-W19	1	T 6S R54W SEC28.	7.0	5.3	48.7	18.7	27.3	6,049	35.1	3.2	1.1	11.7	0.2
	2					35.0	65.0	12,757	76.3	5.6	2.5	15.2	0.4
SS 70-W27	1	T 6S R54W SEC28.	1.5	11.9	7.4	30.7	50.0	9,960	59.5	4.8	1.7	26.2	0.4
	2					37.6	62.4	10,829	73.7	4.3	2.1	19.4	0.5
SS 70-W28	1	T 6S R54W SEC28.	2.8	13.4	13.6	32.2	40.8	8,349	51.1	4.7	1.5	28.7	0.4
	2					43.2	56.8	9,788	70.0	4.4	2.0	23.1	0.5
SS 70-W29	1	T 6S R54W SEC29.	2.2	13.2	13.0	33.3	40.5	8,423	51.6	4.9	1.5	28.8	0.2
	2					44.4	55.6	9,801	70.0	4.5	2.0	23.2	0.3
SS 70-W30A	1	T 6S R54W SEC30.	8.5	12.5	31.1	25.0	30.4	6,487	39.9	3.9	0.9	23.8	0.4
	2					41.5	58.5	9,767	70.8	4.5	1.5	22.4	0.8
SS 70-W30B	1	T 6S R54W SEC30.	1.7	13.2	11.0	33.8	42.0	8,932	54.5	5.0	1.2	27.9	0.4
	2					44.0	56.0	10,141	72.0	4.6	1.7	21.2	0.5
SS 70-W30C	1	T 6S R54W SEC30.	1.7	12.0	10.0	33.2	44.8	9,174	55.4	4.9	1.5	27.9	0.3
	2					41.9	58.1	10,292	71.0	4.5	1.9	22.3	0.3
SS 70-W30D	1	T 6S R54W SEC30.	3.3	12.0	5.8	34.2	48.0	9,807	59.2	5.1	1.5	28.0	0.4
	2					41.2	58.8	10,467	71.9	4.6	1.8	21.2	0.5
SS 70-W30E	1	T 6S R54W SEC30.	4.0	15.7	30.3	24.8	29.2	5,814	36.3	4.2	1.1	27.8	0.3
	2					43.3	56.7	8,645	67.3	4.5	2.1	25.7	0.4
SS 70-W31A	1	T 6S R54W SEC29.	2.5	14.1	2.9	33.1	49.9	9,858	60.3	4.9	1.3	30.3	0.3
	2					39.6	60.4	10,181	72.7	4.0	1.6	21.4	0.3
SS 70-W31B	1	T 6S R54W SEC29.	4.0	14.0	11.3	32.8	41.9	8,527	52.8	4.7	1.1	30.8	0.3
	2					43.2	56.8	9,709	70.6	4.1	1.5	23.4	0.4

* 1 Equilibrium moisture basis
2 V.M. and F.C. are dry, mineral matter free basis
Btu/lb. is moist mineral matter free basis
C, H, N, O, and S are dry, ash free basis

SS - Surface Sample
G, A, F - Surface Sample, The letter being the initial of the sample collector. G - Gary Martin, A - Carl Almquist
DH - Drill hole AH - Auger hole SP - Shot Point (Siesmic Shot hole)
Sample Number Includes Date

TABLE 4 Proximate and Ultimate Analyses of Corwin Bluff Coals (continued)

Sample No.	*Basis	Location	Thickness (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
SS 70-W32A	1	T 6S R54W SEC29.	4.0	10.8	5.1	29.4	54.7	11,325	66.3	5.2	1.2	22.0	0.2
	2					34.6	65.4	11,985	78.9	4.8	1.5	14.6	0.2
SS 70-W32B	1	T 6S R54W SEC29.	2.5	7.3	5.8	30.6	56.3	11,032	66.2	4.5	1.2	21.9	0.4
	2					34.8	65.2	11,768	76.0	4.3	1.4	17.8	0.5
SS 70-W32C	1	T 6S R54W SEC29.	1.0	12.4	6.5	32.7	48.4	9,798	59.8	5.0	1.1	27.3	0.3
	2					39.8	60.2	10,539	73.7	4.4	1.5	20.1	0.3
SS 70-W33U	1	T 6S R54W SEC29.	6.0	7.7	6.0	28.1	58.2	11,267	68.0	4.5	1.1	20.2	0.2
	2					32.1	67.1	12,051	78.7	4.1	1.3	15.7	0.2
SS 70-W33M	1	T 6S R54W SEC29.	6.5	6.3	4.0	39.1	50.6	12,362	71.1	5.5	1.3	17.9	0.2
	2					43.3	56.7	12,929	79.4	5.3	1.4	13.7	0.2
SS 70-W33L	1	T 6S R54W SEC29.	6.0	6.4	6.4	39.0	48.2	11,995	68.5	5.4	1.2	18.2	0.3
	2					44.4	55.6	12,887	78.5	5.4	1.4	14.4	0.3
SS 70-W73	1	T 6S R56W SEC36.	6.3	5.7	9.2	37.0	48.1	11,876	67.9	5.2	1.6	15.9	0.2
	2					42.9	57.1	13,197	79.9	5.3	1.8	12.8	0.2
SS 70-W74	1	T 7S R56W SEC2.	4.4	13.9	7.1	35.1	43.9	9,079	55.6	5.2	1.4	30.4	0.3
	2					44.0	56.0	9,830	70.4	4.5	1.8	23.0	0.3
SS 70-W80	1	T 6S R56W SEC36.	10.8	9.5	7.8	34.1	48.6	10,346	61.5	5.0	1.3	24.2	0.2
	2					40.8	59.2	11,297	74.4	4.7	1.5	19.2	0.2
SS 70-W82	1	T 7S R56W SEC 2.	2.2	11.9	11.0	34.3	42.8	9,161	55.1	5.0	1.2	27.3	0.4
	2					43.7	56.3	10,401	71.5	4.8	1.6	21.5	0.6
SS 70-W83	1	T 7S R56W SEC 2.	3.1	11.2	19.7	32.6	36.5	8,175	49.4	4.7	1.2	24.6	0.4
	2					45.9	54.1	10,388	71.5	5.0	1.6	21.4	0.5
SS 70-W88	1	T 6S R55W SEC31.	3.3	11.0	8.2	32.9	47.9	9,811	59.1	4.9	1.3	26.1	0.4
	2					40.2	59.8	10,766	73.1	4.5	1.6	20.3	0.5

TABLE 5 Proximate and Ultimate Analyses of Cape Beaufort Coals

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
AH 73-1	1	T 4S R48W SEC12.	4.5- 17.5	6.6	26.8	23.4	43.2	8,586	51.3	3.7	0.8	17.2	0.2
	2					33.0	67.0	12,090	77.0	4.5	1.3	17.0	0.2
AH 73-1A	1	T 4S R48W SEC12.	4.5- 8.0	7.0	17.1	23.2	52.7						
	2					29.2	70.8						
AH 73-1B	1	T 4S R48W SEC12.	8.0- 12.0	11.3	32.0	22.0	34.7						
	2					35.9	64.1						
AH 73-1C	1	T 4S R48W SEC12.	12.0- 16.0	6.6	31.7	22.1	39.6						
	2					33.1	66.9						
AH 73-1D	1	T 4S R48W SEC12.	16.0- 17.5	6.4	33.8	23.2	36.6						
	2					35.9	64.1						
AH 73-2	1	T 4S R48W SEC 1.	2.7- 7.5	9.9	20.1	28.4	41.6						
	2					39.1	60.9						
AH 73-3	1	T 3S R48W SEC36.	3.0- 9.8	12.2	12.6	28.5	46.7	9,197					
	2					37.1	62.9	10,641					
AH 73-4	1	T 3S R47W SEC14.	3.0- 13.5	10.2	5.6	31.0	53.2	10,778	64.1	5.1	1.4	23.6	0.2
	2					36.4	63.6	11,470	76.2	4.7	1.7	17.2	0.2
AH 73-5	1	T 3S R47W SEC23.	4.3- 12.8	10.2	13.4	26.7	49.7	9,651	58.5	4.3	1.1	22.5	0.2
	2					33.9	66.1	11,284	76.7	4.1	1.4	17.6	0.2
AH 73-6	1	T 3S R47W SEC15.	4.2- 12.0	11.1	9.9	29.5	49.5	9,776	59.4	4.6	1.1	24.8	0.2
	2					36.7	63.3	10,943	75.2	4.3	1.4	18.8	0.3
AH 73-8	1	T 3S R47W SEC25.	4.5- 19.2	11.2	10.5	29.3	49.0	9,643	58.4	4.6	1.1	25.2	0.2
	2					36.7	63.3	10,876	74.6	4.3	1.3	19.6	0.2
AH 73-10A	1	T 3S R47W SEC13.	5.2- 7.5	10.2	8.4	26.4	55.0						
	2					31.9	68.1						
AH 73-10B	1	T 3S R47W SEC13.	11.2- 14.2	10.5	4.8	30.9	53.8						
	2					36.2	63.8						

TABLE 5 Proximate and Ultimate Analyses of Cape Beaufort Coals (continued)

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter, %	Fixed Carbon, %	Heating Value BTU/lb.	C, %	H, %	N, %	O, %	S, %
AH 73-10C	1	T 3S R47W SEC13.	7.5– 11.2	10.6	5.7	30.0	53.7						
	2					34.6	65.4						
AH 73-23A	1	T 3S R47W SEC25.	4.5– 7.9	12.5	10.4	30.2	46.9	9,424	57.2	4.8	1.1	26.3	0.2
	2					38.4	61.6	10,619	74.3	4.4	1.4	19.7	0.2
AH 73-23B	1	T 3S R47W SEC25.	7.9– 10.9	11.8	15.1	29.6	43.5						
	2					39.5	60.5						
AH 73-24	1	T 3S R47W SEC23.	3.8– 10.0	12.1	10.5	29.6	47.8	9,480	57.1	4.7	1.0	26.5	0.2
	2					37.6	62.4	10,700	73.9	4.3	1.3	20.2	0.3
AH 73-25A	1	T 3S R47W SEC23.	4.0– 8.0	13.1	11.8	28.1	47.0						
	2					37.6	62.4						
AH 73-25B	1	T 3S R47W SEC23.	8.0– 12.0	11.4	31.7	21.8	35.1						
	2					35.4	64.6						
AH 73-25C	1	T 3S R47W SEC23.	12.0– 17.3	9.7	9.0	29.6	51.7						
	2					35.8	64.2						
AH 73-27	1	T 3S R47W SEC17.	4.2– 17.0	10.9	4.4	30.8	53.9	10,669	64.0	5.0	1.3	20.1	0.2
	2					36.1	63.9	11,200	75.4	4.4	1.6	18.3	0.3
AH 73-29	1	T 5S R50W SEC32.	6.3– 13.0	5.6	6.9	32.1	55.4	12,178	70.2	5.0	1.4	16.3	0.2
	2					36.2	63.8	13,162	80.3	5.0	1.6	12.9	0.2
AH 73-31A	1	T 5S R51W SEC25.	5.8– 12.0	10.4	27.8	22.4	39.4	7,339	46.0	3.6	0.7	21.7	0.2
	2					33.8	66.2	10,487	74.4	3.9	1.2	20.3	0.2
AH 73-31B	1	T 5S R51W SEC25.	12.0– 19.5	12.6	25.1	25.2	37.1						
	2					38.4	61.6						
AH 73-32	1	T 5S R50W SEC30.	3.2– 16.0	8.9	18.5	27.0	45.7	9,359	55.7	4.5	1.0	20.0	0.3
	2					35.8	64.2	11,701	76.6	4.8	1.4	16.8	0.4
AH 73-34	1	T 5S R50W SEC15.	4.5– 8.8	6.6	11.2	27.4	54.8						
	2					32.6	67.4						

TABLE 5 Proximate and Ultimate Analyses of Cape Beaufort Coals (continued)

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter, %	Fixed Carbon, %	Heating Value BTU/lb.	C, %	H, %	N, %	O, %	S, %
AH 73-36	1	T 5S R50W SEC10.	7.5- 13.5	10.7	9.6	29.3	50.4	9,926	60.1	4.7	1.2	24.0	0.4
	2					36.0	64.0	11,073	75.4	4.4	1.6	18.2	0.4
DH 72-11	1	T 5S R50W SEC17.	84.5- 91.7	5.3	21.0	29.5	44.2	10,176	59.5	4.6	1.0	13.7	0.2
	2					38.5	61.5	13,168	80.8	5.3	1.3	12.4	0.3
AH 74-9A	1	T 5S R50W	7.8- 16.8	9.5	0.4	30.8	56.3						
	2					34.1	65.9						
AH 74-9B	1	T 5S R50W	16.8- 22.8	7.5	2.0	32.1	58.4						
	2					35.4	64.6						
AH 74-9C	1	T 5S R50W	22.8- 28.8	5.2	0.7	34.6	59.5						
	2					36.7	63.3						
AH 74-11	1	T 5S R50W	12.0- 17.5	5.9	6.6	28.7	58.8						
	2					32.4	67.6						
AH 74-14A	1	T 5S R50W	3.0- 8.0	8.6	3.8	24.7	62.9						
	2					27.9	72.1						
AH 74-15	1	T 5S R50W	4.0- 9.0	13.9	5.8	35.8	44.5						
	2					44.3	55.7						

TABLE 6 Proximate and Ultimate Analyses of Kukpowruk River Coals

Sample No.	*Basis	Location	Thickness (feet)	Moisture %	Ash, %	Volatile Matter, %	Fixed Carbon, %	Heating Value BTU/lb.	C, %	H, %	N, %	O, %	S, %
SS 67-1	1	T 1S R44W SEC28	5.0	3.9	3.1	41.6	51.4	13,528	76.4	5.6	1.4	13.3	0.2
	2					44.6	55.4	13,997	82.1	5.6	1.5	10.6	0.2
SS 67-2	1	T 1S R44W SEC28	5.0	4.2	7.4	35.4	53.0	12,432	71.9	5.0	1.1	14.4	0.2
	2					39.6	60.4	13,514	81.3	5.1	1.3	12.1	0.2
SS 67-3	1	T 1S R44W SEC28	5.0	4.8	3.7	30.7	60.8	13,296	76.7	4.9	1.2	13.3	0.2
	2					33.2	66.8	13,856	83.7	4.8	1.3	10.0	0.2
SS 67-4	1	T 1S R44W SEC28	4.0	4.3	10.4	34.8	50.5	12,483	70.2	5.3	1.3	12.5	0.3
	2					40.1	59.9	14,077	82.3	5.6	1.5	10.3	0.3
SS 67-5	1	T 1S R44W SEC29	2.9	5.2	9.9	32.3	52.6	12,186	69.7	5.0	1.2	13.7	0.5
	2					37.4	62.6	13,652	82.1	5.3	1.4	10.7	0.5
SS 67-6	1	T 1S R44W SEC29	3.6	5.2	19.0	29.8	46.0	10,693	61.2	4.7	1.1	13.7	0.3
	2					37.9	62.1	13,455	80.7	5.3	1.5	12.2	0.3
SS 67-8	1	T 1S R44W SEC17	3.3	4.9	11.7	34.0	49.4	12,026	68.2	5.1	1.4	13.2	0.4
	2					40.1	59.9	13,775	81.8	5.5	1.7	10.6	0.4
SS 67-9	1	T 1S R44W SEC 8	5.3	6.2	2.8	35.7	55.3	13,052	74.4	5.5	1.5	15.5	0.3
	2					39.0	61.0	13,467	81.8	5.2	1.7	11.0	0.3
SS 67-10	1	T 1S R44W SEC 8	5.6	5.5	6.0	35.9	52.6	12,488	71.5	5.3	1.6	15.3	0.3
	2					40.2	59.8	13,353	80.8	5.3	1.8	11.7	0.4
SS 67-11	1	T 1S R44W SEC 7	5.2	6.9	4.0	34.9	54.2	12,369	71.6	5.3	1.5	17.2	0.4
	2					38.9	61.1	12,937	80.3	5.2	1.7	12.4	0.4
SS 67-12	1	T 1S R44W SEC 6	9.1	7.5	19.3	28.4	44.8	9,983	57.4	4.6	1.0	17.3	0.3
	2					37.4	62.6	12,626	78.5	5.2	1.4	14.6	0.3

TABLE 7. Proximate and Ultimate Analyses of West Utukok River Coals

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
725 SP45	1	T 5N R38W SEC33.	94.0 —101.0	11.0	6.8	30.6	51.6	11,201	64.2	5.4	1.3	21.8	0.5
	2					36.7	63.3	12,093	78.1	5.0	1.7	14.7	0.5
725 SP63	1	T 4N R38W SEC 8.	85.0 — 90.0	14.2	4.8	33.1	47.9	11,064	63.8	6.0	1.3	23.8	0.3
	2					40.5	59.5	11,675	78.6	5.3	1.6	14.0	0.4
725 SP66	1	T 4N R38W SEC 8.	85.0 — 89.0	12.3	18.1	26.0	43.6	8,915	52.6	5.1	1.0	22.8	0.4
	2					36.0	64.0	11,078	75.6	5.3	1.6	17.1	0.5
725 SP69	1	T 4N R38W SEC 9.	83.0 — 94.0	13.9	6.6	28.3	51.2	10,734	61.9	5.6	1.2	24.4	0.3
	2					35.1	64.9	11,567	78.0	5.0	1.5	15.0	0.4
725 SP77	1	T 4N R38W SEC15.	93.0 — 98.0	11.5	7.2	28.5	52.8	10,881	63.4	5.4	1.2	22.4	0.4
	2					34.5	65.5	11,800	77.9	5.0	1.5	15.1	0.5
725 SP81	1	T 4N R38W SEC15.	100.0 —104.0	14.5	4.1	32.0	49.4						
	2					38.9	61.1						
725 SP131	1	T 3N R37W SEC 5.	55.0 — 66.0	7.7	8.3	33.0	51.0	11,677	66.7	5.4	1.2	17.9	0.5
(two beds)	2		72.0 — 85.0			38.8	61.2	12,837	79.5	5.4	1.5	13.1	0.5
725 SP135	1	T 3N R37W SEC 5.	18.0 — 27.0	25.8	9.3	30.4	34.5	8,936	51.1	6.4	1.0	31.8	0.4
(several beds)	2					46.0	54.0	9,933	78.8	5.3	1.5	13.9	0.5
R5XNSP340	1	T 3N R38W SEC 4.		4.5	8.7	34.3	52.5	12,519	71.0	5.4	1.8	12.7	0.4
	2					38.9	61.1	13,827	81.8	5.6	2.0	10.2	0.5
R5XNSP354	1	T 3N R38W SEC16.	92.0 —	5.3	7.1	34.6	53.0	12,813	72.6	5.0	1.6	13.3	0.4
	2					39.0	61.0	13,888	82.9	5.0	1.8	9.9	0.4
R5XNSP359	1	T 3N R38W SEC21.		6.2	4.3	36.8	52.7	13,048					0.6
	2					40.8	59.2	13,700					
R5XNSP368	1	T 3N R38W SEC28.	62.0 — 66.0	5.2	10.8	32.1	51.9	12,227					0.5
	2					37.5	62.5	13,855					

TABLE 7. Proximate and Ultimate Analyses of West Utukok River Coals (continued)

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
R5XNSP384	1	T 2N R38W SEC16.	75.0 — 82.0	7.6	8.6	36.3	47.5	12,126	68.5	5.7	1.8	15.0	0.4
	2					42.8	57.2	13,376	81.7	5.7	2.2	9.9	0.4
R5XNSP394	1	T 2N R38W SEC21.	50.0 — 59.0	4.8	9.3	34.0	51.9	12,075					0.3
	2					39.0	61.0	13,436					
630 SP413	1	T 2N R41W SEC 1.		20.8	3.7	30.4	45.1	10,845	61.1	6.0	1.6	27.4	0.2
	2					40.0	60.0	11,301	80.9	4.9	2.1	11.9	0.2
630 SP441	1	T 2N R41W SEC36.	98.0 —102.0	6.1	3.6	36.2	54.1	12,947	73.4	5.7	2.0	15.1	0.2
	2					39.8	60.2	13,471	81.3	5.5	2.1	10.8	0.2
630 SP444	1	T 2N R41W SEC36.	16.0 — 22.0	11.2	2.3	33.3	53.2	11,375					0.3
	2					38.3	61.7	11,670					
630 SP471	1	T 1N R41W SEC24.		4.8	9.7	31.1	54.4	12,618	71.6	5.2	1.3	11.8	0.4
	2					35.7	64.3	14,108	83.8	5.4	1.6	8.8	0.4
F 12-79 (outcrop)	1	T 1N R41W SEC13.		10.9	4.9	30.4	53.8	10,835					0.4
	2					35.7	64.3	11,445					
F 20-79 (outcrop)	1	T 1N R41W SEC26.		5.8	5.6	29.6	59.1	12,425					0.3
	2					33.0	67.0	13,226					

TABLE 8. Proximate and Ultimate Analyses of Kokolik River Coals

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
605 SP 393	1	T 1S R39W SEC11.	22.0 — 27.0	8.2	14.3	28.2	49.3	10,136	59.4	4.9	1.9	18.8	0.7
	2					35.2	64.8	12,004	76.7	5.1	2.5	14.7	1.0
605 SP 402	1	T 1S R39W SEC 9.	48.0 — 52.0	3.5	15.0	32.4	49.1	12,045	67.4	5.2	2.1	10.0	0.3
	2					38.8	61.2	14,374	82.7	5.9	2.6	8.4	0.4
605 SP 428	1	T 1S R39W SPEC11.	15.0 — 30.0	6.6	8.0	30.9	54.5	11,125	66.0	4.8	1.2	19.8	0.2
	2					35.7	64.3	12,186	82.5	5.2	1.6	10.4	0.3
605 SP 431	1	T 1S R39W SEC10.		7.6	6.4	30.9	55.1	12,133					0.6
	2					35.5	64.5	13,042					
605 SP 434	1	T 1S R39W SEC10.	37.0 — 44.0	5.5	8.6	31.9	54.0	12,206					0.3
	2					36.6	63.4	13,463					
605 SP 435	1	T 1S R39W SEC10.	70.0 — 75.0	4.2	5.8	35.9	54.1	13,141	74.5	5.4	1.6	12.4	0.3
	2					39.5	60.5	14,019	82.8	5.6	1.8	9.6	0.3
605 SP 439	1	T 1S R39W SEC 9.		6.0	11.1	35.1	47.8	12,075					0.5
	2					41.7	58.3	13,732					
605 SP 442	1	T 1S R39W SEC 8.	62.0 — 65.0	4.6	9.3	36.7	49.4	12,503					0.5
	2					42.1	57.9	13,920					
605 SP 447	1	T 1S R39W SEC 8.	20.0 — 25.0	11.7	5.0	31.1	52.2	10,452					0.4
	2					36.9	63.1	11,046					
605 SP 448	1	T 1S R39W SEC 7.	48.0 — 52.0	15.0	7.6	30.8	46.6	9,209	56.6	4.6	1.4	29.4	0.4
	2					39.2	60.8	10,041	73.1	3.8	1.7	20.9	0.5
605 SP 454	1	T 1S R39W SEC 7.	60.0 — 73.0	4.6	5.0	31.6	58.8	13,006					0.3
	2					34.6	65.4	13,750					
605 SP 455	1	T 1S R40W SEC13.	10.0 — 15.0	10.5	7.6	30.9	51.0	10,634	63.7	4.5	1.2	22.5	0.5
	2					37.1	62.9	11,593	77.8	4.0	1.5	16.1	0.6

TABLE 8. Proximate and Ultimate Analyses of Kokolik River Coals (continued)

Sample No.	*Basis	Location	Depth/Interval Thickness (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
605 SP457	1	T 1S R40W SEC13.	30.0 — 40.0	4.0	4.4	38.1	53.5	13,430					0.3
	2					41.3	58.7	14,112					
605 SP461	1	T 1S R40W SEC14.	49.0 — 58.0	4.0	6.0	36.7	53.3	13,351					0.3
	2					40.4	59.6	14,293					
605 SP465	1	T 1S R40W SEC14.	45.0 — 55.0	4.0	6.1	33.5	56.4	13,313	74.8	5.6	1.7	11.5	0.3
	2					36.9	63.1	14,267	83.3	5.8	1.9	8.8	0.3
605 SP467	1	T 1S R40W SEC15.	73.0 — 76.0	4.3	9.8	33.9	52.0	12,511					0.6
	2					38.7	61.3	14,002					
605 SP471	1	T 1S R40W SEC15.	60.0 — 70.0	3.8	11.0	34.6	50.6	12,607					0.3
	2					39.8	60.2	14,311					
605 SP472	1	T 1S R40W SEC15.	82.0 — 85.0	3.7	12.9	33.6	49.8	11,898	68.1	5.3	1.6	11.6	0.5
	2					39.4	60.6	13,840	81.7	5.8	2.0	10.0	0.5
605 SP474	1	T 1S R40W SEC16.	5.0 — 22.0	7.8	14.6	28.5	49.1	10,312					0.3
	2					35.7	64.3	12,243					
UA 126	1	T 1S R40W SEC13.	11.6	15.6	5.4	26.4	52.6	10,904	63.4	5.6	1.0	24.4	0.2
	2					33.0	67.0	11,585	80.3	4.9	1.3	13.1	0.4
AH 3-78	1	T 1S R39W SEC18.	11.8	13.9	4.7	28.4	53.0	10,069					0.3
	2					34.6	65.4	10,615					
AH 4-78	1	T 1S R39W SEC 8.	4.3	13.4	4.2	30.6	51.8	10,065					0.4
	2					36.9	63.1	10,551					
AH 12-78	1	T 1N R38W SEC32.	7.5	12.5	9.0	29.2	49.3	9,654					0.3
	2					36.6	63.4	10,697					
AH 16-78	1	T 1S R39W SEC 2.	8.9	12.7	6.3	30.0	51.0	10,050					0.2
	2					36.5	63.5	10,784					

TABLE 8. Proximate and Ultimate Analyses of Kokolik River Coals (continued)

Sample No.	*Basis	Location	Depth/Interval Thickness (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
AH 18-78	1	T 1S R39W SEC11.	11.1	11.4	12.0	26.1	50.5	9,649					0.2
	2					33.2	66.8	11,095					
AH 19-78	1	T 1S R39W SEC14.	5.6	9.9	10.5	26.9	52.7	10,152					0.3
	2					33.1	66.9	11,460					
AH 21-78	1	T 1S R38W SEC 3.	7.5	8.8	14.8	24.9	51.5	9,939					0.3
	2					32.0	68.0	11,830					
AH 22-78	1	T 1S R38W SEC 9.	6.9	11.3	9.2	29.4	50.1	10,020					0.2
	2					36.4	63.6	11,132					
AH 23-78	1	T 1S R38W SEC 4.	9.2	11.0	7.7	28.1	53.2	10,615					0.4
	2					34.0	66.0	11,578					
AH 25-78	1	T 1N R37W SEC32.	7.2	11.3	4.7	29.7	54.3	10,718	63.9	5.1	1.4	24.6	0.3
	2					35.0	65.0	11,295	76.0	4.6	1.6	17.4	0.3
A 78-14	1	T 1N R38W SEC27.	8.2	10.6	2.9	28.7	57.8	11,225	67.0	5.1	1.2	23.5	0.3
	2					32.9	67.1	11,587	77.4	4.5	1.4	16.4	0.3
A 78-15	1	T 1N R38W SEC25.	—	6.4	10.8	28.6	54.2						
	2					33.8	66.2						
AH 1-79	1	T 1S R39W SEC11.	—	3.0	2.9	36.3	57.8	13,414					0.3
	2					38.4	61.6	13,857					
AH 4-79	1	T 1S R38W SEC31.	—	7.5	15.9	28.8	47.8	10,007					0.4
	2					36.4	63.6	12,091					
AH 5-79	1	T 2S R38W SEC 6.	—	6.5	9.4	29.8	54.3	11,227					0.5
	2					34.8	65.2	12,511					
AH 6-79	1	T 2S R38W SEC 7.	—	7.8	9.0	31.1	52.1	10,944					0.6
	2					36.7	63.3	12,138					

TABLE 8. Proximate and Ultimate Analyses of Kokolik River Coals (continued)

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
AH 7-79	1	T 2S R38W SEC 4.		12.0	10.0	27.5	50.5	9,695					0.3
	2					34.6	65.4	10,876					
R5XNSP450	1	T 1S R39W SEC 1.	76.0 — 78.0	5.3	5.5	35.2	54.0	12,920	73.4	5.5	1.9	13.3	0.4
	2					39.1	60.9	13,745	82.3	5.5	2.2	9.6	0.4
R5XNSP457	1	T 1S R39W SEC12.		9.0	4.4	32.4	54.2	11,322					0.2
	2					37.1	62.9	11,886					
R5XNSP458	1	T 1S R39W SEC12.	39.0 — 41.0	4.9	6.0	32.2	56.9	13,022	73.9	5.5	1.7	12.5	0.4
	2					35.8	64.2	13,934	82.9	5.5	1.9	9.3	0.4
R5XNSP462	1	T 1S R39W SEC13.	83.0 — 87.0	3.0	16.0	32.8	48.2	11,932					3.9
	2					38.6	61.4	14,566					

TABLE 9. Proximate and Ultimate Analyses of Archimedes Ridge Coals

Sample No.	*Basis	Location	Thickness (feet)	Moisture %	Ash, %	Volatile Matter, %	Fixed Carbon, %	Heating Value BTU/lb.	C, %	H, %	N, %	O, %	S, %
G 78-37	1	T 4S R39W SEC 7.	3.3	10.8	4.6	31.8	52.8	10,655					0.4
	2					37.2	62.8	11,222					
G 78-40	1	T 4S R39W SEC 7.	2.6	9.3	3.4	29.7	57.6	11,535					0.3
	2					33.8	66.2	11,974					
G 78-41	1	T 4S R39W SEC 7.	7.2	8.4	2.8	32.2	56.6	12,416					0.3
	2					36.1	63.9	12,802					
G 78-43	1	T 4S R40W SEC12.	11.2	7.1	3.5	31.2	58.2	12,106					0.3
	2					34.7	65.3	12,591					
G 78-55	1	T 4S R39W SEC 6.	2.0	4.2	7.2	30.8	57.8	12,671					0.5
	2					34.2	65.8	13,749					
G 78-58	1	T 3S R39W SEC31.	1.6	7.9	35.1	19.5	37.5	7,384					0.4
	2					30.7	69.3	11,901					
G 78-80	1	T 4S R40W SEC10.	8.9	6.4	3.6	32.2	57.8	12,283	70.0	5.1	1.5	19.5	0.3
	2					35.5	64.5	12,793	77.8	4.9	1.7	15.3	0.3
G 78-84	1	T 4S R40W SEC14.	11.5	5.4	6.4	30.7	57.5	11,856					0.3
	2					34.3	65.7	12,747					
G 78-89	1	T 4S R39W SEC17.	2.0	4.4	8.6	28.5	58.5	12,534					0.3
	2					32.1	67.9	13,826					
G 78-93	1	T 4S R39W SEC16.	7.5	7.6	3.2	33.3	55.9	11,943					0.3
	2					37.2	62.8	12,380					
G 78-94	1	T 4S R40W SEC11.	6.9	7.2	4.1	30.0	58.7	11,954					0.3
	2					33.5	66.5	12,511					
G 78-97	1	T 4S R40W SEC25.	1.0	9.2	10.9	28.8	51.1	10,478					0.6
	2					35.2	64.8	11,886					

TABLE 9. Proximate and Ultimate Analyses of Archimedes Ridge Coals (continued)

Sample No.	*Basis	Location	Thickness (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
G 78-99	1	T 4S R40W SEC25.	3.6	7.8	5.1	30.0	57.1	11,723					0.3
	2					34.0	66.0	12,407					
133X SP431	1	T 4S R40W SEC16.	15.0- 25.0	2.9	28.0	27.8	41.3	9,943					0.2
	2					38.1	61.9	14,254					
133X SP432	1	T 4S R40W SEC16.	35.0- 40.0	2.9	12.5	36.0	48.6	12,616					0.3
	2					41.8	58.2	14,601					
F 45-79	1	T 4S R39W SEC 8.	—	6.1	14.3	31.3	48.3	12,044					0.3
	2					39.3	60.7	14,248					
F 47-79	1	T 4S R39W SEC 5.	—	5.0	6.4	31.0	57.6	12,324					0.4
	2					34.5	65.5	13,244					
R5 SP601	1	T 4S R39W SEC27.	80.0- 84.0	6.9	25.0	23.5	44.6	9,044	53.4	4.0	0.9	16.1	0.6
	2					32.2	67.8	12,396	78.4	4.7	1.3	14.7	0.9
R5 SP605	1	T 4S R39W SEC34.	27.0- 36.0	2.8	17.0	32.8	47.4	12,012	67.1	4.9	1.6	8.7	0.7
	2					39.7	60.3	14,741	83.7	5.7	2.0	7.7	0.9
137X SP656	1	T 3S R37W SEC25.	15.0- 19.0	6.7	50.7	18.7	23.9	5,414					0.3
	2					37.7	62.3	11,970					
137X SP666	1	T 3S R37W SEC36.	60.0- 62.0	9.7	44.6	18.7	27.0	6,621					0.4
	2					35.7	64.3	12,796					

TABLE 10. Proximate and Ultimate Analyses of Elusive Creek Coals

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
605 SP 307	1	T 1S R35W SEC19.	5.0 — 15.0	4.7	11.5	31.8	52.0	10,410					0.5
	2					37.2	62.8	11,899					
605 SP 327	1	T 1S R36W SEC15.	38.0 — 52.0	10.8	5.4	32.8	51.0	12,341					0.3
	2					38.7	61.3	13,118					
605 SP 328	1	T 1S R36W SEC15.	45.0 — 60.0	9.3	3.8	33.6	53.3	12,682	72.4	5.8	1.3	16.5	0.2
	2					38.5	61.5	13,231	83.3	5.4	1.5	9.5	0.2
605 SP 329	1	T 1S R36W SEC15.	56.0 — 70.5	8.4	5.5	34.2	51.9	12,662	71.2	5.7	1.4	16.0	0.2
	2					39.4	60.6	13,465	82.7	5.6	1.6	9.9	0.2
605 SP 330	1	T 1S R36W SEC16.	64.0 — 80.0	7.1	3.7	33.1	56.1	12,996					0.3
	2					36.8	63.2	13,547					
605 SP 331 (zone)	1	T 1S R36W SEC16.	37.0 — 57.0	4.2	11.2	33.3	51.3	12,404					0.4
	2					38.7	61.3	14,125					
605 SP 332	1	T 1S R36W SEC16.	23.0 — 30.0	7.9	5.3	31.9	54.9	12,139					0.2
	2					36.4	63.6	12,886					
605 SP 336	1	T 1S R36W SEC16.	49.0 — 55.0	6.4	7.9	34.7	51.0	12,287					0.3
	2					40.0	60.0	13,436					
605 SP 337	1	T 1S R36W SEC17.	30.0 — 37.0	5.4	6.1	36.0	52.5	12,731	71.9	5.5	1.5	14.7	0.3
	2					40.3	59.7	13,630	81.2	5.6	1.7	11.2	0.3
605 SP 338 (2 beds)	1	T 1S R36W SEC17.	21.0 — 30.0	4.4	4.3	37.8	53.5	13,518					0.2
	2		91.0 — 97.0			41.1	58.9	14,182					
605 SP 339	1	T 1S R36W SEC17.	61.0 — 73.0	7.6	5.3	37.8	49.3	12,803					0.3
	2					43.0	57.0	13,581					
605 SP 340 (2 beds)	1	T 1S R36W SEC17.	36.0 — 42.0	7.2	2.9	36.6	53.3	13,312					0.3
	2		84.0 — 90.0			40.6	59.4	13,747					

TABLE 10. Proximate and Ultimate Analyses of Elusive Creek Coals (continued)

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
605 SP 342	1	T 1S R36W SEC17.	7.0 — 15.0	9.2	11.8	28.5	50.5	10,322	61.3	4.8	1.4	20.4	0.3
	2					35.2	64.8	11,836	77.6	4.8	1.8	15.5	0.4
605 SP 347	1	T 1S R36W SEC18.	90.0 — 95.0	7.8	3.3	37.7	51.2	13,222					0.5
	2					42.2	57.8	13,726					
137XSP 736	1	T 1S R36W SEC28.	0.5 — 30.0	5.8	38.4	24.5	31.3	7,926					0.4
	2					40.5	59.5	13,566					
137XSP 737	1	T 1S R36W SEC28.	84.0 — 86.0	3.8	37.3	25.5	33.4	8,449					0.5
	2					40.1	59.9	14,174					
137XSP 742	1	T 1S R36W SEC22.	11.0 — 24.5	7.2	6.8	32.1	53.9	11,501					0.2
	2					36.9	63.1	12,413					
137XSP 744	1	T 1S R36W SEC22.	42.0 — 50.0	4.3	9.3	35.0	51.4	12,620					0.2
	2					40.0	60.0	14,031					
137XSP 745	1	T 1S R36W SEC22.	75.0 — 81.0	5.1	8.5	34.8	51.6	12,483					0.2
	2					39.7	60.3	13,757					
137XSP 749	1	T 1S R36W SEC15.	80.0 — 83.0	4.2	15.2	32.6	48.0	11,866					0.2
	2					39.5	60.5	14,210					
137XSP 753	1	T 1S R36W SEC15.	93.0 —104.0	4.0	23.6	30.6	41.8	10,335	58.4	4.5	1.3	11.8	0.4
	2					40.7	59.3	13,886	80.7	5.6	1.8	11.4	0.5
137XSP 752	1	T 1S R36W SEC15.	70.0 — 81.0	4.6	13.1	35.6	46.7	12,125	68.1	5.2	1.3	12.1	0.2
	2					42.4	57.6	14,122	82.8	5.7	1.6	9.6	0.2
137XSP 755	1	T 1S R36W SEC11.	64.0 — 75.0	8.4	10.4	34.5	46.7	11,892	66.7	5.4	1.5	15.8	0.2
	2					41.9	58.1	13,408	82.1	5.6	1.8	10.3	0.2
137XSP 757	1	T 1S R36W SEC11.	33.0 — 37.0	4.4	13.3	34.4	47.9	11,905	67.5	5.0	1.3	12.7	0.2
	2					41.0	59.0	13,906	82.0	5.5	1.6	10.8	0.2
137XSP 758	1	T 1S R36W SEC11.	90.0 — 92.0	4.8	23.6	31.1	40.5	10,198					0.2
	2					41.9	58.1	13,693					

TABLE 10. Proximate and Ultimate Analyses of Elusive Creek Coals (continued)

Sample No.	*Basis	Location	Depth/Interval Thickness (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
137XSP 764	1	T 1S R36W SEC 1.	63.0 — 66.0	9.8	38.4	23.4	28.4	7,186					0.1
	2					41.8	58.2	12,287					
137XSP 765	1	T 1S R36W SEC 1.	45.0 — 48.0	18.8	40.1	20.1	21.0	5,664					0.1
	2					44.4	55.6	9,997					
137XSP 767	1	T 1N R35W SEC33.	35.0 — 37.0	3.5	27.5	31.1	37.9	9,877					0.4
	2					43.1	56.9	14,067					
137XSP 768	1	T 1N R35W SEC33.	40.0 — 42.0	4.0	41.5	25.6	28.9	7,709					0.3
	2					43.3	56.7	13,982					
137XSP 771	1	T 1N R35W SEC34.	70.0 — 75.0	10.4	46.2	17.5	25.9	5,662					0.3
	2					37.8	62.2	11,317					
137XSP 773	1	T 1N R35W SEC27.	54.0 — 59.0	19.0	10.9	28.4	41.7	10,136					0.2
	2					39.7	60.3	11,486					
137XSP 775	1	T 1N R35W SEC27.	86.0 — 90.0	12.5	13.0	29.3	45.2	10,719					0.4
	2					38.4	61.6	12,482					
137XSP 777	1	T 1N R35W SEC27.	31.0 — 41.0	7.0	6.0	35.7	51.3	12,545					0.3
	2					40.6	59.4	13,414					
137XSP 802	1	T 1N R34W SEC 6.	32.0 — 35.0	3.5	10.6	36.5	49.4	12,681					0.3
	2					41.8	58.2	14,332					
137XSP 804	1	T 2N R34W SEC31.	14.0 — 19.0	6.7	4.6	45.0	43.7	12,246					0.3
	2					50.4	49.6	12,888					
137XSP 808	1	T 2N R34W SEC29.	72.0 — 76.0	5.0	16.2	30.0	48.8	11,390					0.3
	2					37.0	63.0	13,805					
AH 34-78	1	T 1S R36W SEC22.	7.5	8.6	9.0	29.4	53.0	10,774					0.2
	2					35.1	64.9	11,930					

TABLE 10. Proximate and Ultimate Analyses of Elusive Creek Coals (continued)

Sample No.	*Basis	Location	Depth/Interval Thickness (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
AH 37-78U	1	T 1S R36W SEC24.	11.1	11.1	7.5	29.8	51.6	10,532					0.3
	2					36.0	64.0	11,460					
AH 37-78L	1	T 1S R36W SEC24.	11.1	9.8	6.1	31.0	53.1	10,885					0.2
	2					36.5	63.5	11,659					
AH 43-78	1	T 1S R36W SEC24.	12.8	10.0	5.9	30.3	53.8	10,745					0.1
	2					35.7	64.3	11,483					
AH 48-78	1	T 1S R35W SEC17.	72.0	7.9	9.8	37.8	54.5	10,958					0.4
	2					33.0	67.0	12,256					
AH 56-78	1	T 1N R35W SEC32.	13.1	11.9	4.0	30.5	53.6	10,684					0.2
	2					36.0	64.0	11,165					
AH 60-78	1	T 1N R36W SEC10.	5.6	12.7	4.3	31.1	51.9	10,198					0.4
	2					37.1	62.9	10,695					
AH 61-78U	1	T 1N R35W SEC16.	6.6	10.0	2.3	31.0	56.7	11,314					0.4
	2					35.2	64.8	11,612					
AH 61-78L	1	T 1N R35W SEC16.	6.6	11.8	4.8	30.7	52.7	10,658					0.4
	2					36.4	63.6	11,240					
AH 63-78	1	T 1N R35W SEC17.	4.3	11.8	1.9	27.9	58.4	12,322					0.5
	2					32.0	68.0	12,596					
AH 8-79	1	T 1N R36W SEC27.	—	11.0	9.0	31.5	48.5	9,754					0.3
	2					38.8	61.2	10,806					
AH 10-79	1	T 1N R35W SEC31.	—	7.9	8.4	28.5	55.2	10,740					0.3
	2					33.4	66.6	11,813					
AH 13-79	1	T 1N R35W SEC28.	—	9.8	2.1	33.4	54.7	11,173					0.3
	2					37.7	62.3	11,432					

TABLE 10. Proximate and Ultimate Analyses of Elusive Creek Coals (continued)

Sample No.	*Basis	Location	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
AH 15-79	1	T 1N R35W SEC26.	10.9	2.9	32.9	53.3	10,881					0.4
	2				37.9	62.1	11,231					
AH 16-79	1	T 1N R35W SEC26.	11.5	7.9	31.3	49.3	10,086					0.4
	2				38.3	61.7	11,029					
AH 22-79	1	T 1N R35W SEC25.	9.7	3.2	32.1	55.0	11,001					0.3
	2				36.6	63.4	11,405					
AH 25-79	1	T 1S R36W SEC 1.	13.8	10.6	29.8	45.8	9,024					0.3
	2				38.7	61.3	10,192					
AH 26-79	1	T 1S R36W SEC12.	10.2	6.8	30.8	52.2	10,590					0.4
	2				36.6	63.4	11,437					
AH 34-79	1	T 1N R34W SEC 8.	10.2	6.8	32.1	50.9	10,483					0.3
	2				38.2	61.8	11,320					
AH 35-79	1	T 1N R34W SEC 8.	13.5	2.2	32.8	51.5	10,099					0.3
	2				38.7	61.3	10,342					
AH 36-79	1	T 1N R34W SEC 8.	14.1	8.9	27.4	49.6	9,849					0.4
	2				34.9	65.1	10,905					
AH 37-79	1	T 1N R34W SEC 5.	9.0	11.1	28.5	51.4	10,369					0.4
	2				34.8	65.2	11,787					
AH 38-79	1	T 1S R35W SEC14.	12.4	3.1	31.5	53.0	10,660					0.4
	2				37.0	63.0	11,029					
78-35	1	T 1N R34W SEC22.	5.1	1.6	32.7	60.6	13,295					0.6
	2				34.9	65.1	13,478					
F 75-79	1	T1S R SEC31.	14.6	4.0	32.2	49.2	10,270					0.3
	2				39.3	60.7	10,737					

TABLE 10. Proximate and Ultimate Analyses of Elusive Creek Coals (continued)

Sample No.	*Basis	Location	Depth/Interval Thickness (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
632SP300	1	T1S R37W SEC11.	95.0 —101.0	3.5	9.1	35.2	52.2	12,955	72.0	5.5	2.1	10.9	0.4
	2					39.7	60.3	14,374	82.4	5.8	2.4	9.0	0.4
632SP307	1	T1S R37W SEC 2.	62.0 — 63.0	4.3	7.0	34.9	53.8	12,845	72.5	5.5	1.9	12.4	0.7
	2					38.8	61.2	13,911	81.8	5.6	2.1	9.7	0.7
632SP321	1	T1N R36W SEC28.	20.0 — 30.0	4.4	5.5	34.6	55.5	13,146					0.3
	2					38.1	61.9	13,991					
632SP322	1	T1N R36W SEC21.	87.0 — 98.5	4.2	6.8	36.2	52.8	12,915					0.4
	2					40.2	59.8	13,950					
632SP324	1	T1N R36W SEC21.	85.0 — 94.0	5.1	7.6	34.7	52.6	12,684	72.0	5.4	1.6	13.1	0.3
	2					39.3	60.7	13,825	82.5	5.6	1.8	9.9	0.3
632SP340	1	T1N R36W SEC10.	32.0 — 42.0	4.6	4.6	34.7	56.1	13,377					0.4
	2					37.9	62.1	14,084					
632SP341	1	T1N R36W SEC 3.	93.0 —101.0	4.1	9.2	33.5	53.2	12,848					0.3
	2					38.0	62.0	14,275					
632SP342	1	T1N R36W SEC 3.	40.0 — 47.0	3.9	6.9	37.6	51.6	13,208	73.8	5.5	1.7	11.8	0.3
	2					41.7	58.3	14,284	82.8	5.7	1.9	9.4	0.3
734SP216	1	T1S R35W SEC 9.	78.5 — 84.5	5.1	1.4	38.7	54.8						
	2					41.3	58.7						
137XSP24	1	T3N R34W SEC28.		6.3	44.7	17.6	31.4						
	2					30.7	69.3						
137XSP748	1	T1S R36W SEC14.	85.0 — 100.0	5.6	24.0	29.3	41.1	10,097					0.2
	2					39.9	60.1	13,632					
UA 125	1	T 1N R34W SEC22.	11.5	12.0	2.4	30.4	55.2	11,242	65.9	5.2	1.3	24.9	0.3
	2					35.4	64.6	11,541	77.0	4.5	1.5	16.6	0.4

TABLE 11. Proximate and Ultimate Analyses of Central Utukok River Coals

Sample No.	*Basis	Location	Depth/Interval Thickness (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
632 SP369	1	T 2N R36W SEC22.	85.5 — 93.5	6.2	13.0	33.2	47.6	11,576	64.2	4.8	1.4	16.3	0.3
	2					40.3	59.7	13,481	79.4	5.1	1.7	13.4	0.4
632 SP370	1	T 2N R36W SEC15.	75.0 — 80.5	5.6	5.8	33.6	55.0	12,858					0.4
	2					37.5	62.5	13,736					
632 SP383	1	T 2N R36W SEC 2.	71.0 — 78.0	4.5	2.4	32.0	61.1	13,651	78.5	5.4	1.5	11.6	0.6
	2					34.1	65.9	14,029	84.3	5.2	1.6	8.3	0.6
632 SP386	1	T 2N R36W SEC 2.	25.0 — 38.5	18.0	3.8	33.8	44.4	8,741					0.3
	2					43.0	57.0	9,120					
632 SP392	1	T 3N R36W SEC35.		8.4	13.0	30.8	47.8	10,985	62.6	4.7	1.4	17.9	0.4
(several beds)	2					38.2	61.8	12,790	79.6	4.8	1.7	13.4	0.5
632 SP400	1	T 3N R36W SEC23.	52.0	10.0	4.0	34.1	51.9	11,804	68.2	5.4	1.5	20.6	0.3
	2					39.4	60.6	12,349	79.3	4.9	1.7	13.8	0.3
632 SP402	1	T 3N R36W SEC23.	60.0 — 69.0	10.3	5.8	28.8	55.1	11,791					0.3
	2					33.9	66.1	12,589					
632 SP422	1	T 3N R36W SEC 2.	61.0 — 66.0	5.4	4.8	35.0	54.8	12,993					0.5
(two beds)	2		97.0 —103.0			38.6	61.4	13,719					
632 SP436	1	T 4N R36W SEC26.	82.0 — 90.0	11.4	6.2	32.1	50.3	11,225					0.3
	2					38.5	61.5	12,035					
632 SP440	1	T 4N R36W SEC24.	97.5 —102.0	11.6	11.7	28.9	47.8	10,327					0.3
	2					36.8	63.2	11,821					
632 SP442	1	T 4N R36W SEC13.	66.5 — 73.0	10.0	8.6	30.8	50.6	11,776	67.1	5.4	1.3	17.1	0.5
	2					37.2	62.8	12,985	82.3	5.3	1.6	10.3	0.5
632 SP447	1	T 4N R36W SEC12.	58.0 — 68.0	14.8	6.4	29.6	49.2	10,782					0.3
	2					37.2	62.8	11,585					

TABLE 11. Proximate and Ultimate Analyses of Central Utukok River Coals (continued)

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
632 SP467	1	T 5N R35W SEC33.	101.0 —103.0	14.1	21.0	25.6	39.3	8,638	49.9	5.0	1.2	22.6	0.3
	2					37.8	62.2	11,183	77.0	5.3	1.9	15.3	0.5
632 SP480	1	T 5N R35W SEC16.		5.6	15.5	31.8	47.1	11,536	65.3	5.2	1.5	12.2	0.3
	2					39.3	60.7	13,861	82.8	5.9	1.9	9.1	0.4
725 SP169	1	T 3N R36W SEC26.	54.5 — 60.5	8.8	11.2	38.8	41.2	10,907	64.2	4.8	1.0	18.6	0.2
(two beds)	2		90.0 — 98.5			48.0	52.0	12,413	80.2	4.8	1.3	13.4	0.3
725 SP206	1	T 2N R35W SEC 2.	94.5 —100.5	4.8	5.6	31.1	58.5	13,070	73.1	5.5	1.6	13.7	0.5
	2					34.3	65.7	13,928	81.6	5.6	1.8	10.5	0.5
725 SP216	1	T 2N R35W SEC 1.	63.0 — 68.0	5.5	5.8	33.2	55.5	12,858	72.6	5.3	1.5	14.4	0.4
	2					37.1	62.9	13,721	81.9	5.3	1.7	10.7	0.4
725 SP219	1	T 2N R34W SEC 6.	52.5 — 60.5	7.1	11.9	30.7	50.3	11,286	64.7	4.9	1.3	16.9	0.3
	2					37.2	62.8	12,956	79.9	5.0	1.6	13.2	0.4
725 SP222	1	T 2N R34W SEC 6.	24.0 — 32.0	9.6	12.9	29.5	48.0	10,013	59.2	4.9	1.2	21.5	0.3
	2					37.2	62.8	11,641	76.4	4.9	1.5	16.9	0.4
725 SP230	1	T 2N R34W SEC 9.	96.5 —102.0	4.0	3.6	34.6	57.8	13,684	77.2	5.5	1.3	12.1	0.3
	2					37.2	62.8	14,254	83.6	5.5	1.4	9.2	0.4
725 SP271	1	T 2N R33W SEC28.	22.0 — 32.0	15.9	38.9	20.0	25.2	5,889					0.2
	2					42.1	57.9	10,166					
723 SP114	1	T 3N R34W SEC26.	85.0 — 91.0	13.2	3.2	30.2	53.4						
	2					35.8	64.2						

TABLE 12. Proximate and Ultimate Analyses of East Utukok River Coals

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter, %	Fixed Carbon, %	Heating Value BTU/lb.	C, %	H, %	N, %	O, %	S, %
603 SP211	1	T 2S R30W SEC12.	35.0 — 45.0	10.3	9.3	31.6	48.8	10,310	60.3	5.1	1.6	23.5	0.2
	2					38.8	61.2	11,468	75.0	4.9	2.0	17.8	0.3
603 SP232	1	T 2S R30W SEC 4.	70.0 — 80.0	6.0	15.6	33.9	44.5	10,998					0.3
	2					42.3	57.7	13,234					
603 SP267	1	T 1S R31W SEC22.	40.0 — 45.0	9.9	5.0	33.2	51.9	10,899					0.3
	2					38.6	61.4	11,520					
F 73-79	1	T 1S R33W SEC11.		17.2	4.7	29.6	48.5	9,475					0.3
	2					37.6	62.4	9,985					
R4 SP2	1	T 1N R32W SEC29.	12.0 — 22.0	4.7	25.9	30.7	38.7	9,632					0.4
	2					42.4	57.6	13,389					
R4 SP21	1	T 1S R33W	12.0 — 22.0	10.5	12.7	29.0	47.8	9,733					0.4
	2					36.8	63.2	11,287					
725 SP342	1	T 1N R31W SEC19.	26.5 — 30.5	3.9	3.0	34.0	59.1						
(two beds)	2		36.5 — 43.0			36.4	63.6						
723 SP204	1	T 2N R31W SEC18.	68.0 — 74.0	14.3	2.1	32.2	51.4						
	2					38.2	61.8						
R3XN SP390	1	T 4N R29W SEC32.	30.0 — 40.0	26.5	5.5	26.1	41.9	8,580	51.4	5.9	1.1	35.9	0.2
	2					37.9	62.1	9,123	75.7	4.3	1.6	18.1	0.2
R3XN SP397	1	T 3N R29W SEC 5.	78.0 — 90.0	32.7	7.2	25.5	34.6	8,119	46.9	6.9	0.9	38.0	0.1
	2					41.8	58.2	8,803	78.1	5.4	1.4	14.8	0.3
R3XN SP443	1	T 2N R30W SEC13.	5.0 — 15.0	16.7	2.5	32.8	48.0	9,388	57.7	5.4	1.5	32.6	0.3
	2					40.4	59.6	9,650	71.5	4.3	1.8	22.0	0.4
R3XN SP449	1	T 2N R30W SEC13.	15.0 — 21.0	19.0	12.9	30.4	37.7	7,331	44.8	5.0	1.4	35.6	0.3
	2					43.7	56.3	8,513	65.8	4.2	2.0	27.5	0.5

TABLE 13. Proximate and Ultimate Analyses of Lookout Ridge Coals

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
R7XN SP413	1	T 1N R28W SEC11.	30.0 — 40.0	7.1	2.9	36.4	53.6	12,391	71.2	5.3	1.0	19.3	0.3
	2					40.2	59.8	12,795	79.1	5.1	1.1	14.5	0.3
R7XN SP428	1	T 2N R28W SEC35.	30.0 — 40.0	5.5	2.4	36.6	55.5	13,087	73.6	5.4	1.8	16.5	0.3
	2					39.5	60.5	13,436	79.9	5.3	1.9	12.6	0.4
R7XN SP445	1	T 2N R28W SEC14.	24.0 — 31.0	8.8	3.6	33.6	54.0	12,297	71.5	5.3	1.8	17.4	0.4
	2					38.2	61.8	12,809	81.7	4.9	2.1	10.9	0.4
R7XN SP482	1	T 3N R27W SEC18.	35.0 — 39.0	5.8	12.0	32.7	49.5	11,661					0.6
(two beds)	2		54.0 — 57.0			38.6	61.4	13,421					
R7XN SP486	1	T 3N R27W SEC 7.	71.0 — 82.5	17.0	4.4	34.6	44.0	8,847	55.7	4.6	1.7	33.3	0.3
	2					43.7	56.3	9,289	70.9	3.5	2.1	23.1	0.5
R7XN SP488	1	T 3N R27W SEC 7.	64.0 — 71.0	8.5	9.2	35.3	47.0	11,472					0.4
	2					42.3	57.7	12,738					
R7XN SP494	1	T 3N R27W SEC 6.	75.0 — 90.0	13.3	4.0	31.0	51.7	10,992	65.2	5.3	1.0	24.4	0.1
	2					37.2	62.8	11,489	78.9	4.6	1.6	14.6	0.2
R7XN SP520	1	T 4N R27W SEC17.	55.0 — 63.0	14.6	4.1	35.4	45.9	11,033	64.0	5.5	1.4	24.6	0.4
(several beds)	2					43.3	56.7	11,550	78.8	4.7	1.7	14.3	0.5
R7XN SP531	1	T 4N R27W SEC 5.	25.0 — 32.0	10.9	5.4	31.0	52.7	11,347	65.9	5.0	1.3	22.0	0.4
	2					36.6	63.4	12,062	78.8	4.5	1.6	14.6	0.4
R7XN SP582	1	T 6N R27W SEC25.	73.0 — 81.0	13.7	7.8	29.0	49.5	10,459	60.0	5.5	1.1	25.3	0.3
	2					36.4	63.6	11,432	76.6	5.0	1.4	16.6	0.4

TABLE 14 Proximate and Ultimate Analyses of Tunalik Test Well Coals (T10N R36N SEC20)

Sample No. Depth Interval (feet)	*Basis	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
225.0- 735.0	1	16.9	5.5	30.5	47.1	9,585					0.3
	2			38.9	61.1	10,191					
220.0- 360.0	1	17.8	9.4	30.5	42.3	9,097					0.4
	2			40.1	59.9	10,134					
400.0- 430.0	1	18.5	6.8	29.6	45.1	9,584	53.9	6.1	1.0	31.9	0.3
	2			39.1	60.9	10,341	72.2	5.3	1.3	20.7	0.5
430.0- 460.0	1	16.6	10.9	28.8	43.7	9,365					0.3
	2			38.9	61.1	10,620					
470.0- 490.0	1	16.8	12.1	28.1	43.0	9,245					0.3
	2			38.6	61.4	10,634					
695.0- 705.0	1	18.8	6.5	28.7	46.0	9,687	55.4	6.2	1.1	30.4	0.4
	2			37.9	62.1	10,422	74.1	5.4	1.5	18.5	0.5
725.0- 735.0	1	17.9	6.3	29.0	46.8	9,920	57.0	6.0	1.2	29.2	0.3
	2			37.9	62.1	10,650	75.3	5.2	1.5	17.6	0.4
785.0- 800.0	1	17.3	11.1	29.1	42.5	9,439					0.4
	2			39.8	60.2	10,720					
910.0- 940.0	1	17.6	8.0	28.4	46.0	9,835					0.5
	2			37.4	62.6	10,770					
995.0- 1005.0	1	17.5	8.7	28.7	45.1	9,750					0.7
	2			38.1	61.9	10,763					
1025.0- 1140.0	1	16.9	7.2	27.6	48.3	10,079					0.5
	2			35.7	64.3	10,938					
1180.0- 1203.0	1	16.4	5.7	30.3	47.6	10,360	59.8	6.1	1.3	26.7	0.4
	2			38.4	61.6	11,042	76.7	5.4	1.7	15.7	0.5
1230.0- 1260.0	1	16.7	5.2	29.3	48.8	10,273					0.4
	2			37.1	62.9	10,895					

TABLE 14 Proximate and Ultimate Analyses of Tunalik Test Well Coals (T10N R36N SEC20) (continued)

Sample No. Depth Interval (feet)	*Basis	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
1305.0- 1410.0	1	15.6	6.2	29.7	48.5	10,488					0.5
	2			37.5	62.5	11,254					
1400.0- 1635.0	1	15.3	6.6	30.3	47.8	10,535					0.5
	2			38.3	61.7	11,352					
1650.0- 1672.0	1	16.0	8.0	28.7	47.3	10,155					0.5
	2			37.1	62.9	11,119					
1672.0- 1800.0	1	15.4	9.4	28.8	46.4	10,055					0.4
	2			37.5	62.5	11,195					
1830.0- 1860.0	1	15.9	6.0	29.4	48.7	10,478	60.4	5.8	1.4	25.9	0.5
	2			37.2	62.8	11,206	77.3	5.2	1.8	15.1	0.6
1905.0- 1915.0	1	13.9	10.7	29.2	46.2	10,187	57.8	5.9	1.3	23.8	0.5
	2			37.9	62.1	11,522	76.7	5.7	1.8	15.1	0.7
1960.0- 1975.0	1	14.9	4.2	29.7	51.2	11,130					0.4
	2			36.3	63.7	11,661					
2015.0- 2020.0	1	14.9	6.6	29.7	48.8	10,754					0.4
	2			37.3	62.7	11,579					
2070.0- 2400.0	1	14.0	4.4	31.1	50.5	11,311					0.3
	2			37.8	62.2	11,878					
2480.0- 2490.0	1	12.1	7.1	29.6	51.2	11,287					0.3
	2			36.2	63.8	12,232					
2520.0- 2540.0	1	12.0	4.8	30.2	53.0	11,470	65.3	5.8	1.2	22.5	0.4
	2			36.0	64.0	12,110	78.5	5.3	1.5	14.5	0.5
2580.0- 2600.0	1	12.1	4.6	31.3	52.0	11,599	65.9	5.9	1.3	21.9	0.4
	2			37.2	62.8	12,209	79.1	5.4	1.6	13.3	0.5

TABLE 15. Proximate and Ultimate Analyses of Kuk River Coals

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
602 SP152	1	T11N R29W SEC29.	75.0 — 80.0	19.8	12.9	28.9	38.4	8,560	50.9	5.4	1.2	29.3	0.3
	2					42.1	57.9	9,947	75.6	4.7	1.8	17.3	0.5
703 SP98	1	T11N R34W SEC35.	44.0 — 48.0	32.3	3.8	27.4	36.5						
	2					42.5	57.5						
703 SP110	1	T11N R33W SEC30.	41.0 — 54.0	19.4	4.9	32.3	43.4						
	2					42.4	57.6						
703 SP119	1	T11N R33W SEC21.	52.0 — 64.0	19.8	5.9	30.2	44.1	9,011					0.3
	2					40.2	59.8	9,621					
703 SP122	1	T11N R33W SEC22.	58.0 — 68.0	19.6	5.0	30.1	45.3						
	2					39.4	60.6						
703 SP125	1	T11N R33W SEC23.	49.0 — 58.0	17.8	3.8	30.2	48.2						
	2					38.2	61.8						
710 SP3	1	T11N R35W SEC 6.	61.0 — 68.0	21.8	3.3	30.3	44.6						
	2					40.0	60.0						
712 SP1	1	T12N R35W SEC27.	16.0 — 22.0	26.0	1.3	27.3	45.4						
	2					37.5	62.5						
712 SP3	1	T12N R35W SEC27.	64.0 — 67.0	18.8	1.3	38.4	41.5						
	2					47.8	52.2						
712 SP11	1	T11N R35W SEC 3.	46.0 — 51.0	18.6	4.2	40.9	36.3						
	2					52.6	47.4						
712 SP27	1	T11N R35W SEC26.	41.0 — 49.0	19.1	1.5	38.6	40.8						
	2					48.5	51.5						
D4XNSP29	1	T12N R34W SEC17.		20.3	1.8	38.1	39.8						
	2					48.8	51.2						
D4XNSP29	1	T12N R34W SEC20.		19.9	5.4	34.1	40.6						
	2					45.3	54.7						

TABLE 16. Proximate and Ultimate Analyses of Peard Bay Test Well (T16N R28W SEC25)

Sample No.	*Basis	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
135.0- 145.0	1	17.6	6.7	30.4	45.3	9,731					0.4
	2			39.6	60.4	10,490					
190.0- 200.0	1	17.3	5.0	32.3	45.4	9,892					0.7
	2			41.1	58.9	10,457					
250.0- 260.0	1	18.4	3.7	31.8	46.1	9,976					0.5
	2			40.5	59.5	10,391					
300.0- 310.0	1	17.1	4.8	32.3	45.8	9,948					0.8
	2			40.9	59.1	10,499					
345.0- 350.0	1	17.0	3.8	32.4	46.8	10,133	60.5	4.8	1.2	29.4	0.3
	2			40.6	59.4	10,572	76.4	3.7	1.6	17.8	0.5
350.0- 360.0	1	17.2	5.7	30.7	46.3	9,878					0.4
	2			39.4	60.6	10,531					
360.0- 365.0	1	17.9	5.5	30.7	45.9	9,812					0.4
	2			39.6	60.4	10,435					
400.0- 410.0	1	15.2	9.5	31.6	43.7	9,779	56.6	5.1	1.2	26.2	1.4
	2			41.1	58.9	10,913	75.2	4.5	1.6	16.8	1.9
690.0- 700.0	1	14.9	3.2	34.9	47.0	10,678					0.5
	2			42.3	57.7	11,070					
750.0- 780.0	1	15.7	5.3	32.5	46.5	10,387	60.9	5.3	1.4	26.6	0.5
	2			40.7	59.3	11,025	77.1	4.5	1.7	16.0	0.7
790.0- 800.0	1	15.3	6.5	32.4	45.7	10,222	59.4	5.4	1.4	26.7	0.6
	2			41.0	59.0	11,003	76.1	4.6	1.7	16.8	0.8

TABLE 17 Proximate and Ultimate Analyses of East Simpson Test Well No. 2 Coal

Sample No.	*Basis	Location	Depth/Interval (feet)	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
ESTW#2	1	T19N R11W SEC23.	79.0- 137.0	1.7	46.4	19.7	32.2	6,813					0.04
	2					32.9	67.1	13,679					

TABLE 18 Proximate and Ultimate Analyses of Umiat Coal

Sample No.	*Basis	Location	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
U7 SP12	1	T 2S R 3W SEC 2.	5.3	19.9	29.9	44.9	10,212					0.5
	2				38.6	61.4	13,017					

TABLE 19 Proximate and Ultimate Analyses of Ikpikpuk Coal

Sample No.	*Basis	Location	Moisture %	Ash, %	Volatile Matter,%	Fixed Carbon,%	Heating Value BTU/lb.	C,%	H,%	N,%	O,%	S,%
U2 SP65	1	T 3S R13W SEC25.	14.6	42.9	19.3	23.2						
	2				40.4	59.6						

Table 20 Reflectance Rank Distribution of Vitrinites in Corwin Bluff Coals

Sample Number	Reflectance Class V 3	V 4	V 5	V 6	V 7	V 8	V 9	Mean Maximum Reflectance $\bar{R}_{om\%}$
SS 70-W17				69	21	10		.69
SS 70-W19				40	60			.72
SS 70-W27				40	52	8		.72
SS 70-W28				78	22			.67
SS 70-W29		84	16					.49
SS 70-W30A			48	42	10			.61
SS 70-W30B		24	76					.52
SS 70-W30C	5	49	52	4				.51
SS 70-W30D			6	52	42			.67
SS 70-W30E		9	61	30				.58
SS 70-W31A		11	59	30				.56
SS 70-W31B		19	60	21				.55
SS 70-W32A				80	20			.68
SS 70-32B				5	86	9		.74
SS 70-W32C				72	28			.67
SS 70-W33V			6	35	40	19		.71
SS 70-W33M			66	33				.59
SS 70-W33L			32	61	7			.64
SS 70-W73				60	36	4		.69
SS 70-W74			35	62	3			.64
SS 70-W80		9	41	36	14			.61
SS 70-W82		9	40	51				.57
SS 70-W83		10	76	14				.55
SS 70-W88				49	46	5		.70

Table 21 Reflectance Rank Distribution of Vitrinites in Cape Beaufort Coals

Sample Number	V 4	V 5	V 6	V 7	V 8	V 9	V 10	Mean Maximum Reflectance $\bar{R}_{om}\%$
AH 73-1		15	30	41	14			.71
AH 73-1A			9	71	16	4		.76
AH 73-1B		8	42	29	21			.72
AH 73-1C		15	69	16				.66
AH 73-1D		24	56	20				.65
AH 73-2			60	22	18			.71
AH 73-3		12	68	20				.64
AH 73-4		41	54	5				.61
AH 73-5		6	32	48	6	8		.71
AH 73-6		16	50	23	11			.68
AH 73-8		12	78	10				.62
AH 73-10A				68	22	10		.78
AH 73-10B			30	62	8			.73
AH 73-10C			52	48				.69
AH 73-23A			78	22				.68
AH 73-23B		4	46	40	5			.69
AH 73-24			39	36	25			.72
AH 73-25A		20	36	44				.67
AH 73-25B		25	35	36	9			.67
AH 73-25C		8	64	27	1			.67
AH 73-27			24	56	20			.73
AH 73-29				29	53	28		.86
AH 73-31A		8	22	52	18			.74
AH 73-31B			58	42				.71
AH 73-32		4	36	55	5			.70
AH 73-34			12	66	12			.73
AH 73-36		8	24	36	20	12		.74
DH 72-11		7	73	20				.65
AH 74-9A				14	66	20		.84
AH 74-9B			25	51	24			.75
AH 74-9C			11	85	4			.75
AH 74-11					71	29		.87
AH 74-15			15	56	24	5		.77

	V 11	V 12	V 13	V 14	V 15	
AH 74-14A	4	21	46	24	5	1.36

Table 22 Reflectance Rank Distribution of Vitrinites in Kukpowruk River Coals

Sample Number	Reflectance Class V 4	V 5	V 6	V 7	V 8	V 9	Mean Maximum Reflectance $\bar{R}_{om}\%$
SS 67-1				78	22		.75
SS 67-2				48	52		.79
SS 67-3				20	42	38	.86
SS 67-4			21	55	24		.75
SS 67-5				24	76		.82
SS 67-6			20	49	31		.76
SS 67-8				58	40	2	.79
SS 67-9			18	72	10		.74
SS 67-10		2	52	46			.70
SS 67-11			61	39			.69
SS 67-12			48	52			.70

Table 23 Reflectance Rank Distribution of Vitrinites in West Utukok River Coals

Sample Number	Reflectance Class V 4	V 5	V 6	V 7	V 8	V 9	V 10	Mean Maximum Reflectance $\bar{R}_{om}\%$
725 SP 45		28	72					.60
725 SP 63		19	81					.63
725 SP 66		25	75					.60
725 SP 69		57	43					.60
725 SP 77		26	65	9				.64
725 SP 81		29	61	10				.63
725 SP 131		4	86	10				.66
725 SP 135			61	35	4			.69
R5XN SP 340				14	58	28		.86
R5XN SP 354				31	61	8		.83
R5XN SP 359			1	49	50			.79
R5XN SP 368			8	46	44	2		.79
R5XN SP 384			14	54	32			.76
R5XN SP 394			6	45	45	4		.80
630 SP 413			14	86				.73
630 SP 441		4	72	24				.68
630 SP 444			24	72	4			.72
630 SP 471			6	34	50	10		.80
F 12-79			30	68	2			.72
F 20-79			2	63	35			.76

Table 24 Reflectance Rank Distribution of Vitrinites in Kokolik River Coals

Sample Number	Reflectance Class V 4	V 5	V 6	V 7	V 8	V 9	V 10	Mean Maximum Reflectance $\bar{R}_{om}\%$
605 SP 393				8	66	26		.86
605 SP 402			6	58	34	2		.77
605 SP 428			4	29	62	5		.81
605 SP 431			16	69	15			.75
605 SP 434			8	66	24	2		.77
605 SP 435			24	69	7			.73
605 SP 439			30	40	30			.76
605 SP 442			32	64	4			.71
605 SP 447				32	60	8		.82
605 SP 448			45	53	2			.71
605 SP 454				48	44	8		.82
605 SP 455			6	64	30			.77
605 SP 457			40	40	20			.72
605 SP 461		2	6	82	10			.75
605 SP 465			40	54	6			.70
605 SP 467		4	18	64	14			.75
605 SP 471		4	28	36	32			.75
605 SP 472			20	55	25			.79
605 SP 474			8	56	32	4		.71
UA 126				10	18	62	10	.96
AH 3-78		5	38	45	12			.72
AH 4-78			32	52	16			.73
AH 12-78		4	24	52	20			.74
AH 16-78			63	33	4			.69
AH 18-78		76	24					.59
AH 19-78		25	75					.63
AH 21-78		71	29					.57
AH 22-78	4	61	35					.58
AH 23-78			36	74				.72
AH 25-78		5	57	32	6			.69
A 78-14		1	33	46	20			.73
A 78-15			30	43	23	4		.74
AH 1-79			5	54	41			.78
AH 4-79			2	78	20			.77
AH 5-79				56	44			.80
AH 6-79			7	63	28	2		.77
AH 7-79			22	66	10	2		.75
R5XN SP 450			6	27	65	2		.81
R5XN SP 457			8	55	37			.78
R5XN SP 458			10	57	33			.78
R5XN SP 462		5	43	49	3			.69

Table 25 Reflectance Rank Distribution of Vitrinites in Archimedes Ridge Coals

Sample Number	V 5	V 6	V 7	V 8	V 9	V 10	V 11	Mean Maximum Reflectance $\bar{R}_{om}\%$
G 78-37			30	57	13			.83
G 78-40			38	50	12			.82
G 78-41			17	45	13	23	2	.90
G 78-43			20	50	30			.86
G 78-55		2	30	61	7			.83
G 78-58			10	50	40			.89
G 78-80		4	14	58	24			.74
G 78-84		2	13	85				.72
G 78-89				59	37	4		.80
G 78-93			41	57	2			.71
G 78-94			2	48	50			.78
G 78-97			22	62	16			.73
G 78-99				20	66	14		.84
133 X SP 431		35	60	5				.72
133 X SP 432	4	46	41	9				.72
F 45-79		2	60	38				.78
F 47-79		1	5	84	10			.86
R5 SP 601				88	12			.85
R5 SP 605			78	22				.77
137 X SP 656				100				.84
137 X SP 666				6	83	11		.96

Table 26 Reflectance Rank Distribution of Vitrinites in Elusive Creek Coals

Sample Number	V 4	V 5	V 6	V 7	V 8	V 9	V 10	Mean Maximum Reflectance $\bar{R}_{om}\%$
605 SP 307			4	44	46	6		.80
605 SP 327			38	48	14			.72
605 SP 328		2	46	46	6			.71
605 SP 329			52	48				.69
605 SP 330			28	60	12			.72
605 SP 331			16	38	46			.77
605 SP 332			7	80	13			.76
605 SP 336			12	64	24			.78
605 SP 337			27	68	5			.74
605 SP 338		1	54	44	1			.71
605 SP 339			20	76	4			.74
605 SP 340			26	62	12			.72
605 SP 342			24	60	16			.74
605 SP 347			9	65	26			.75
137 X SP 736			14	70	16			.76
137 X SP 737			4	70	26			.76
137 X SP 742		28	32	40				.65
137 X SP 744	5	15	30	50				.74
137 X SP 745		29	44	27				.72
137 X SP 749			69	31				.69
137 X SP 753			77	23				.68
137 X SP 754		19	54	23	4			.66
137 X SP 755			24	46	30			.76
137 X SP 757		17	64	19				.66
137 X SP 758			9	54	35	2		.80
137 X SP 764		20	63	17				.65
137 X SP 765		9	69	22				.68
137 X SP 767		3	61	29	7			.68
137 X SP 768		12	53	35				.69
137 X SP 771			42	55	3			.72
137 X SP 773			52	43	5			.70
137 X SP 775		11	60	25	4			.68
137 X SP 777		5	61	34				.68
137 X SP 802			16	84				.72
137 X SP 804			56	44				.69
137 X SP 808			10	76	14			.76
AH 34-78			25	60	15			.74
AH 37-78V			53	44	3			.69
AH 37-78L		5	86	9				.65
AH 43-78		4	62	29	5			.68
AH 48-78			5	55	40			.78

Table 26 Reflectance Rank Distribution of Vitrinites in Elusive Creek Coals (continued)

Sample Number	V 4	V 5	V 6	V 7	V 8	V 9	V 10	Mean Maximum Reflectance $\bar{R}_{om}\%$
AH 56-78		14	81	5				.63
AH 60-78			18	72	10			.74
AH 61-78V			4	36	50	10		.81
AH 61-78L		6	45	49				.69
AH 63-78		34	51	15				.63
AH 8-79			32	50	18			.70
AH 10-79				52	48			.79
AH 13-79			8	89	3			.72
AH 15-79			10	88	2			.74
AH 16-79			43	57				.71
AH 22-79			26	74				.72
AH 25-79			13	87				.74
AH 26-79			31	69				.72
AH 34-79		4	36	55	5			.71
AH 35-79				50	44	6		.79
AH 36-79				19	60	21		.84
AH 37-79				26	69	5		.82
AH 38-79			21	54	25			.76
78-35				14	78	8		.85
F 75-79		38	62					.60
UA 125			33	67				.71
632 SP 300		4	24	48	24			.72
632 SP 307			8	68	24			.76
632 SP 321			30	54	16			.74
632 SP 322			34	54	12			.73
632 SP 324			14	46	40			.77
632 SP 340			2	60	36	2		.80
632 SP 341			10	44	40	6		.79
632 SP 342			2	58	40			.78
734 SP 216			33	66	4			.73
137 X SP 748		3	59	38				.69

Table 27 Reflectance Rank Distribution of Vitrinites in Central Utukok River Coals

Sample Number	Reflectance Class V 4	V 5	V 6	V 7	V 8	V 9	V 10	Mean Maximum Reflectance $\bar{R}_{om}\%$
632 SP 369			18	68	14			.74
632 SP 370			8	62	30			.79
632 SP 383				4	84	12		.84
632 SP 386				16	64	20		.85
632 SP 392			76	24				.67
632 SP 400		1	45	52	2			.69
632 SP 402		1	20	70	9			.73
632 SP 422			2	66	32			.77
632 SP 436		2	78	20				.67
632 SP 440		4	44	47	5			.70
632 SP 442		8	44	48				.69
632 SP 447		3	73	24				.67
632 SP 467		34	63	3				.61
632 SP 480			6	56	38			.78
725 SP 169			50	46	4			.70
725 SP 206			45	50	5			.71
725 SP 216			6	94				.73
725 SP 219			9	56	28	7		.78
725 SP 222			3	63	24			.76
725 SP 230			28	43	29			.74
725 SP 271			3	87	10			.75
723 SP 114					59	41		.89
137 X SP 24			48	52				.70

Table 28 Reflectance Rank Distribution of Vitrinites in East Utukok River Coals

Sample Number	Reflectance Class V 4	V 5	V 6	V 7	V 8	V 9	V 10	Mean Maximum Reflectance $\bar{R}_{om}\%$
603 SP 211			44	50	6			.70
603 SP 232		4	32	52	12			.72
603 SP 267				40	60			.79
F 73-79			43	57				.71
R4 SP 2				18	74	8		.84
R4 SP 21			6	52	40	2		.79
725 SP 342			5	67	25	3		.78
723 SP 204				88	12			.76
R 3XN SP 390		20	54	26				.65
R 3XN SP 397		66	34					.58
R 3XN SP 443				46	48	6		.81
R 3XN SP 449			26	58	16			.74

Table 29 Reflectance Rank Distribution of Vitrinites in Lookout Ridge Coals

Sample Number	Reflectance Class V 3	V 4	V 5	V 6	V 7	V 8	V 9	Mean Maximum Reflectance $\bar{R}_{om\%}$
R7XN SP 413				30	68	2		.71
R7XN SP 428				10	65	25		.76
R7XN SP 445				28	60	12		.73
R7XN SP 482		4	32	64				.60
R7XN SP 486				18	60	20	2	.75
R7XN SP 488			11	53	36			.68
47XN SP 494		4	78	18				.56
R7XN SP 520			52	48				.60
R7XN SP 531		4	64	32				.58
R7XN SP 582		10	60	30				.58

Table 30 Reflectance Rank Distribution of Vitrinites in Tunelik Test Well Coals

Depth Interval Feet	Reflectance Class V 1	V 2	V 3	V 4	V 5	V 6	V 7	V 8	Mean Maximum Reflectance $\bar{R}_{om\%}$
225–735				8	92				.53
220–360				9	60	31			.57
400–430			83	17					.37
430–460				12	76	12			.43
470–490				8	81	11			.55
695–705			89	11					.38
725–735					23	67	10		.63
785–800				45	46	9			.54
910–940				12	60	28			.56
955–1005				12	47	41			.57
1025–1140				6	48	46			.58
1180–1203				7	75	18			.57
1230–1260				8	76	16			.56
1305–1410				52	46	2			.52
1400–1635					64	36			.60
1650–1672				10	62	28			.58
1672–1800				24	64	12			.54
1830–1860					72	28			.57
1905–1915					20	71	9		.65
1960–1975					37	58	5		.62
2015–2020				15	55	30			.56
2070–2400					83	17			.58
2480–2490					32	68			.62
2520–2540					44	56			.61
2580–2600					16	80	4		.63

Table 31 Reflectance Rank Distribution of Vitrinites in Kuk River Coals

Sample Number	Reflectance Class V 3	V 4	V 5	V 6	V 7	V 8	Mean Maximum Reflectance $\bar{R}_{om}$%
602 SP 152			70	30			.58
703 SP 98		39	50	11			.52
703 SP 110		13	77	10			.55
703 SP 119			47	44	19		.60
703 SP 122		8	82	10			.54
703 SP 125			40	52	8		.60
710 SP 3			42	56	2		.51
712 SP 1			18	64	18		.63
712 SP 3		10	81	9			.54
712 SP 11			61	39			.57
712 SP 27			72	20	8		.57
D4X2 SP 26		23	67	10			.52
D4XW SP 29		25	75				.52

Table 32 Reflectance Rank Distribution of Vitrinites in Peard Bay Test Well Coals

Depth Interval Feet	Reflectance Class V 2	V 3	V 4	V 5	V 6	V 7	V 8	Mean Maximum Reflectance $\bar{R}_{om}$%
135-145			16	76	8			.54
190-200		4	37	52	7			.51
250-260			32	74	4			.55
300-310		4	24	72				.52
345-350			20	45	30	5		.58
350-360			14	62	24			.57
360-365			24	60	16			.57
400-410			37	63				.51
690-700			48	52				.51
750-780			44	52	4			.51
790-800			48	48	4			.51

Table 33 Reflectance Rank Distribution of Vitrinites in East Simpson Test Well Coal

Sample Number	Reflectance Class V 9	V 10	V 11	V 12	V 13	Mean Maximum Reflectance $\bar{R}_{om}$%
East Simpson #2		33	62	5		1.11

Table 34 Reflectance Rank Distribution of Vitrinites in Umiat Coal

Sample Number	Reflectance Class V 5	V 6	V 7	V 8	V 9	Mean Maximum Reflectance $\bar{R}_{om}$%
U-7 SP 12		64	31	5		.68

Table 35 Reflectance Rank Distribution of Vitrinite in Ikpikpuk Coal

Sample Number	Reflectance Class V 2	V 3	V 4	V 5	V 6	Mean Maximum Reflectance $\bar{R}_{om}$%
U-2 SP 65		15	79	6		.44

Table 36 Distribution of Macerals in Corwin Bluff Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
SS 70-W17	73.0	17.3	1.1	1.3	.7	1.6	1.0	.3	—	—	—	.9	.4	.2	1.2	.2	—	.6	—
SS 70-W19	72.4	17.6	.3	1.2	1.2	.7	2.1	2.2	—	—	—	—	.3	—	.9	—	—	1.3	—
SS 70-W27	63.6	24.4	.4	.4	—	2.4	1.6	.8	—	—	—	—	—	—	4.8	—	—	1.6	—
SS 70-W28	64.0	19.0	3.0	—	2.0	5.0	3.0	2.0	—	—	—	—	—	—	2.0	—	—	—	—
SS 70-W29	68.0	9.5	5.5	—	.5	4.0	2.0	1.0	.5	—	—	—	—	1.0	5.5	—	—	2.5	—
SS 70-W30A	70.4	13.6	1.0	.8	—	2.6	1.8	—	.2	—	—	—	—	.8	4.2	.6	—	4.0	—
SS 70-W30B	71.6	20.4	.8	.6	.4	.4	1.6	.8	—	—	—	.2	—	—	2.4	—	—	.8	—
SS 70-W30C	59.5	16.6	1.5	—	—	3.5	1.9	.9	—	.2	.3	—	—	.2	9.9	2.1	—	3.4	—
SS 70-W30D	64.2	15.0	2.4	1.2	.4	3.4	2.8	.4	—	—	—	.2	—	.6	6.0	1.0	—	2.6	—
SS 70-W30E	70.9	19.1	3.4	.4	1.2	.7	1.1	1.1	—	—	—	—	.4	.2	1.2	—	—	.5	—
SS 70-W31A	59.9	19.4	1.1	.4	.3	2.0	.3	.4	—	—	.3	—	—	1.8	9.9	.6	—	3.6	—
SS 70-W31B	56.0	15.8	.9	—	1.7	4.3	1.8	.6	1.4	—	—	—	—	.9	11.5	1.6	—	3.6	—
SS 70-W32A	49.8	9.9	.5	.7	1.4	4.2	2.3	—	—	—	.1	—	—	.7	22.3	3.0	.7	4.4	—
SS 70-W32B	59.5	10.2	.5	.6	.1	1.5	1.1	.2	—	—	.1	—	—	.3	12.0	1.2	—	12.7	—
SS 70-W32C	61.4	9.9	.8	.7	.6	3.7	2.8	.4	—	—	.8	—	—	1.0	13.7	.9	—	3.3	—
SS 70-W33V	49.5	8.9	.5	—	.4	2.0	.2	.7	—	—	—	—	.2	2.7	21.5	2.8	1.9	8.7	—
SS 70-W33M	74.1	12.3	—	—	.1	1.3	.1	—	.1	—	—	—	—	.6	7.0	.8	.6	3.0	—
SS 70-W33L	67.0	20.6	—	1.2	.2	2.4	1.0	.4	.8	—	—	—	—	—	4.4	.6	—	1.4	—
SS 70-W73	69.2	10.0	—	.4	—	2.0	.2	—	—	—	—	—	—	.2	13.6	1.2	—	4.2	—
SS 70-W74	71.4	14.0	1.4	—	.9	2.3	2.2	—	—	—	—	—	—	.7	2.9	1.2	—	3.0	—
SS 70-W80	61.9	12.9	4.1	1.5	1.0	3.9	2.0	—	.7	.7	—	—	—	.4	7.0	.6	—	3.3	—
SS 70-W82	64.0	15.0	2.8	2.6	1.2	3.8	3.6	.8	.4	—	—	—	—	—	4.0	.8	—	1.2	—
SS 70-W83	72.6	12.4	1.9	1.0	.4	2.6	1.8	.6	—	—	—	—	—	.6	3.8	.2	—	2.2	—
SS 70-W88	66.0	15.6	1.0	1.0	.4	3.0	1.8	.2	.2	—	.2	—	—	.2	6.0	1.4	—	3.0	—

Table 37 Distribution of Macerals in Cape Beaufort Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
AH 73-1	54.6	5.6	—	.2	1.4	.6	1.0	—	—	.4	—	—	.4	2.2	21.8	3.3	2.1	6.4	—
AH 73-1A	60.4	3.6	.6	—	3.6	1.8	.8	.6	—	—	—	—	—	1.0	18.4	4.4	—	4.8	—
AH 73-1B	54.5	4.4	1.0	.2	2.6	1.8	.9	.2	.1	.3	—	—	—	3.3	22.6	2.5	.3	5.2	.1
AH 73-1C	54.1	5.5	.4	.2	1.8	1.7	1.7	.4	—	—	—	—	—	5.0	19.4	1.9	—	7.9	—
AH 73-1D	57.8	2.8	.6	—	1.4	2.0	.4	.4	—	—	.2	—	.8	.4	20.4	4.2	—	8.6	—
AH 73-2	57.6	6.0	1.2	.4	.6	3.8	1.2	—	.2	—	—	—	—	1.2	16.2	5.8	—	5.8	—
AH 73-3	53.3	4.0	—	—	—	1.0	.7	—	—	—	—	—	—	6.5	21.7	1.8	1.2	9.8	—
AH 73-4	63.5	14.8	1.3	—	.5	2.4	1.3	.5	—	—	.5	—	—	—	8.8	3.3	.5	2.6	—
AH 73-5	56.9	4.8	.9	.3	1.5	1.6	.9	.2	—	—	.7	—	—	.9	23.4	1.7	.6	6.7	—
AH 73-6	53.2	5.2	1.0	.1	2.1	1.5	1.7	.4	—	—	.5	—	—	3.1	23.9	4.4	—	2.9	—
AH 73-8	56.8	14.5	1.1	.3	.5	1.5	1.8	—	—	—	.9	—	—	.8	16.5	.6	—	4.6	—
AH 73-10A	65.6	8.0	2.0	—	2.0	1.2	.8	—	—	—	—	—	—	1.6	21.6	4.0	—	3.2	—
AH 73-10B	63.8	22.4	1.2	—	—	3.1	—	—	—	—	—	—	—	.4	6.1	1.3	—	1.7	—
AH 73-10C	63.4	18.7	1.0	.1	.6	.5	1.1	—	—	—	.3	—	—	5.5	12.9	2.7	—	3.2	—
AH 73-23A	60.0	16.8	.4	—	—	1.6	1.2	—	—	—	.8	—	—	2.8	13.6	1.6	—	1.2	—
AH 73-23B	58.4	16.3	2.0	—	1.4	2.4	1.5	.5	.1	—	.4	—	—	1.4	7.1	2.1	—	6.4	—
AH 73-24	67.0	23.5	.3	—	.3	.5	1.0	.4	—	—	.2	—	—	.2	4.6	.6	—	1.4	—
AH 73-25A	59.6	4.8	1.8	.2	1.6	2.5	1.6	.1	—	—	.1	—	—	2.4	20.4	.8	—	4.1	—
AH 73-25B	62.8	13.8	.3	.2	.2	1.9	.3	.6	—	—	.8	—	—	1.2	19.6	1.2	1.2	6.0	—
AH 73-25C	52.8	13.6	1.4	.4	1.2	1.9	.9	.3	.2	—	.2	—	—	1.2	18.0	1.8	—	6.2	—
AH 73-27	69.8	16.2	.4	.1	.6	.5	.5	.2	—	—	.7	—	—	—	8.3	.2	—	2.4	—
AH 73-29	78.0	8.5	.5	.2	.7	.2	1.1	—	—	—	.4	—	—	.5	6.6	.9	.7	1.7	—
AH 73-31A	39.3	6.1	1.0	—	1.9	1.4	1.0	—	—	—	—	—	.1	.9	21.7	4.9	5.9	15.7	.1
AH 73-31B	52.0	9.2	.8	.4	.8	1.6	.8	—	—	—	—	—	—	.4	24.4	1.8	1.0	6.8	—
AH 73-32	67.0	15.8	.4	.2	.2	1.1	.7	—	—	.4	—	—	—	.6	8.8	1.4	.8	2.6	—

Table 37 Distribution of Macerals in Cape Beaufort Coals (cont.)

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
AH 73-34	55.9	10.1	.4	1.2	.8	1.6	.7	.2	—	.1	.2	—	—	1.4	20.6	1.9	.9	4.0	—
AH 73-36	68.9	5.9	.9	.5	.5	1.7	.4	.4	.1	—	.3	—	—	.2	15.4	.9	—	3.9	—
OH 72-11	72.6	14.4	.7	.4	2.3	.9	.9	.4	.2	.1	.1	—	—	2.0	2.6	.2	—	2.2	—
AH 74-9A	48.3	12.5	1.9	.1	1.6	1.0	.4	.1	—	—	—	—	—	.4	25.3	.8	.9	6.7	—
AH 74-9B	63.0	18.0	1.0	1.2	.8	1.4	—	.2	.2	—	.2	—	—	.4	10.2	1.2	.4	3.8	—
AH 74-9C	80.7	9.2	1.0	.2	.8	.7	.2	.4	—	—	—	—	—	—	3.6	.6	—	2.8	—
AH 74-11	73.4	12.2	1.1	.7	.5	.4	.2	.2	.1	—	—	—	—	.2	5.9	.5	—	4.6	—
AH 74-14A	34.8	42.5	.2	—	—	—	—	—	—	—	—	—	—	.7	10.0	6.2	—	5.6	—
AH 74-15	64.4	20.6	.6	.2	—	2.2	1.2	.2	.2	—	—	—	—	.2	6.0	.2	—	4.0	—

Table 38 Distribution of Macerals in Kukpowruk River Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
SS 67-1	74.6	13.2	2.8	.2	1.6	1.6	—	—	.6	—	—	—	—	—	4.2	.4	—	.8	—
SS 67-2	52.3	22.5	1.4	.1	1.0	1.0	.6	.2	—	—	—	.1	—	.9	16.5	.8	—	2.6	—
SS 67-3	54.0	4.9	2.0	.3	1.8	1.3	.3	.2	.1	—	.1	—	—	.6	27.2	2.1	1.5	3.5	.1
SS 67-4	53.4	19.2	1.2	.2	.8	3.6	.8	.6	—	—	—	—	.2	1.3	13.2	1.0	—	4.4	.1
SS 67-5	56.1	19.2	1.4	.2	.4	4.0	1.4	1.1	—	—	—	.2	—	1.0	10.7	.6	—	3.6	.1
SS 67-6	52.4	24.8	1.4	1.1	1.0	.9	.8	.4	.2	.1	—	.7	—	.6	11.2	1.3	.9	2.2	—
SS 67-8	59.8	17.2	1.2	.2	1.0	2.0	1.8	.9	.1	—	.4	—	—	.4	10.6	1.4	.2	2.8	—
SS 67-9	61.8	16.2	2.2	.2	.4	2.6	.6	.2	—	—	1.2	—	—	.2	9.8	.4	—	4.2	—
SS 67-10	70.8	14.8	.6	—	.8	1.6	.4	.2	.2	—	1.2	—	—	.3	6.8	.2	—	2.0	.1
SS 67-11	73.0	14.4	2.2	.8	.6	1.2	.2	.4	—	—	—	.4	—	—	4.4	.8	—	1.6	—
SS 67-12	60.8	13.0	2.0	.2	1.2	1.0	1.2	.2	—	—	.6	—	—	.8	11.2	2.9	.3	4.6	—

Table 39 Distribution of Macerals in West Utukok River Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
725 SP 45	72.8	9.6	.8	—	.4	1.0	1.2	.4	.2	—	.8	—	—	1.2	9.2	1.6	—	.8	—
725 SP 63	68.2	7.4	.8	.2	.2	1.8	1.2	1.0	—	—	.2	—	.4	.4	12.6	1.3	.3	4.0	—
725 SP 66	66.0	7.6	.8	.4	.2	2.0	1.2	.2	.4	—	.2	—	.2	2.2	13.4	2.1	.7	2.6	—
725 SP 69	69.4	5.6	1.4	.4	.8	.6	.6	—	—	—	.4	—	.2	1.2	14.6	1.4	.6	2.8	—
725 SP 77	67.9	7.9	.8	.3	1.4	1.6	.2	.1	.3	—	.3	—	—	1.1	12.1	2.1	.2	4.6	.1
725 SP 81	72.4	11.0	.7	—	.9	1.8	1.7	—	—	—	—	—	.2	—	7.5	.5	—	3.2	—
725 SP 131	71.3	13.0	1.3	—	.9	2.3	1.4	.5	—	—	2.3	—	.4	—	4.9	.4	—	1.3	—
725 SP 135	77.9	12.5	1.2	.4	.3	1.9	1.5	.5	.1	—	.2	—	—	—	2.5	.3	—	.7	—
RSXN SP 340	65.2	15.2	.9	.4	1.5	1.4	2.6	.6	—	1.0	.3	—	1.6	2.7	2.7	1.3	—	2.6	—
RSXN SP 354	68.3	11.0	1.5	.5	2.0	1.5	2.0	.3	—	1.2	.8	—	1.2	4.2	2.5	1.5	—	1.5	—
RSXN SP 359	67.4	8.1	1.2	1.6	3.1	1.2	2.6	.4	—	.8	—	—	1.1	4.3	6.7	1.7	—	4.8	—
RSXN SP 368	68.8	3.6	1.7	1.1	2.8	1.3	1.8	.3	—	1.0	—	—	.2	4.0	6.2	2.3	—	4.9	—
RSXN SP 384	63.8	13.6	1.1	.7	2.1	1.2	2.0	.9	—	1.2	.9	—	1.0	1.5	5.3	1.4	—	3.3	—
RSXN SP 394	64.6	7.6	1.2	1.4	4.6	1.3	1.6	.2	.2	.4	.2	—	1.3	4.8	7.6	1.2	—	2.0	—
630 SP 413	71.3	8.2	1.7	.5	2.9	2.2	1.5	1.0	.7	—	1.0	—	—	3.2	4.6	—	—	1.2	—
630 SP 441	72.9	5.0	1.5	.3	2.2	4.1	1.2	1.9	.5	—	1.1	—	—	3.8	4.5	.4	—	.6	—
630 SP 444	69.2	7.1	.7	.8	1.9	3.7	1.2	1.8	.5	—	.9	—	—	4.7	6.8	.6	—	1.1	—
630 SP 471	67.2	11.1	.5	—	1.1	1.9	1.6	.8	.2	.6	2.5	—	—	4.0	5.0	1.8	—	1.7	—
F 12-79	62.8	19.8	1.1	.3	1.7	.6	1.4	.1	.1	—	.4	—	—	2.9	5.3	1.6	.2	1.7	—
F 20-79	65.4	11.5	1.2	.6	2.7	1.4	.8	—	—	—	.5	—	.2	3.3	8.8	1.4	—	2.3	.1

Table 40 Distribution of Macerals in Kokolik River Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
605 SP 393	79.6	8.0	.8	.8	1.6	—	2.5	1.8	—	3.1	—	—	1.6	.4	—	—	—	—	—
605 SP 402	64.4	25.2	1.6	.5	4.3	.8	.3	.4	—	—	—	—	.9	.4	—	.8	—	.4	—
605 SP 428	62.8	11.6	.4	.9	2.5	1.8	1.9	.8	—	1.5	1.4	—	.8	3.0	7.0	1.2	—	2.4	—
605 SP 431	58.4	1.8	.8	2.1	1.5	2.0	1.3	1.8	—	1.1	—	—	.8	7.7	13.7	2.9	—	4.1	—
605 SP 434	62.4	12.2	1.3	.9	2.6	1.4	1.2	1.0	—	1.6	.6	—	.6	5.2	11.2	3.2	—	4.6	—
605 SP 435	58.5	11.3	1.3	1.1	3.1	1.1	2.4	.1	—	.6	2.3	—	.7	7.7	6.1	1.7	—	2.0	—
605 SP 439	56.2	12.4	2.7	1.1	3.0	2.0	3.4	.4	—	—	1.0	—	1.4	4.0	2.2	5.2	—	3.0	—
605 SP 442	62.9	20.3	1.6	.9	1.5	3.2	1.5	1.2	—	2.9	.7	—	1.7	—	.8	.4	—	.4	—
605 SP 447	60.3	15.9	2.0	2.7	4.1	2.1	1.9	.9	.2	.9	.8	—	1.0	2.4	3.6	.8	—	.4	—
605 SP 448	63.1	11.7	1.2	1.1	1.9	1.3	2.7	.8	—	.7	.2	—	1.5	4.3	5.5	2.7	—	1.3	—
605 SP 454	56.1	6.7	1.0	1.0	1.5	2.0	.7	.4	—	—	1.7	—	1.7	7.1	10.5	5.3	—	4.3	—
605 SP 455	62.1	22.1	.2	.5	2.5	.6	1.9	.4	—	—	1.8	—	.1	1.7	4.7	.4	—	1.0	—
605 SP 457	75.6	12.4	.4	.7	.9	2.3	1.1	1.2	—	.5	.5	—	.4	1.5	.5	—	—	2.0	—
605 SP 461	61.1	9.7	1.8	.7	2.9	2.3	.3	—	.4	1.1	.4	—	.5	9.1	3.5	2.6	—	3.6	—
605 SP 465	65.0	6.7	.9	1.5	2.5	1.2	.7	.7	.4	.3	—	—	.1	7.1	4.9	3.9	—	4.1	—
605 SP 467	67.9	21.6	1.3	1.6	2.6	3.0	1.5	.6	.3	.5	.3	—	.5	2.7	1.1	1.7	—	2.9	—
605 SP 471	55.4	32.8	1.2	.7	2.5	.4	.9	.2	—	.7	—	—	2.4	.8	—	—	—	2.0	—
605 SP 472	62.7	14.4	1.6	2.4	4.1	2.5	1.3	.2	—	.4	—	—	.4	4.7	2.9	1.2	—	1.2	—
605 SP 474	61.7	22.3	2.1	1.6	4.3	.3	.8	.8	—	—	.4	—	.1	2.7	2.5	—	—	.4	—
UA 126	60.3	16.4	1.0	.4	1.6	1.5	.3	.2	.2	—	.1	—	—	2.1	12.5	.8	—	2.6	—
AH 3-78	67.2	16.5	.2	.2	.8	.5	.6	—	—	.2	.7	—	.1	3.9	4.9	1.6	.2	2.4	—
AH 4-78	61.5	21.5	.6	1.3	2.9	1.1	1.4	.1	.1	—	.1	—	—	3.7	2.9	1.3	.5	1.2	—
AH 12-78	62.5	12.2	1.4	—	1.4	.8	1.3	.2	.6	.3	1.2	—	—	5.4	8.0	1.1	1.1	2.4	—
AH 16-78	54.8	16.5	1.6	1.2	7.8	2.3	1.2	.5	1.2	—	.5	—	—	3.2	5.7	1.1	.1	2.3	—
AH 18-78	61.9	7.9	.3	1.1	.9	1.0	.8	.3	.1	—	—	—	.9	4.5	15.0	2.9	.1	2.4	.1

Table 40 Distribution of Macerals in Kokolik River Coals (cont.)

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
AH 19-78	65.7	10.5	.4	.6	1.7	.4	1.0	—	—	—	—	.2	.2	4.0	11.3	1.7	—	2.3	—
AH 22-78	62.5	14.6	1.1	.3	.9	1.4	1.0	.1	—	—	.9	—	.6	4.4	6.2	1.3	.2	4.5	—
AH 21-78	57.3	5.3	.9	.1	2.2	.1	1.8	.2	—	—	.7	—	.1	8.7	13.9	2.5	1.5	4.7	—
AH 23-78	60.7	10.8	.5	.7	1.1	.4	1.4	.3	.5	—	.8	—	—	4.4	10.2	2.2	1.1	4.9	—
AH 25-78	71.6	10.9	.6	.1	.8	.6	.8	.2	—	—	.5	—	—	3.3	6.1	.9	—	3.6	—
A 78-14	51.1	36.8	1.4	2.4	.6	.9	2.5	.4	—	—	—	—	.2	1.0	1.8	.2	—	.6	.1
A 78-15	71.3	7.1	.8	1.9	1.0	.7	1.2	.1	.1	2.2	.8	—	.2	2.8	6.8	.9	.5	1.6	—
AH 1-79	63.2	20.8	.6	1.2	1.0	.6	2.0	.4	.2	—	.8	—	—	3.2	3.0	1.4	—	1.6	—
AH 4-79	69.4	21.6	1.6	2.0	2.8	.8	1.4	—	—	—	—	—	—	.2	—	—	—	.2	—
AH 5-79	53.2	22.6	1.4	.2	1.2	1.6	1.5	.4	—	—	1.0	—	—	2.6	8.8	2.5	.3	2.8	—
AH 6-79	65.4	18.4	.3	.2	.3	1.8	2.0	.9	—	.2	—	—	—	2.6	4.6	1.4	—	1.9	—
AH 7-79	63.5	6.8	.5	.2	2.0	.7	1.6	—	—	—	1.3	—	—	3.2	12.5	3.5	—	4.2	—
RSXN SP 450	60.6	22.0	.9	1.0	1.6	.6	1.6	.6	.2	.8	—	—	.4	2.8	2.8	2.0	—	2.2	—
RSXN SP 457	63.6	12.2	.8	.8	1.4	1.4	2.4	.4	—	.4	1.0	—	1.0	3.0	5.6	2.8	—	3.2	—
RSXN SP 458	66.0	12.7	.8	1.1	.8	1.3	2.3	.5	—	.5	.2	—	.5	2.3	6.6	1.8	—	2.6	—
RSXN SP 462	71.2	12.2	1.0	.7	.6	2.2	2.1	2.4	.1	1.0	—	—	3.8	.6	1.5	—	—	.6	—

Table 41 Distribution of Macerals in Archimedes Ridge Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
G 78-37	68.0	16.5	1.5	1.3	.4	.6	2.2	.3	—	.3	.3	—	—	2.6	3.2	.8	—	1.9	.1
G 78-40	61.0	32.2	2.4	.3	2.3	.5	.4	.3	—	.1	.3	—	—	—	.2	—	—	—	—
G 78-41	52.1	45.4	.7	.6	.1	.1	.3	—	—	.1	—	—	—	.1	—	.1	—	.4	—
G 78-43	68.7	12.7	.4	.2	.6	.8	2.4	4.0	—	.4	.7	—	—	3.6	3.7	.5	.1	1.2	—
G 78-55	53.8	1.8	.4	—	.4	2.0	1.0	—	.1	—	—	—	.5	7.0	26.0	4.0	—	3.0	—
G 78-58	66.4	22.4	1.2	—	3.9	.2	1.8	—	—	—	—	—	—	—	3.4	.8	—	—	—
G 78-80	67.9	21.7	.4	—	.2	.6	.4	—	—	.6	1.0	—	—	2.3	2.9	1.2	—	.6	—
G 78-84	78.0	4.4	.8	.2	2.2	.4	1.2	—	—	1.0	.8	—	—	1.8	4.2	1.8	—	3.2	—
G 78-89	56.3	23.1	.8	1.2	.8	.8	1.1	.4	—	—	.1	—	1.6	2.3	7.4	1.9	.5	1.7	—
G 78-93	71.1	17.9	.6	1.2	.2	.5	.6	.4	.3	.1	.7	—	—	3.2	2.3	.5	.2	.2	—
G 78-94	63.9	12.8	.5	.5	4.5	.7	.2	—	—	—	.6	—	.1	1.4	9.0	1.7	.9	3.1	.1
G 78-97	69.6	15.8	1.4	2.8	5.0	1.0	1.0	.2	—	—	—	—	.6	.4	1.6	.4	—	.2	—
G 78-98	64.0	6.0	.8	—	.4	1.4	2.0	—	.2	.6	.8	—	.2	6.2	11.0	2.4	—	4.2	—
133 X SP 431	57.9	16.5	.7	.5	2.6	1.2	2.9	.5	—	1.1	1.0	—	.4	3.6	4.9	1.4	1.2	3.7	—
133 X SP 432	60.9	21.1	1.1	1.7	5.2	.4	1.9	.6	—	.7	1.2	—	.8	.9	2.3	—	—	1.2	—
F 45-79	52.7	11.6	.8	.4	1.2	.5	.4	.5	.5	.1	.6	—	—	12.4	12.5	2.5	—	3.2	.1
F 47-79	59.0	18.3	.8	—	1.0	2.0	1.0	—	—	—	.3	—	.2	3.6	9.8	1.6	—	2.4	—
RS SP 601	58.9	35.1	3.3	.2	1.3	—	—	—	—	—	—	—	.2	—	.3	—	—	.7	—
RS SP 605	60.6	19.2	.9	.1	2.8	.4	2.5	—	—	1.3	.4	—	.8	2.9	4.4	.9	.3	2.4	.1
137 X SP 658	67.9	18.5	2.9	—	5.5	.5	1.5	.7	—	—	—	—	—	.4	—	—	—	2.1	—
137 X SP 666	73.2	21.6	1.4	—	—	—	1.0	—	—	.2	—	—	.8	—	.6	—	—	1.4	—

Table 42 Distribution of Macerals in Elusive Creek Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
605 SP 307	72.4	14.6	.8	.9	1.9	1.2	1.2	2.8	—	1.6	—	—	1.4	.4	.6	—	—	.2	—
605 SP 327	59.5	6.9	.5	1.0	2.2	1.6	1.6	.6	—	.8	.8	—	.2	5.1	9.9	2.7	—	5.4	—
605 SP 328	59.0	7.2	1.2	.9	2.5	2.2	1.8	.4	—	.5	1.4	—	.4	6.9	11.5	1.8	—	3.4	—
605 SP 329	64.4	11.2	1.8	.6	1.4	1.0	2.5	.6	—	.9	1.0	—	.6	4.7	4.7	2.1	—	2.5	—
605 SP 330	52.0	7.2	.4	.3	1.1	.7	2.2	.2	.2	1.3	.6	—	.4	4.5	17.1	5.2	—	6.6	—
605 SP 331	58.2	21.0	.3	.5	1.9	.7	2.6	.4	.2	.7	.2	—	.4	2.6	5.4	2.2	—	2.8	—
605 SP 332	54.4	5.6	2.0	—	.8	1.9	2.8	2.4	—	1.3	—	—	.8	19.0	6.0	.8	—	3.2	—
605 SP 336	56.5	26.4	1.0	.4	1.0	1.8	2.2	.6	.2	1.2	1.0	—	1.4	2.0	2.2	1.0	—	1.0	—
605 SP 337	64.6	16.8	1.0	1.2	1.9	1.9	2.1	.6	.1	1.0	.5	—	1.6	1.5	2.6	.8	—	1.8	—
605 SP 338	60.8	12.4	1.2	.2	1.6	2.2	1.5	.6	.3	1.4	.8	—	1.0	6.2	4.6	2.4	—	2.8	—
605 SP 339	65.2	18.2	2.2	.7	2.3	1.8	1.5	.4	—	.9	1.2	—	.4	1.5	1.5	.9	—	1.3	—
605 SP 340	62.1	16.4	6.3	.7	.9	.8	1.9	—	.4	1.3	.3	—	.5	1.7	3.1	1.7	—	1.9	—
605 SP 342	61.6	7.0	1.4	1.3	2.5	1.8	1.9	.2	—	1.3	.2	—	.8	4.8	9.2	3.0	—	3.0	—
605 SP 347	78.5	8.7	1.3	1.3	1.7	.9	2.0	.3	.4	1.0	.8	—	.6	.1	1.4	.2	—	.8	—
137 X SP 736	63.9	21.0	2.1	1.1	5.5	—	1.4	—	—	.6	—	—	.8	1.2	—	—	—	2.4	—
137 X SP 737	62.6	23.6	.9	.7	7.8	.3	.3	1.0	—	.3	—	—	1.1	.3	—	—	—	1.1	—
137 X SP 742	59.4	10.0	1.6	—	3.6	1.6	1.0	.2	—	.2	1.4	—	.4	7.6	9.0	1.4	—	3.6	—
137 X SP 744	54.9	5.8	3.3	.3	8.9	1.2	1.1	.6	—	1.1	.9	—	—	8.4	5.2	1.5	.9	5.9	—
137 X SP 745	60.2	13.3	1.5	.7	6.2	.5	1.3	.2	—	.4	1.9	.1	—	4.5	4.9	1.5	—	2.8	—
137 X SP 749	58.6	11.6	.3	.9	3.6	1.2	1.3	.2	—	.5	1.7	—	1.0	6.8	5.6	2.1	.7	3.9	—
137 X SP 753	62.8	20.8	1.9	.9	7.1	.4	.9	—	—	.3	.4	.3	.4	1.7	.9	.8	—	.4	—
137 X SP 754	56.1	24.5	2.2	.3	1.9	.8	1.5	.2	—	.7	.8	—	—	3.0	1.9	2.7	1.1	2.3	—
137 X SP 755	61.9	18.5	1.5	.5	6.8	.2	1.2	—	—	—	.4	—	—	4.2	2.1	.7	.3	1.9	—
137 X SP 757	60.4	12.6	1.1	.7	5.6	1.2	2.7	—	—	.7	.4	—	1.0	6.6	2.4	1.0	—	3.6	—
137 X SP 758	70.6	6.7	.8	.2	1.2	1.1	2.6	.1	—	.8	1.2	—	—	4.3	6.6	1.7	—	2.1	—

Table 42 Distribution of Macerals in Elusive Creek Coals (cont.)

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
137 X SP 764	48.8	17.8	1.9	.5	8.0	1.3	2.5	—	—	1.7	.8	—	.5	4.6	2.7	2.3	.5	6.1	—
137 X SP 765	49.6	8.8	2.3	.5	6.2	1.6	3.7	.4	.1	2.1	.6	—	.3	7.2	4.9	2.0	—	9.7	—
137 X SP 767	51.8	22.2	2.2	—	3.2	1.3	1.7	—	—	1.7	1.2	—	.3	4.4	3.8	2.8	—	3.4	—
137 X SP 769	57.6	17.6	2.1	.5	3.0	.7	3.9	.6	—	2.1	.6	—	1.1	3.8	3.2	1.1	—	2.1	—
137 X SP 771	55.4	8.4	2.1	.7	10.6	.4	1.5	—	—	.5	—	—	.2	10.4	4.3	.7	.3	4.5	—
137 X SP 773	54.0	11.6	1.9	.4	4.4	.7	2.1	—	—	1.3	.3	—	1.1	7.5	7.7	3.1	.5	3.4	—
137 X SP 775	54.1	13.9	2.4	.5	4.9	.4	1.7	.2	—	.9	.5	—	.7	5.6	7.9	3.8	.4	2.1	—
137 X SP 777	66.7	19.9	3.0	.5	5.9	.2	.6	.1	.2	—	.4	—	.5	—	.5	.1	—	1.4	—
137 X SP 802	58.1	26.3	2.7	.5	4.8	.8	1.7	.4	—	.3	—	—	—	.8	.4	.9	—	2.3	—
137 X SP 804	60.5	12.8	2.1	—	3.5	.5	1.9	—	—	.5	.8	—	.1	5.5	6.4	2.1	.5	2.8	—
137 X SP 808	57.1	19.3	2.5	1.3	5.2	1.3	.9	—	.1	.3	.7	—	.3	4.2	3.0	1.1	—	2.7	—
AH 34-78	65.5	8.2	1.0	.2	.9	.3	1.3	.1	—	—	1.4	—	.1	3.7	9.2	3.7	.6	3.7	.1
AH 37-78U	63.0	5.8	2.0	.6	3.2	.8	.8	—	.6	—	.4	—	—	3.4	14.4	1.4	.4	3.2	—
AH 37-78L	71.2	6.2	1.0	.7	1.1	.3	1.2	.1	.3	—	1.7	—	.1	4.5	6.3	.9	—	2.4	—
AH 43-78	66.4	6.4	1.0	.4	.8	1.1	.9	.1	—	—	.8	—	.1	3.0	10.8	2.5	1.1	4.7	—
AH 48-78	59.0	3.2	1.1	.7	2.7	1.1	2.0	.6	—	—	1.5	—	—	2.4	14.9	2.5	.4	7.9	—
AH 58-78	70.9	10.7	1.6	.5	1.4	1.4	.9	—	—	—	.8	—	—	1.6	5.9	1.0	—	3.3	—
AH 60-78	65.7	15.3	.7	.1	.7	.9	1.1	.4	.3	—	.7	—	—	3.2	6.1	.6	.2	4.0	—
AH 61-78U	61.1	15.1	2.1	.4	3.8	1.0	.7	.9	—	—	.8	—	—	3.5	7.2	1.1	.5	1.8	—
AH 61-78L	68.0	16.2	.3	.2	2.2	.9	1.5	—	.1	—	.3	—	.3	1.9	4.8	1.4	—	1.9	—
AH 63-78	78.8	10.0	.6	.9	2.6	.2	.9	.3	—	.1	.7	—	—	.4	2.3	.5	—	1.7	—
AH 8-79	60.9	24.1	1.1	.4	.9	1.9	1.2	.2	.2	—	—	—	—	—	5.1	.7	—	3.3	—
AH 10-79	64.0	8.0	.8	.6	1.2	1.0	.4	.2	—	—	.2	—	—	3.0	16.2	1.1	.5	2.8	—
AH 13-79	73.0	19.8	.8	.6	.2	.8	1.0	.4	—	—	1.4	—	—	.2	1.8	—	—	—	—
AH 15-79	64.8	22.0	.4	.4	.8	.8	.4	.4	.4	—	.8	—	—	.8	5.2	2.0	—	.8	—

Table 42 Distribution of Macerals in Elusive Creek Coals (cont.)

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
AH 16-79	67.8	18.9	1.8	1.4	1.8	1.8	2.2	.6	—	—	—	.2	—	.4	1.9	.2	—	1.2	—
AH 22-79	64.2	20.8	.6	1.3	1.6	1.0	.8	.2	.4	—	.2	.3	.2	.4	6.0	.8	—	1.2	—
AH 25-79	59.0	32.0	.6	.6	1.2	1.4	.3	.4	—	.1	—	—	.2	1.0	1.8	—	—	1.4	—
AH 26-79	58.4	25.8	.8	.9	.6	1.4	2.0	.4	.2	—	—	.1	—	1.2	5.2	.4	—	2.8	—
AH 34-79	58.4	16.8	1.0	.2	2.0	3.8	1.7	.5	.3	.3	.4	—	—	1.8	9.0	1.2	—	2.8	—
AH 35-79	68.4	18.4	.8	1.2	1.6	.6	.6	—	—	—	—	—	—	—	6.4	1.2	—	.8	—
AH 36-79	53.8	6.6	—	.2	2.8	.8	.8	.4	—	—	.2	—	—	3.4	21.8	1.9	.3	5.0	—
AH 37-79	68.6	12.6	.4	—	.8	1.2	1.0	.4	—	—	1.8	—	.2	1.2	8.6	1.8	—	2.6	—
AH 38-79	60.0	27.2	—	.2	1.6	1.4	2.2	.8	—	—	.2	—	—	.8	3.6	.6	—	1.4	—
78-35	71.9	17.3	.9	1.0	1.2	.5	.5	.2	.5	—	—	—	.1	3.2	1.9	.5	—	.3	—
F 75-79	74.4	10.4	2.4	1.6	1.6	2.0	2.0	.4	—	—	1.6	—	—	—	3.2	.4	—	—	—
UA 125	70.7	17.3	.3	.8	—	1.5	.1	.6	.2	—	.1	—	—	—	7.1	.4	—	.9	—
632 SP 300	67.6	16.0	.4	.6	.2	1.8	2.0	1.4	—	1.4	—	—	—	.8	6.0	.6	—	1.2	—
632 SP 307	51.2	12.4	1.2	2.4	2.4	3.6	2.2	2.0	.4	1.8	—	.1	—	8.0	10.8	.4	—	1.1	—
632 SP 321	62.1	4.4	.3	.1	.4	1.8	3.8	1.0	.5	1.3	1.6	—	—	5.6	11.6	2.8	—	2.9	—
632 SP 322	64.7	8.5	1.5	.2	1.0	1.6	2.0	.4	.3	.7	.5	—	—	3.7	11.6	1.2	—	2.1	—
632 SP 324	57.0	23.5	3.0	.8	4.5	1.0	1.4	.7	.1	1.2	.4	—	—	.7	4.5	.5	—	.7	—
632 SP 340	57.8	6.3	1.3	.3	4.9	.9	2.0	.9	.1	1.3	.8	—	—	6.0	11.6	1.6	—	4.2	—
632 SP 341	58.1	7.7	.9	.1	4.2	1.1	3.6	.7	.3	1.9	.4	—	—	7.3	6.5	2.1	—	5.1	—
632 SP 342	64.5	13.1	1.4	.2	4.9	1.6	2.0	.9	.4	1.1	.7	—	—	3.4	2.4	1.1	—	2.3	—
734 SP 216	70.6	14.8	.2	.6	—	1.8	1.8	.8	—	—	—	—	.2	.2	7.6	.2	—	1.2	—
137 X SP 748	50.5	15.7	2.2	.4	7.0	—	1.8	—	.2	.8	1.2	—	.2	7.2	7.9	2.0	—	3.2	—

Table 43 Distribution of Macerals in Central Utukok River Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
632 SP 369	63.1	8.0	2.3	1.4	13.5	1.3	1.2	.5	.3	.4	.6	—	—	2.2	3.2	1.2	—	.8	—
632 SP 370	54.9	5.4	2.3	.9	4.6	2.7	1.4	.8	—	.7	1.1	—	—	6.9	9.6	3.7	—	4.9	.2
632 SP 383	40.9	6.5	2.1	.6	3.8	2.8	1.3	.9	—	.9	1.1	—	—	10.5	14.6	5.8	—	5.2	—
632 SP 386	72.3	4.3	.7	1.1	3.4	1.0	2.2	.9	.1	2.4	.2	—	—	4.3	4.3	1.4	—	1.4	—
632 SP 392	65.8	2.5	.9	1.8	3.8	3.4	1.2	.9	.1	1.1	.5	—	—	8.0	4.1	2.2	—	3.7	—
632 SP 400	64.9	2.3	1.7	1.6	6.4	1.0	1.2	.5	—	.5	.5	—	.8	9.2	3.8	1.8	.5	3.3	—
632 SP 402	55.2	.4	1.1	.2	2.2	1.8	.8	.1	.1	.8	—	—	—	13.2	11.7	5.5	—	5.9	—
632 SP 422	59.4	7.2	2.0	.2	2.2	.9	2.0	.6	.2	1.6	1.0	—	—	6.2	3.9	.8	—	2.0	—
632 SP 436	65.4	.6	.6	.4	5.0	1.8	.8	.4	.4	.8	—	—	—	5.8	7.0	3.0	—	8.0	—
632 SP 440	56.1	.2	1.1	.4	2.7	1.3	1.0	.1	—	.9	—	—	—	12.4	11.1	6.3	—	6.4	—
632 SP 442	53.2	1.2	.4	—	1.2	3.2	2.4	—	—	.4	—	—	—	7.2	15.6	6.4	—	8.8	—
632 SP 447	58.6	1.1	2.0	.8	4.2	1.2	1.1	.1	.2	.1	.2	—	.4	14.3	6.4	3.5	—	5.5	—
632 SP 457	67.8	—	1.4	3.9	2.6	2.5	2.7	.2	.4	1.5	.2	—	2.8	8.4	3.3	.7	—	1.6	—
632 SP 480	64.3	8.7	2.0	.7	1.9	2.0	1.7	.2	—	1.2	.5	—	.5	6.0	4.1	3.0	—	3.2	—
725 SP 169	59.4	3.1	.4	1.2	1.4	1.5	1.1	.2	.2	.1	—	—	.1	.9	22.8	2.5	1.8	4.3	—
725 SP 206	70.6	19.0	.8	—	.2	2.0	1.4	.6	—	—	—	—	—	.2	4.4	.6	—	.2	—
725 SP 216	60.8	22.0	1.0	.2	.5	1.9	.8	.1	.1	.2	.5	—	.1	.5	6.7	.7	.4	1.5	—
725 SP 219	63.8	20.0	.9	.1	.9	.3	.7	.2	—	—	.6	—	—	2.4	7.4	.8	—	1.9	—
725 SP 227	6.80	17.4	.6	—	.2	1.8	2.2	.6	—	—	—	—	—	—	7.2	.6	—	1.4	—
725 SP 230	68.4	12.8	1.3	.4	.3	1.0	1.1	—	.3	—	—	—	—	.4	9.2	1.0	.5	3.3	—
725 SP 271	76.4	14.5	.9	—	.6	1.8	2.3	.9	—	—	.9	—	—	—	.9	.5	—	.4	—
723 SP 114	60.0	15.2	1.4	.6	1.6	1.2	.6	—	—	.4	1.0	—	.4	.4	10.2	1.4	—	5.6	—
137 X SP 24	54.0	2.7	7.1	.3	8.4	1.1	.5	.3	—	1.1	.8	—	.3	8.9	10.7	1.9	.9	6.0	—

Table 44 Distribution of Macerals in East Utukok River Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
603 SP 211	69.2	16.5	2.4	.9	1.3	1.8	1.7	.6	—	.7	.6	—	.6	1.7	.3	.2	—	1.4	—
603 SP 232	60.0	18.1	2.4	1.6	6.7	1.2	3.3	.5	—	—	1.7	—	.9	1.4	.7	.3	—	1.2	—
603 SP 267	65.9	14.1	3.6	1.1	4.5	2.5	1.3	.4	—	.3	1.6	.2	.7	1.3	.9	.4	—	1.2	—
F73-78	68.4	16.6	2.1	1.4	.6	1.8	.5	.4	—	—	.5	—	—	—	5.3	.9	.3	1.4	—
R4 SP 2	70.5	11.9	.8	2.8	1.5	1.6	1.7	.2	.2	.5	—	—	.1	3.0	1.9	1.5	—	1.8	—
R4 SP 21	73.8	17.4	1.0	.9	3.4	.4	1.5	.1	—	.1	—	—	.4	.6	.2	—	—	.2	—
725 SP 342	71.1	11.2	1.0	.2	.5	1.1	2.3	.4	.3	—	.3	—	.1	1.2	7.5	.5	.1	2.2	—
723 SP 204	67.9	22.6	1.3	.6	2.1	1.4	.9	.6	—	—	.8	—	—	.3	1.4	—	—	.2	—
R3XN SP 390	50.4	.5	—	.9	1.9	3.4	1.0	1.5	.4	.4	.1	—	—	9.3	22.2	2.7	—	5.3	—
R3XN SP 397	65.5	2.3	2.8	1.1	16.7	1.3	1.5	.3	.1	.1	.1	—	—	1.5	3.1	1.6	—	2.1	—
R3XN SP 443	67.7	1.4	.2	.6	2.0	1.9	1.7	.2	.1	.7	.6	—	—	8.6	11.3	1.5	—	1.5	—
R3XN SP 449	52.2	3.0	—	.7	1.4	11.3	2.4	1.0	.2	3.0	.6	—	—	5.0	12.6	3.5	—	3.1	—

Table 45 Distribution of Macerals in Lookout Ridge Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
R 7XN SP 413	68.6	4.4	3.8	2.4	6.2	1.4	.6	.4	—	.4	1.1	—	.5	4.4	4.6	1.7	—	1.7	—
R 7XN SP 428	63.0	16.8	3.3	3.1	4.8	1.8	.3	.8	.4	—	1.7	—	.4	.5	1.1	.9	—	1.1	—
R 7XN SP 445	64.3	2.1	1.2	.7	5.7	2.4	.6	.8	.9	—	.9	—	—	7.7	6.0	2.5	—	4.0	—
R 7XN SP 482	67.7	4.7	2.8	3.1	3.7	3.6	1.7	.8	—	1.1	.8	—	—	6.1	1.5	—	—	2.4	—
R 7XN SP 486	87.1	5.4	.9	—	.7	.6	1.2	.3	—	—	.3	—	—	.8	1.9	.1	—	.7	—
R 7XN SP 488	55.1	16.1	4.8	1.3	7.5	1.2	2.7	.8	—	.1	.4	—	—	6.3	1.7	—	—	2.0	—
R 7XN SP 494	66.2	.2	1.6	1.0	2.8	1.7	.7	.2	—	—	.5	—	.9	8.5	7.2	1.9	.5	6.1	—
R 7XN SP 520	71.6	.4	1.2	1.1	3.7	2.0	1.7	.4	—	.3	.4	—	2.4	2.5	3.9	1.3	.3	6.8	—
R 7XN SP 531	73.2	.4	1.2	.6	1.9	2.4	.5	—	—	.7	2.0	—	.4	6.8	4.8	.5	—	4.7	—
R 7XN SP 532	60.3	1.3	1.2	3.1	3.7	2.8	.9	—	—	.7	—	—	1.2	5.6	10.5	2.0	—	6.7	—

Table 46 Distribution of Macerals in Tunalik Test Well Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
225-735	59.5	1.7	1.2	1.9	3.7	2.0	1.3	.8	.4	1.1	—	—	.4	9.3	7.1	2.1	1.1	6.4	—
220-360	55.3	8.4	1.6	—	4.8	1.6	2.6	—	—	1.8	.8	—	1.6	5.0	5.6	2.9	1.1	6.8	.1
400-430	60.7	6.3	1.7	1.2	6.3	.9	1.3	.3	.5	1.1	—	—	1.3	8.0	3.2	.8	—	6.4	—
430-460	46.4	4.8	1.8	.5	3.7	1.1	1.9	.5	—	3.1	.2	—	1.8	8.4	8.0	6.5	.7	10.6	—
470-490	61.3	8.9	1.2	—	2.5	.8	.8	.2	—	.3	—	—	2.4	6.1	2.1	4.9	.7	8.7	—
695-705	67.6	10.8	2.8	1.1	6.5	—	1.5	.4	—	.5	.4	—	.8	3.6	2.5	1.1	—	.4	—
725-735	52.7	10.1	4.4	1.9	8.3	1.5	3.7	.2	—	—	.3	—	.7	7.0	3.5	2.3	.9	2.5	—
785-800	65.8	9.6	2.0	.7	3.5	1.3	2.5	—	—	1.1	—	—	.7	3.2	3.8	1.9	.5	3.4	—
910-940	64.0	8.4	2.0	.3	4.5	—	2.7	.8	—	—	—	—	.9	4.3	2.9	3.1	—	6.1	—
955-1005	69.2	13.6	1.8	2.5	3.9	.4	.6	—	—	—	—	—	.6	1.2	6.2	—	—	.2	—
1025-1140	64.5	3.3	9.0	1.7	3.3	.8	2.3	—	.4	—	.8	—	.1	3.8	3.8	1.3	—	4.9	—
1160-1203	63.5	15.3	3.0	1.9	4.1	—	2.1	—	—	.5	—	—	—	4.5	2.5	.2	—	2.4	—
1230-1280	63.5	6.3	2.4	1.1	4.9	—	3.1	.4	—	1.7	—	—	—	5.6	2.0	2.1	1.1	6.8	—
1305-1410	60.3	10.1	3.1	2.0	7.7	.8	2.3	.2	—	.5	—	—	.2	4.1	4.1	1.8	—	2.8	—
1400-1635	68.9	5.9	2.0	.3	4.3	.3	2.3	.4	.2	.3	—	—	.3	6.1	3.3	1.3	.5	3.6	—
1650-1672	68.2	6.8	3.8	2.5	11.9	.1	1.1	.4	—	.8	—	—	—	1.3	.5	.2	—	.4	—
1672-1800	68.7	5.1	—	.9	5.9	.8	2.3	.4	—	2.9	—	—	.4	12.3	3.3	1.0	.2	4.8	—
1830-1860	64.5	13.1	1.9	1.1	10.2	1.2	.8	.3	—	—	.4	—	.5	2.0	.8	.5	—	2.7	—
1905-1915	57.9	20.1	1.9	.7	7.4	—	1.3	—	—	.3	—	—	1.6	2.3	1.7	1.2	—	3.6	—
1960-1975	69.6	3.6	5.8	.9	12.1	1.3	1.7	.2	.4	.1	.6	—	.5	1.1	.3	.6	—	1.3	—
2015-2020	80.3	3.7	1.5	1.1	7.4	—	.6	—	—	—	—	—	.4	1.9	1.7	—	—	1.4	—
2070-2400	69.1	3.7	6.7	1.5	9.8	—	.8	—	—	—	.3	—	.5	3.1	1.3	.5	.3	2.4	—
2480-2480	73.5	4.8	1.9	1.1	6.2	.9	1.9	—	—	.5	—	—	1.2	2.1	.4	1.1	.5	3.9	—
2520-2540	69.3	5.1	1.6	1.1	7.0	.5	1.3	.4	—	.3	.7	—	.6	4.2	2.2	1.6	.5	4.8	—
2590-2600	68.7	6.5	3.1	.4	6.5	—	1.7	—	—	.7	.3	—	.9	6.0	2.0	1.3	—	1.9	—

Table 47 Distribution of Macerals in Kuk River Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
602 SP 152	77.3	1.4	1.2	2.3	3.7	1.6	.6	.4	.2	—	.4	—	.4	4.6	1.6	1.5	.3	2.4	.1
703 SP 98	59.0	5.2	1.8	2.4	4.6	2.2	1.4	.4	—	.4	—	—	—	2.2	14.6	1.7	.7	3.4	—
703 SP 110	61.6	5.2	1.2	.4	2.8	1.2	1.7	—	—	.3	—	—	—	2.8	14.4	2.0	—	6.4	—
703 SP 119	54.9	9.6	.6	2.4	3.2	.8	.4	—	—	—	.1	—	—	2.0	18.0	4.4	—	3.6	—
703 SP 122	71.4	9.8	2.2	2.2	3.0	.4	.4	.2	—	.4	.2	—	—	.6	7.6	.2	—	1.4	—
703 SP 125	56.9	7.9	1.2	1.2	1.6	2.0	.4	.4	—	—	—	—	—	2.4	15.6	5.6	—	4.8	—
710 SP 3	73.2	12.4	1.2	—	2.4	.4	1.6	—	—	—	—	—	—	—	7.6	.4	—	.8	—
712 SP 1	75.4	6.6	.6	2.4	3.6	3.6	.6	1.8	—	—	—	—	—	.6	3.0	.6	—	1.2	—
712 SP 3	67.0	7.8	2.4	1.4	2.2	1.6	.6	—	.2	—	—	—	—	2.6	10.2	1.8	—	2.2	—
712 SP 11	38.0	1.2	1.2	.4	3.0	1.5	.6	.8	—	—	—	—	.3	3.0	35.5	2.3	2.7	8.4	—
712 SP 27	51.2	7.6	.6	.6	1.8	1.8	.6	.6	—	—	—	—	.6	6.0	19.6	3.2	—	6.4	—
04XW SP 26	60.7	11.6	2.4	2.6	5.5	.8	2.7	.4	—	—	—	.4	.3	1.2	7.6	1.2	—	2.6	—
04XW SP 29	65.0	8.0	2.4	3.9	3.6	1.4	2.4	.6	.1	.1	.2	.3	.4	1.2	7.8	.8	—	1.8	—

Table 48 Distribution of Macerals in Peard Bay Test Well Coals

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
135-145	73.0	5.4	1.9	1.1	2.4	1.8	1.5	.8	.2	.5	.2	—	.4	6.5	2.3	.9	—	1.1	—
190-200	74.6	10.7	4.1	1.3	4.0	1.4	1.2	.4	.3	—	.3	—	.8	.4	.4	—	—	—	.1
250-260	80.4	7.2	1.6	1.9	3.3	1.4	.3	.6	—	.5	—	—	—	1.1	1.3	.1	—	.3	—
300-310	77.0	2.6	1.4	1.9	3.6	2.0	1.5	.4	—	1.1	.2	—	.6	4.1	1.1	.3	.1	2.2	—
345-350	62.7	10.3	3.7	.9	7.6	.9	2.0	.2	—	.5	.2	—	—	4.8	1.6	2.4	—	2.2	—
350-360	69.5	5.6	2.8	.9	5.5	1.4	.9	.1	—	.7	.4	—	1.1	5.9	2.1	1.3	—	1.7	—
360-365	71.1	6.2	1.6	1.7	4.5	1.2	1.4	.3	—	.3	.5	—	.7	5.8	2.3	.6	—	1.7	.1
400-410	66.7	14.8	1.2	.9	4.9	1.2	2.1	.3	—	1.5	.8	.1	1.0	1.9	1.7	.2	.2	.5	—
690-700	70.4	6.6	1.2	.9	5.1	2.2	1.1	.6	—	1.1	2.4	—	.2	2.6	3.6	.9	—	1.2	—
750-780	72.0	7.0	3.0	1.7	5.1	1.0	.8	.9	—	—	—	—	.8	3.5	2.1	1.0	—	1.0	—
790-800	70.4	6.4	3.1	2.4	5.5	1.6	1.9	.3	—	.5	2.2	—	1.1	.9	3.1	—	—	.6	—

Table 49 Distribution of Macerals in East Simpson Test Well Coal

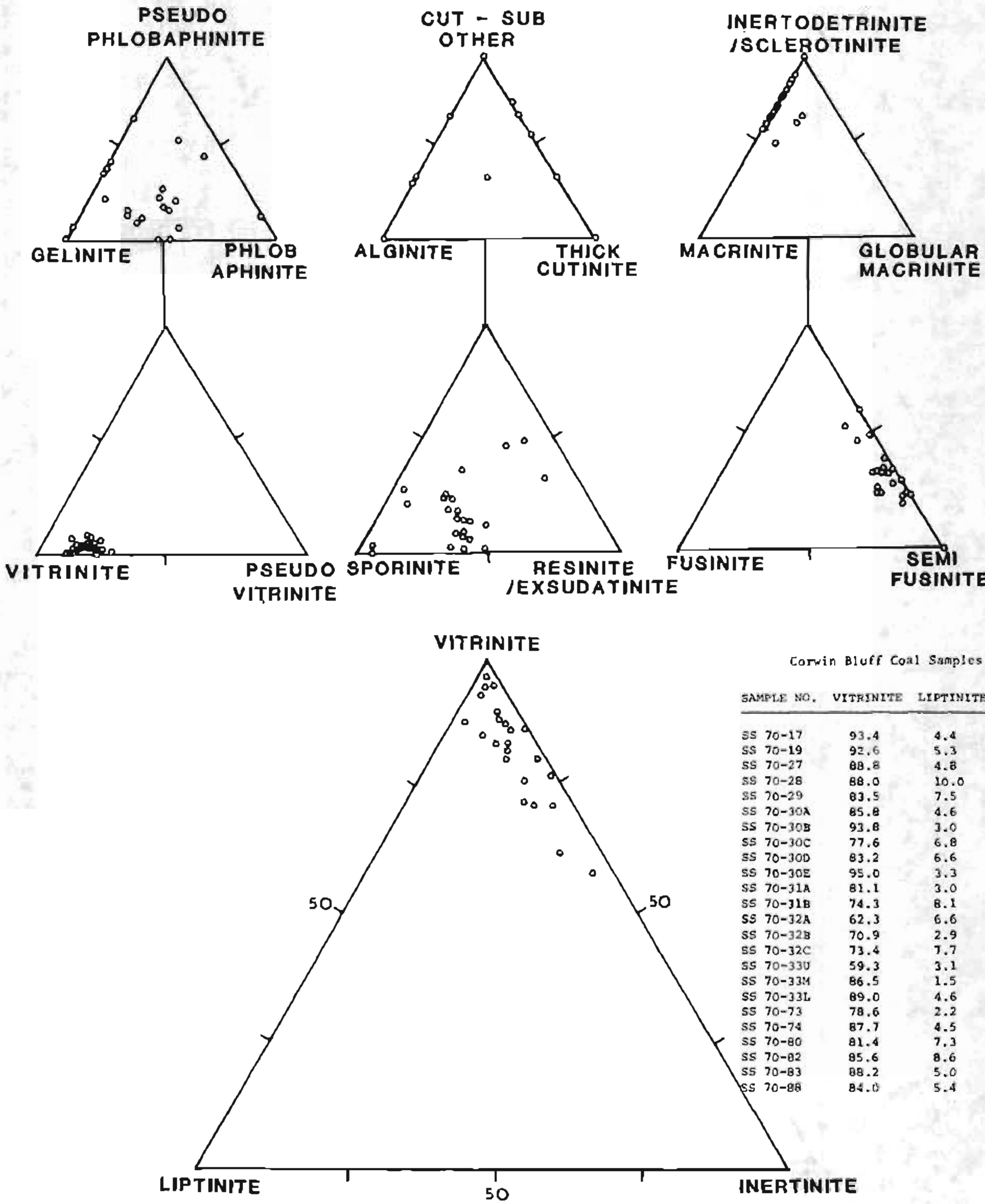
Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
East Simpson #2	52.2	3.2	1.0	—	7.6	1.8	6.6	.2	—	—	—	—	—	4.2	11.0	3.6	—	8.2	.4

Table 50 Distribution of Macerals in Umiat Coal

Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
U-7 SP 12	70.6	16.8	1.8	1.2	3.4	.9	1.1	.9	—	.2	.5	—	.6	.6	1.1	.1	—	.2	—

Table 51 Distribution of Macerals in Ikpikpuk Coal

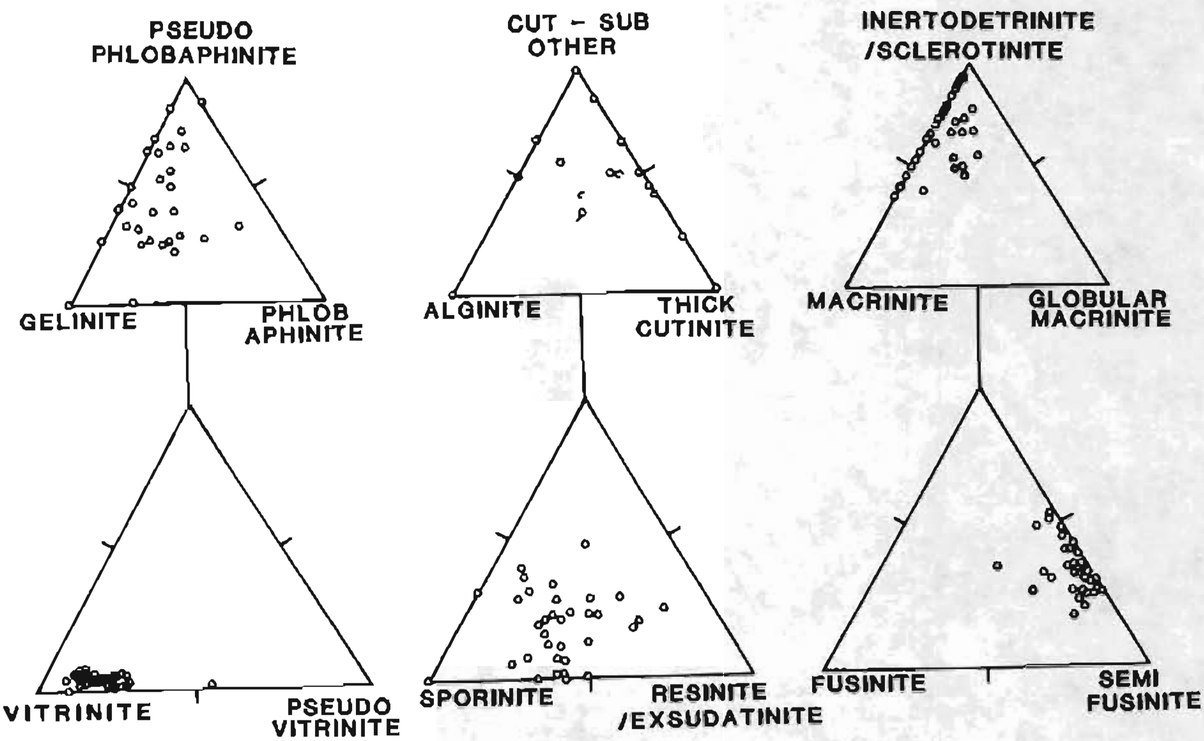
Sample Number	Vitrinite	Pseudovitrinite	Gelinite	Phlobaphinite	Pseudo phlobaphinite	Sporinite	Resinite	Cutinite	Alginite	Exsudatinite	Thick Cutinite	Suberinite	Other Liptinites	Fusinite	Semifusinite	Macrinite	Globular Macrinite	Inertodetrinite	Sclerotinite
U-2 SP 65	69.6	4.8	1.2	.2	3.6	.4	2.2	.2	—	—	—	—	3.4	7.5	2.6	1.3	.3	1.8	.5



Corwin Bluff Coal Samples

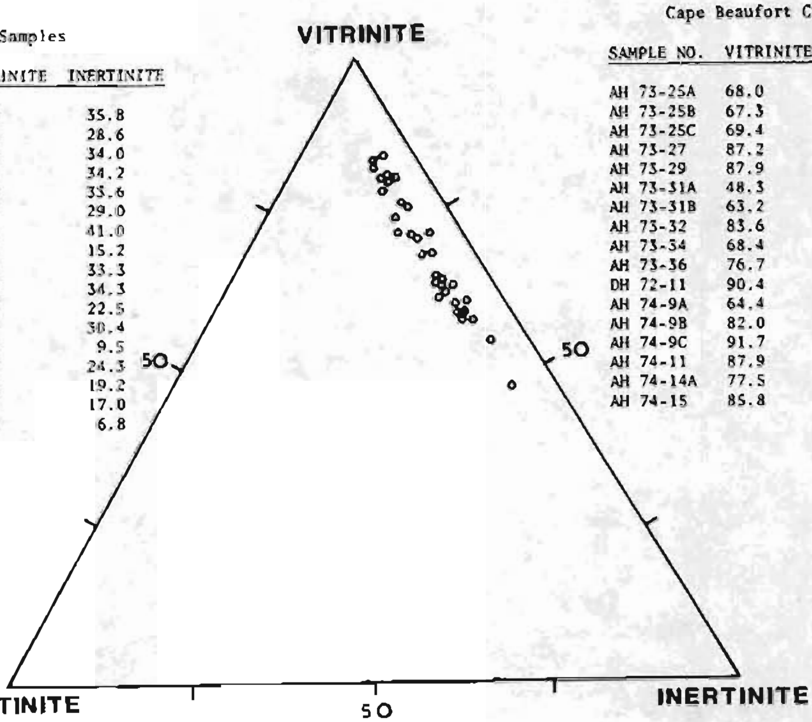
SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
SS 70-17	93.4	4.4	2.2
SS 70-19	92.6	5.3	2.2
SS 70-27	88.8	4.8	6.4
SS 70-28	88.0	10.0	2.0
SS 70-29	83.5	7.5	9.0
SS 70-30A	85.8	4.6	9.6
SS 70-30B	93.8	3.0	3.2
SS 70-30C	77.6	6.8	15.6
SS 70-30D	83.2	6.6	10.2
SS 70-30E	95.0	3.3	1.9
SS 70-31A	81.1	3.0	15.9
SS 70-31B	74.3	8.1	17.6
SS 70-32A	62.3	6.6	31.1
SS 70-32B	70.9	2.9	26.3
SS 70-32C	73.4	7.7	18.9
SS 70-33U	59.3	3.1	36.1
SS 70-33M	86.5	1.5	12.0
SS 70-33L	89.0	4.6	6.4
SS 70-73	78.6	2.2	19.2
SS 70-74	87.7	4.5	7.8
SS 70-80	81.4	7.3	11.3
SS 70-82	85.6	8.6	5.8
SS 70-83	88.2	5.0	6.8
SS 70-88	84.0	5.4	10.6

Figure **14** Ternary Diagrams of the Three Maceral Groups and their Corresponding Macerals in the Corwin Bluff Coals.



Cape Beaufort Coal Samples

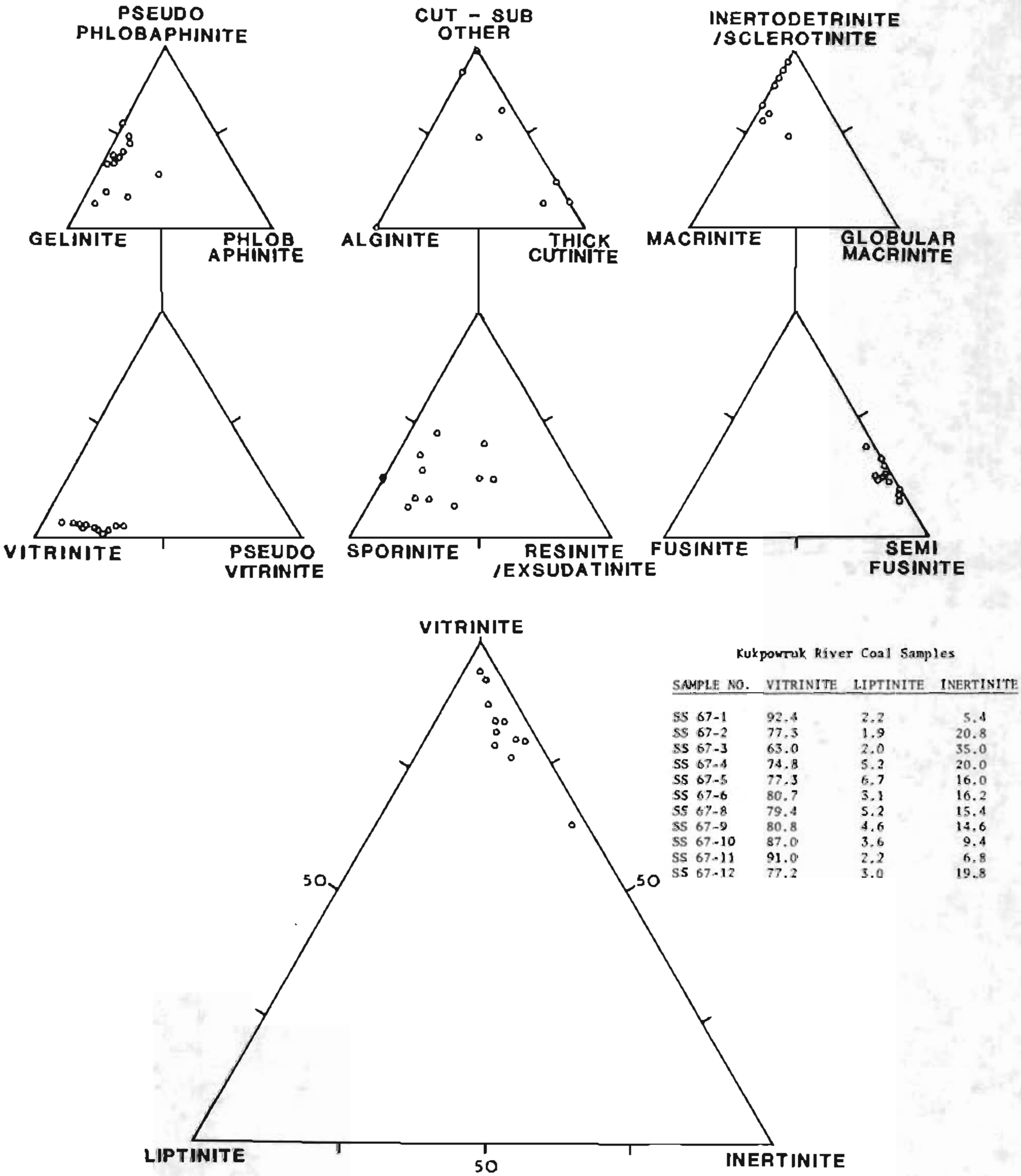
SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
AH 73-1	61.8	2.4	35.8
AH 73-1A	68.2	3.2	28.6
AH 73-1B	62.7	3.3	34.0
AH 73-1C	62.0	3.8	34.2
AH 73-1D	62.6	3.8	33.6
AH 73-2	65.8	5.2	29.0
AH 73-3	57.3	1.7	41.0
AH 73-4	80.1	4.7	15.2
AH 73-5	64.3	3.4	33.3
AH 73-6	61.6	4.1	34.3
AH 73-8	73.3	4.2	22.5
AH 73-10A	67.6	2.0	30.4
AH 73-10B	87.4	3.1	9.5
AH 73-10C	73.8	1.9	24.3
AH 73-23A	77.2	3.6	19.2
AH 73-23B	78.1	4.9	17.0
AH 73-24	91.1	2.1	6.8



Cape Beaufort Coal Samples (cont.)

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
AH 73-25A	68.0	4.3	27.7
AH 73-25B	67.3	3.5	29.2
AH 73-25C	69.4	3.4	27.2
AH 73-27	87.2	1.9	10.9
AH 73-29	87.9	1.7	10.4
AH 73-31A	48.3	2.5	49.2
AH 73-31B	63.2	2.4	34.4
AH 73-32	83.6	2.2	14.2
AH 73-34	68.4	2.8	28.8
AH 73-36	76.7	2.9	20.4
DH 72-11	90.4	2.6	7.0
AH 74-9A	64.4	1.5	34.1
AH 74-9B	82.0	2.0	16.0
AH 74-9C	91.7	1.3	7.0
AH 74-11	87.9	0.9	11.2
AH 74-14A	77.5	0.0	22.5
AH 74-15	85.8	3.8	10.4

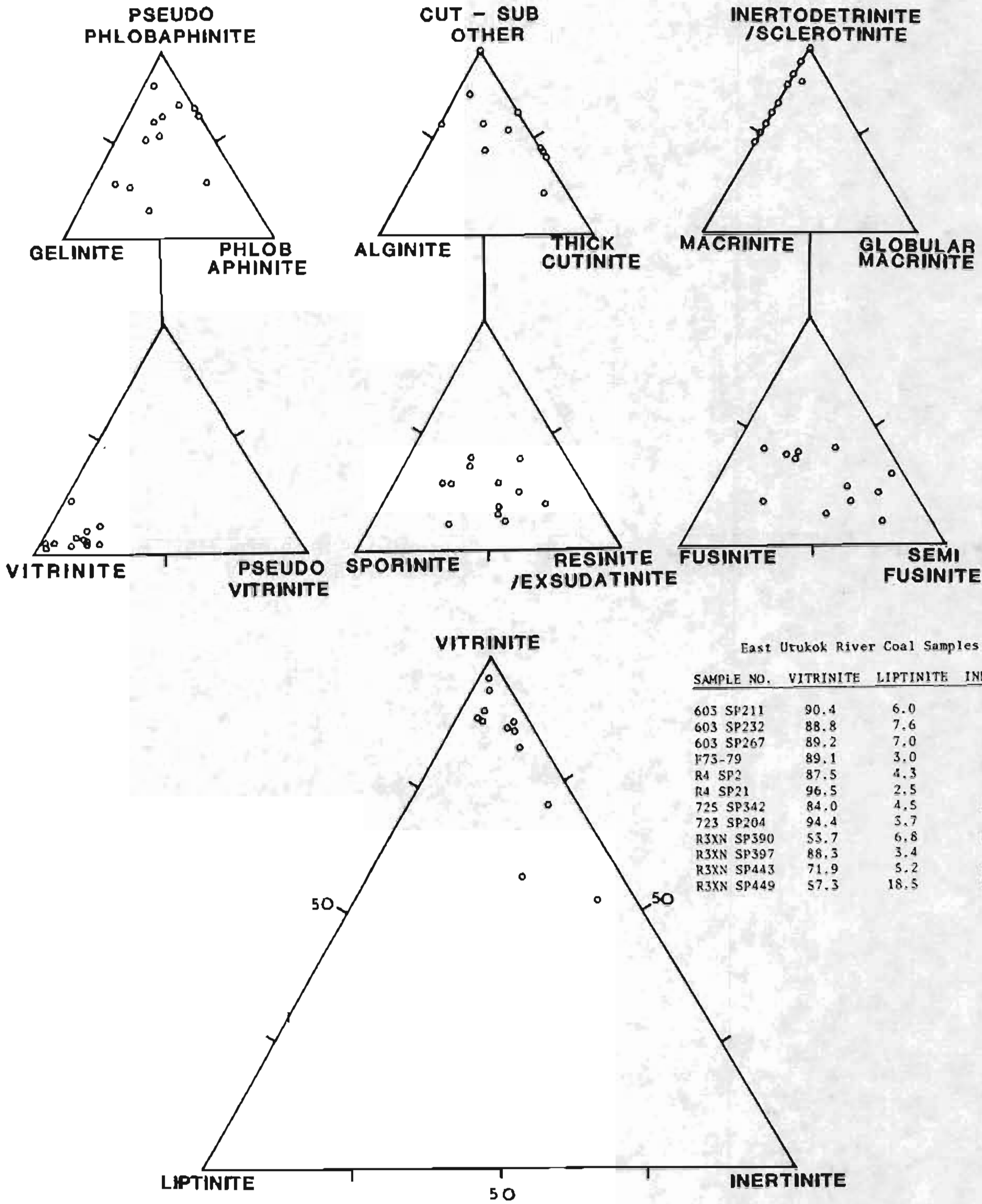
Figure **15** Ternary Diagrams of the Three Maceral Groups and their Corresponding Macerals in the Cape Beaufort Coals.



Kukpowruk River Coal Samples

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
SS 67-1	92.4	2.2	5.4
SS 67-2	77.3	1.9	20.8
SS 67-3	63.0	2.0	35.0
SS 67-4	74.8	5.2	20.0
SS 67-5	77.3	6.7	16.0
SS 67-6	80.7	3.1	16.2
SS 67-8	79.4	5.2	15.4
SS 67-9	80.8	4.6	14.6
SS 67-10	87.0	3.6	9.4
SS 67-11	91.0	2.2	6.8
SS 67-12	77.2	3.0	19.8

Figure **16** Ternary Diagrams of the Three Maceral Groups and their Corresponding Macerals in the Kukpowruk River Coals.



East Utukok River Coal Samples

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
603 SP211	90.4	6.0	3.6
603 SP232	88.8	7.6	3.6
603 SP267	89.2	7.0	3.8
F73-79	89.1	3.0	7.9
R4 SP2	87.5	4.3	8.2
R4 SP21	96.5	2.5	1.0
725 SP342	84.0	4.5	11.5
723 SP204	94.4	3.7	1.9
R3XN SP390	53.7	6.8	39.5
R3XN SP397	88.3	3.4	8.3
R3XN SP443	71.9	5.2	22.9
R3XN SP449	57.3	18.5	24.2

Figure 17 Ternary Diagrams of the Three Maceral Groups and their Corresponding Macerals in the East Utukok River Coals.

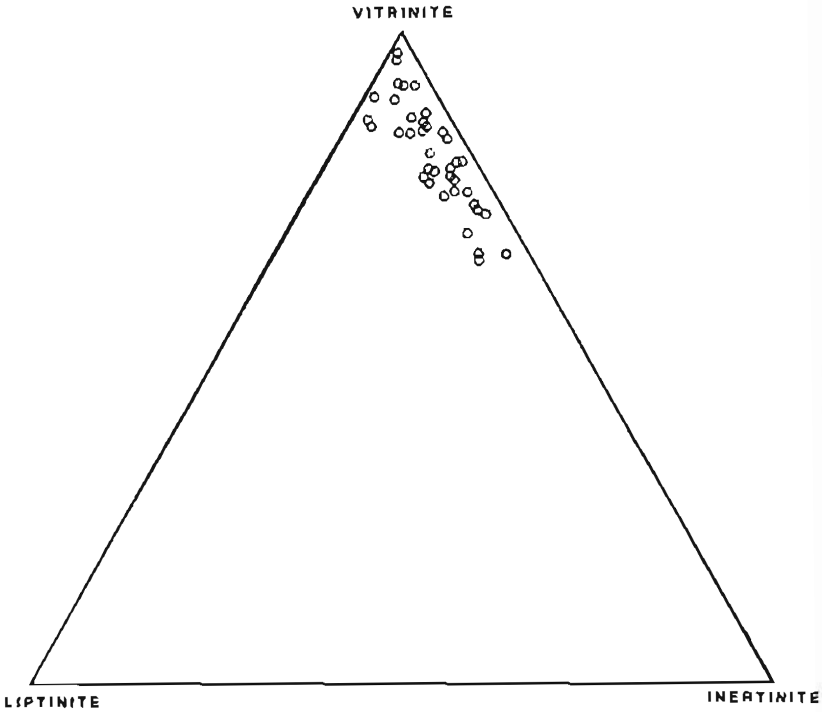
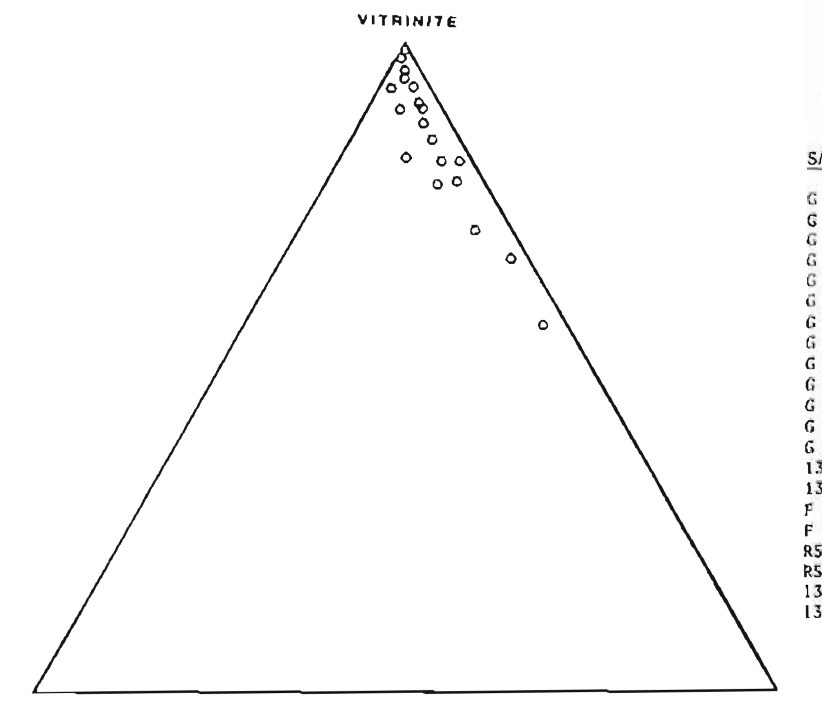


Figure 18 Ternary Diagram of the Three Maceral Groups in the Kokolik River Coals.

Kokolik River Coal Samples

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
605 SP393	90.8	8.8	0.4
605 SP402	96.0	2.4	1.6
605 SP428	78.2	8.2	13.6
605 SP431	64.6	7.0	28.4
605 SP434	69.4	6.4	24.2
605 SP435	75.3	7.2	17.5
605 SP439	77.4	8.2	14.4
605 SP442	87.2	11.2	1.6
605 SP447	85.0	7.8	7.2
605 SP448	79.0	7.2	13.8
605 SP454	66.3	6.5	27.2
605 SP455	87.4	4.8	7.8
605 SP457	90.0	6.0	4.0
605 SP461	76.2	5.0	18.8
605 SP465	76.6	3.4	20.0
605 SP467	84.9	6.7	8.4
605 SP471	92.6	4.6	2.8
605 SP472	85.2	4.8	10.0
605 SP474	92.0	2.4	5.6
UA 126	79.7	2.3	18.0
AH 3-78	84.9	2.1	13.0
AH 4-78	87.6	2.8	9.6
AH 12-78	77.6	4.4	18.0
AH 16-78	81.9	5.7	12.4
AH 18-78	72.1	2.9	25.0
AH 19-78	78.9	1.8	19.3
AH 22-78	79.4	4.0	16.6
AH 21-78	65.8	2.9	31.3
AH 23-78	73.8	3.4	22.8
AH 25-78	84.0	2.4	13.9
A '78-14	92.3	4.0	3.7
A '78-15	82.1	5.3	12.6
AH 1-79	86.8	4.0	9.2
AH 4-79	97.4	2.2	0.4
AH 5-79	78.6	4.4	17.0
AH 6-79	84.6	4.9	10.5
AH 7-79	73.0	3.6	23.4
R5XN SP450	86.0	4.2	9.8
R5XN SP457	78.8	6.6	14.6
R5XN SP458	81.4	5.3	13.3
R5XN SP462	85.7	11.6	2.7



Archimedes Ridge Coal Samples

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
G 78-37	87.7	3.7	8.6
G 78-40	98.2	1.6	0.2
G 78-41	98.9	0.5	0.6
G 78-43	82.6	8.3	9.1
G 78-55	56.4	3.6	40.0
G 78-58	93.8	2.0	4.2
G 78-80	90.2	2.6	7.2
G 78-84	85.6	3.4	11.0
G 78-89	82.2	4.0	13.8
G 78-93	91.0	2.6	6.4
G 78-94	82.2	1.6	16.2
G 78-97	94.6	2.8	2.6
G 78-99	71.2	5.0	23.8
133X SP431	78.1	7.1	14.8
133X SP432	90.0	5.6	4.4
F 45-79	66.7	2.6	30.7
F 47-79	79.1	3.5	17.4
R5 SP601	98.8	0.2	1.0
R5 SP605	83.6	5.4	11.0
137X SP656	94.8	2.7	2.5
137X SP666	96.2	1.8	2.0

Figure 19 Ternary Diagram of the Three Maceral Groups in the Archimedes Ridge Coals.

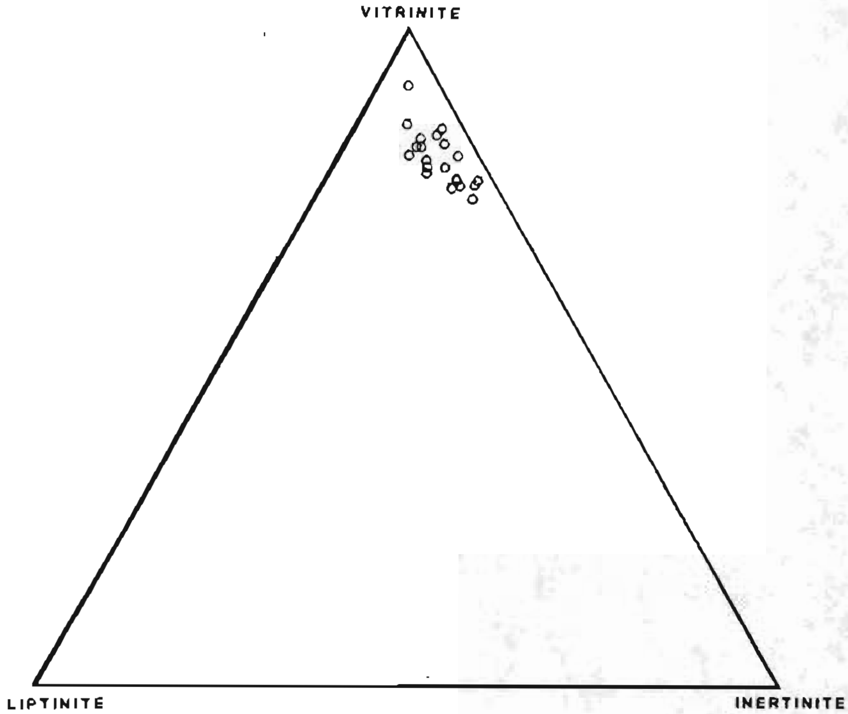


Figure 20 Ternary Diagram of the Three Maceral Groups in the West Utukok River Coals.

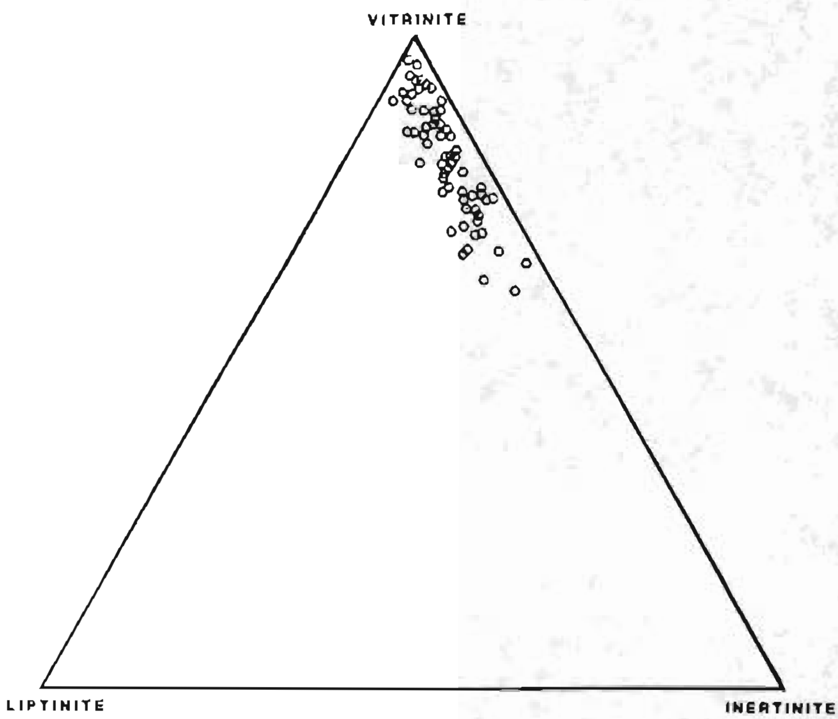
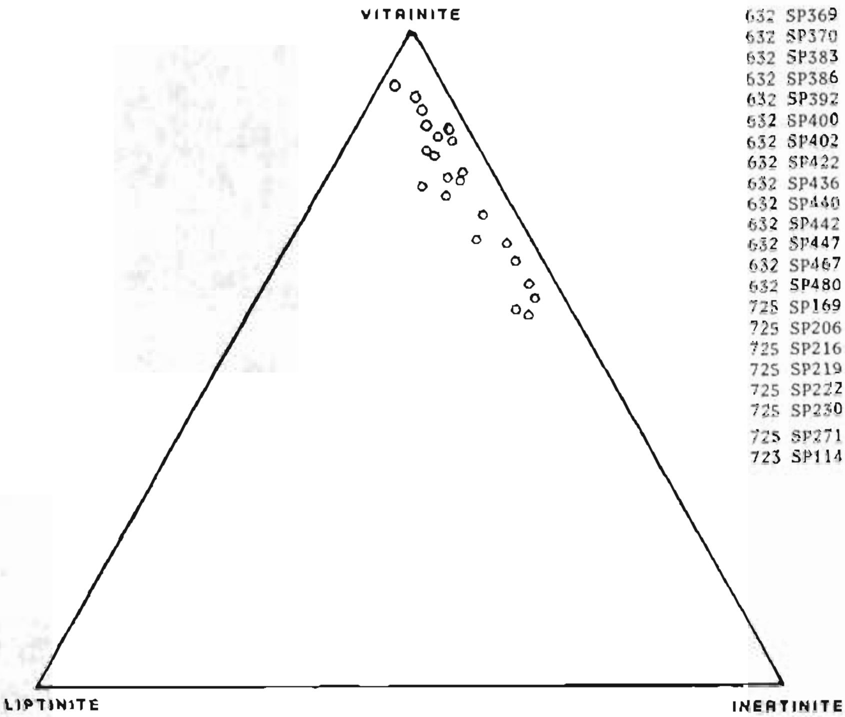


Figure 21 Ternary Diagram of the Three Maceral Groups in the Elusive Creek Coals.

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
725 SP45	83.6	3.6	12.8
725 SP63	76.8	4.6	18.6
725 SP66	74.8	4.2	21.0
725 SP69	77.6	1.8	20.6
725 SP77	77.3	2.5	20.2
725 SP81	85.0	3.7	11.3
725 SP131	86.5	6.9	6.6
725 SP135	92.3	4.2	3.5
R5XN SP340	83.2	7.5	9.3
R5XN SP354	83.3	7.0	9.7
R5XN SP359	76.4	6.1	17.5
R5XN SP368	78.0	4.6	17.4
R5XN SP384	81.3	7.2	11.5
R5XN SP394	79.4	5.2	15.4
630 SP413	84.6	6.4	9.0
630 SP441	81.9	8.8	9.3
630 SP444	78.7	8.1	13.2
630 SP471	79.9	7.6	12.5
F 12-79	85.7	2.6	11.7
F 20-79	81.4	2.7	15.9

Elusive Creek Coal Samples

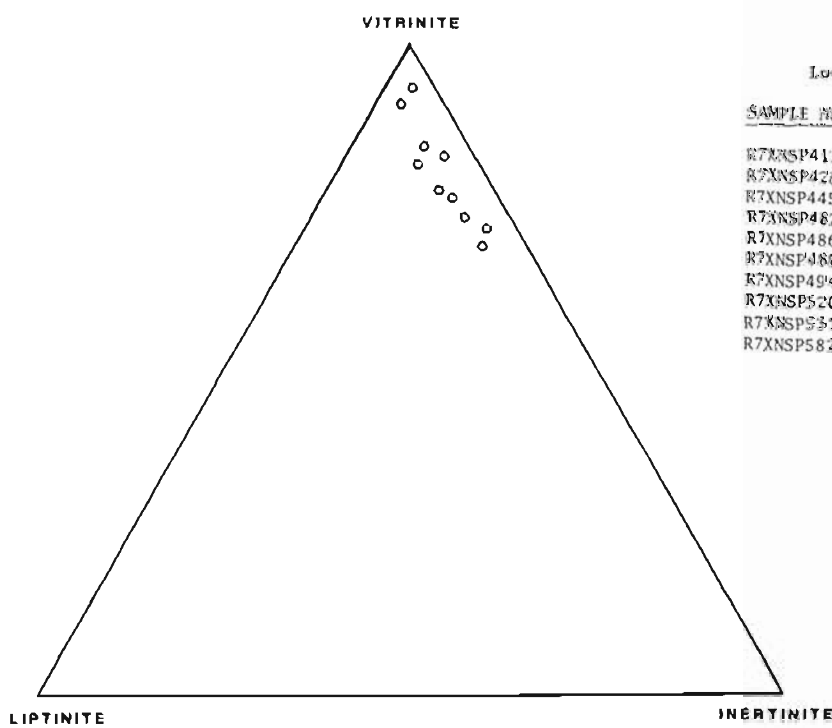
SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
605 SP307	90.6	8.2	2.2
605 SP327	70.1	5.8	24.1
605 SP328	69.8	6.8	23.4
605 SP329	79.4	6.6	14.0
605 SP330	61.0	5.6	33.4
605 SP331	81.8	5.2	13.0
605 SP332	62.8	9.2	28.0
605 SP336	85.4	8.4	6.2
605 SP337	85.5	7.8	6.7
605 SP338	76.2	7.8	16.0
605 SP339	88.6	6.2	5.2
605 SP340	86.4	5.2	8.4
605 SP342	73.8	6.2	20.0
605 SP347	91.5	6.0	2.5
137X SP736	93.6	2.8	3.6
137X SP737	95.6	3.0	1.4
137X SP742	73.6	4.8	21.6
137X SP744	73.2	4.9	21.9
137X SP745	81.9	4.4	13.7
137X SP749	75.0	5.9	19.1
137X SP753	93.5	2.7	3.8
137X SP754	85.0	4.0	11.0
137X SP755	89.0	1.8	9.2
137X SP757	80.4	6.0	13.6
137X SP758	79.5	5.8	14.7
137X SP764	77.0	6.8	16.2
137X SP765	67.4	8.8	23.8
137X SP767	79.4	6.2	14.4
137X SP768	80.8	9.0	10.2
137X SP771	77.2	2.6	20.2
137X SP773	72.3	5.5	22.2
137X SP775	75.8	4.4	19.8
137X SP777	96.0	2.0	2.0
137X SP802	92.4	3.2	4.4
137X SP804	78.9	3.8	17.3
137X SP808	85.4	3.6	11.0
AH 34-78	75.8	3.2	21.0
AH 37-78U	74.6	2.6	22.8
AH 37-78L	82.2	3.7	14.1
AH 43-78	75.0	2.9	22.1
AH 48-78	66.7	5.2	28.1
AH 56-78	85.1	3.1	11.8
AH 60-78	82.5	3.4	14.1
AH 61-78U	82.5	3.4	14.1
AH 61-78L	86.9	3.1	10.0
AH 63-78	92.9	2.2	4.9
AH 8-79	87.4	3.5	9.1
AH 10-79	74.6	1.8	23.6
AH 13-79	94.4	3.6	2.0
AH 15-79	88.4	2.8	8.8
AH 16-79	91.6	4.8	3.6
AH 22-79	88.5	3.1	8.4
AH 25-79	93.4	2.4	4.2
AH 26-79	86.5	4.1	9.4
AH 34-79	78.4	6.8	14.8
AH 35-79	90.4	1.2	8.4
AH 36-79	65.4	2.2	32.4
AH 37-79	82.2	4.6	13.2
AH 38-79	89.0	4.6	6.4
78-35	92.3	1.8	5.9
F 75-79	90.4	6.0	3.6
UA 125	89.1	2.5	8.4
734 SP216	86.2	4.6	9.2
632 SP300	84.8	6.6	8.6
632 SP307	69.6	10.1	20.3
632 SP321	67.3	9.8	22.9
632 SP322	75.9	5.5	18.6
632 SP324	88.8	4.8	6.4
632 SP340	70.6	6.0	23.4
632 SP341	71.0	8.0	21.0
632 SP342	84.1	6.7	9.2



Central Utukok River Coal Samples

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
632 SP369	88.3	4.3	7.4
632 SP370	68.1	6.7	25.2
632 SP383	56.9	7.0	36.1
632 SP386	81.8	6.8	11.4
632 SP392	74.8	7.2	18.0
632 SP400	76.9	4.5	18.6
632 SP402	59.1	3.6	37.3
632 SP422	81.0	6.2	12.8
632 SP436	72.0	4.2	23.8
632 SP440	60.5	3.3	36.2
632 SP442	56.0	6.0	38.0
632 SP447	67.0	3.3	29.7
632 SP467	75.7	10.3	14.0
632 SP480	77.6	6.1	16.3
725 SP169	64.5	3.2	32.3
725 SP206	90.6	4.0	5.4
725 SP216	84.5	3.7	11.8
725 SP219	85.7	1.8	12.5
725 SP222	86.2	4.6	9.2
725 SP230	83.2	2.4	14.4
725 SP271	92.3	5.9	1.8
723 SP114	78.8	3.6	17.6

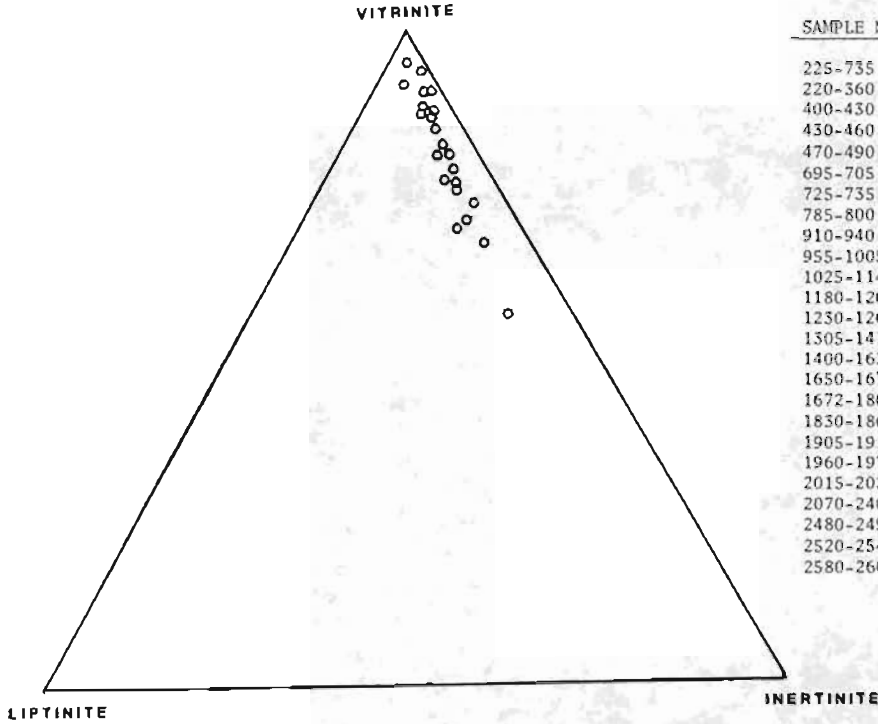
Figure 22 Ternary Diagram of the Three Maceral Groups In the Central Utukok River Coals.



Lookout Ridge Coal Samples

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
R7XNSP413	83.2	4.4	12.4
R7XNSP428	91.0	5.4	3.6
R7XNSP445	74.0	5.8	20.2
R7XNSP482	82.0	8.0	10.0
R7XNSP486	94.1	2.4	3.5
R7XNSP488	84.8	5.2	10.0
R7XNSP494	71.8	4.0	24.2
R7XNSP520	78.0	7.2	14.8
R7XNSP531	77.2	6.0	16.8
R7XNSP582	69.6	5.6	24.8

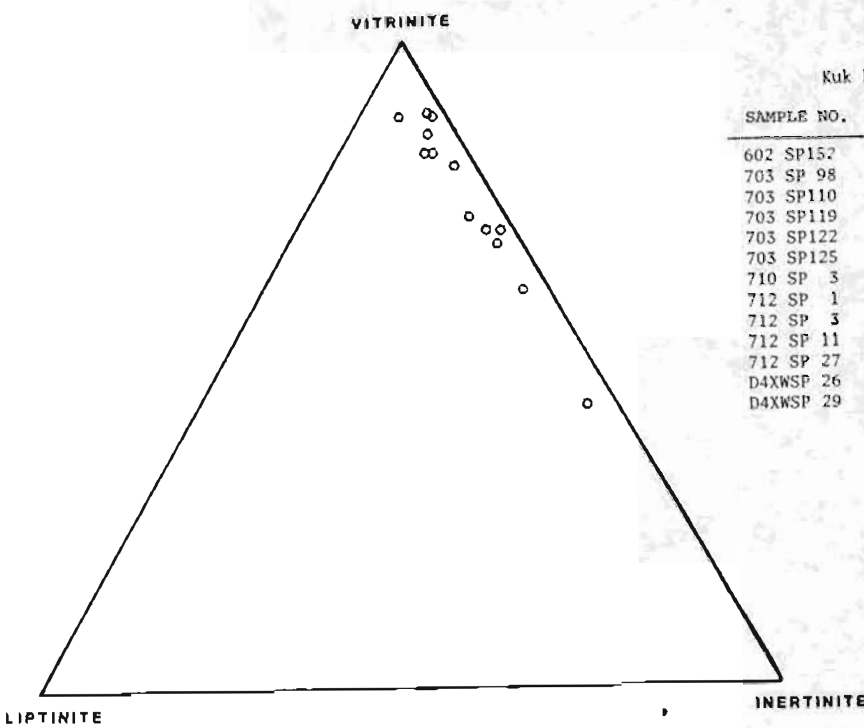
Figure 23 Ternary Diagram of the Three Maceral Groups In the Lookout Ridge Coals.



Tunalik TW No. 1 Coal Samples

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
225-735	68.0	6.0	26.0
220-360	70.1	8.4	21.5
400-430	76.2	5.4	18.4
430-460	57.2	8.6	34.2
470-490	73.9	4.6	21.5
695-705	88.8	3.6	7.6
725-735	77.4	6.4	16.2
785-800	81.6	5.6	12.8
910-940	79.2	4.4	16.4
955-1005	90.8	1.6	7.6
1025-1140	81.8	4.4	13.8
1180-1203	87.8	2.6	9.6
1230-1260	77.2	5.2	17.6
1305-1410	83.2	4.0	12.8
1400-1635	81.4	3.8	14.8
1650-1672	95.2	2.4	2.4
1672-1800	71.6	6.8	21.6
1830-1860	90.8	3.2	6.0
1905-1915	88.0	3.2	8.8
1960-1975	92.0	4.8	3.2
2015-2020	94.0	1.0	5.0
2070-2400	90.8	1.6	7.6
2480-2490	87.5	4.5	8.0
2520-2540	83.0	3.8	13.2
2580-2600	85.2	3.6	11.2

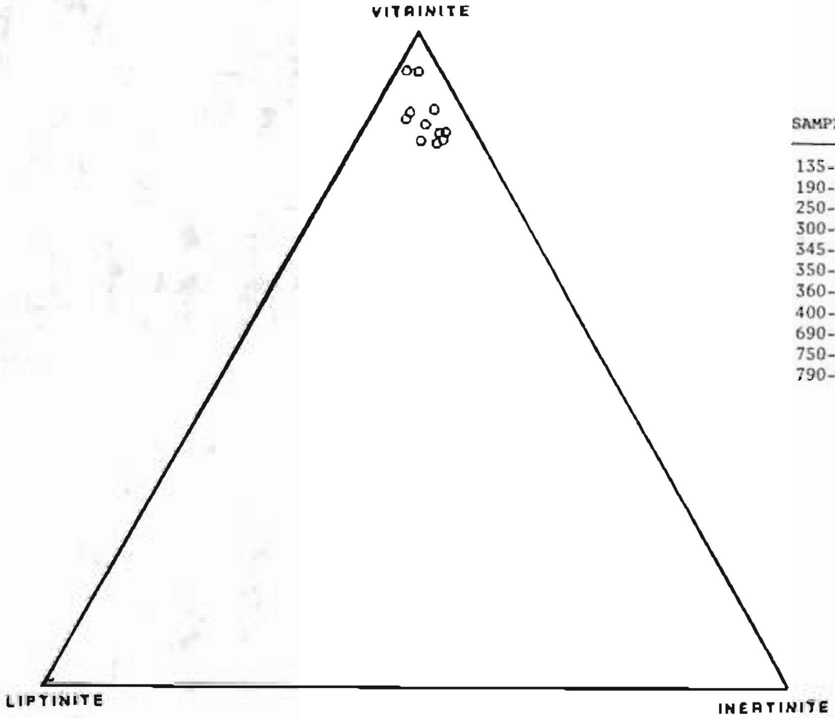
Figure 24 Ternary Diagram of the Three Maceral Groups In the Tunalik Test Well No. 1 Coals.



Kuk River Coal Samples

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
602 SP152	85.9	3.6	10.5
703 SP 98	73.0	4.4	22.6
703 SP110	71.2	3.2	25.6
703 SP119	70.7	1.3	28.0
703 SP122	88.6	1.6	9.8
703 SP125	68.8	2.8	28.4
710 SP 3	89.2	2.0	8.8
712 SP 1	88.6	6.0	5.4
712 SP 3	80.8	2.4	16.8
712 SP 11	43.8	3.2	53.0
712 SP 27	61.8	3.0	35.2
D4XWSP 26	82.8	4.6	12.6
D4XWSP 29	82.9	5.5	11.6

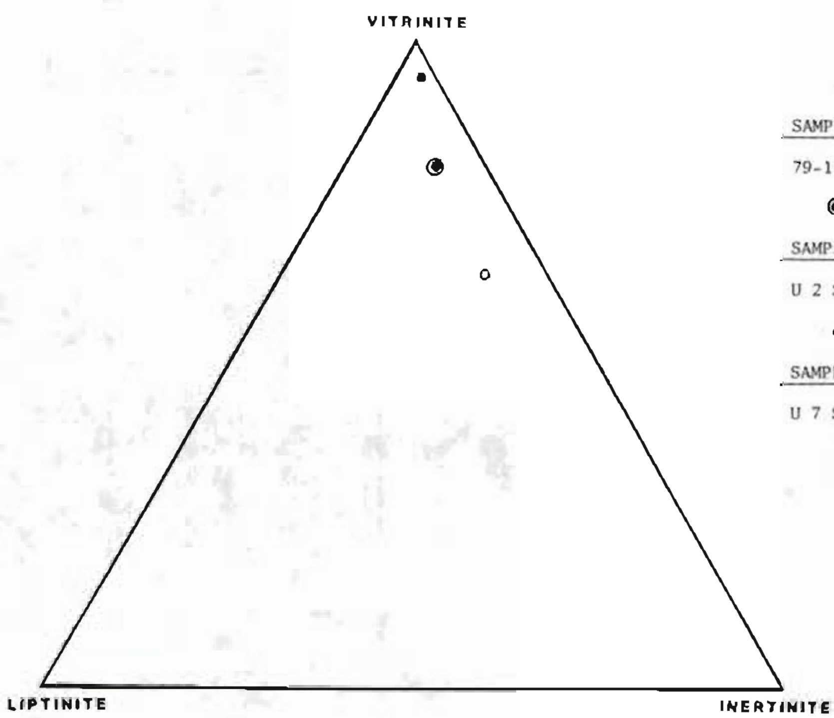
Figure 25 Ternary Diagram of the Three Maceral Groups In the Kuk River Coals.



Peard Bay TW Coal Samples

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
135-145	83.8	5.4	10.8
190-200	94.7	4.4	0.9
250-260	94.4	2.8	2.8
300-310	86.4	5.8	7.8
345-350	85.2	3.8	11.0
350-360	84.4	4.6	11.0
360-365	85.1	4.4	10.5
400-410	88.5	7.0	4.5
690-700	84.2	7.6	8.2
750-780	88.8	3.6	7.6
790-800	87.8	7.6	4.6

Figure 26 Ternary Diagram of the Three Maceral Groups in the Peard Bay Test Well Coals.



o East Simpson TW No. 2 Coal Samples

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
79-137	64.0	8.6	27.4

◉ Ikpikpuk Coal Samples

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
U 2 SP65	79.8	6.2	14.0

• Umiat Coal Samples

SAMPLE NO.	VITRINITE	LIPTINITE	INERTINITE
U 7 SP12	93.8	4.2	2.0

Figure 27 Ternary Diagram of the Three Maceral Groups in the East Simpson Test Well No. 2 Coal, the Ikpikpuk Coal and the Umiat Coal.

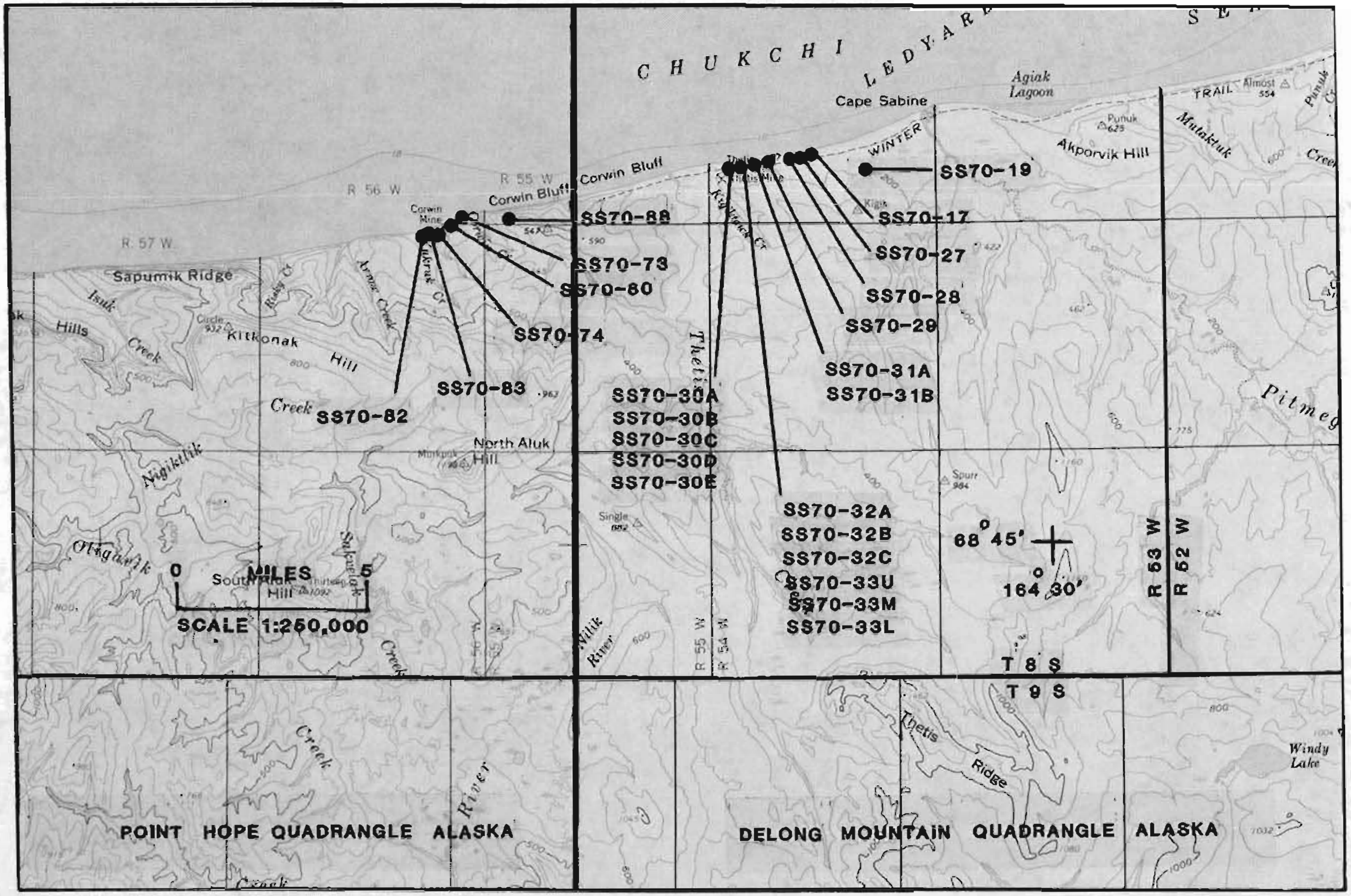


Figure 28 Location of Sampling Sites in the Corwin Bluff Area.

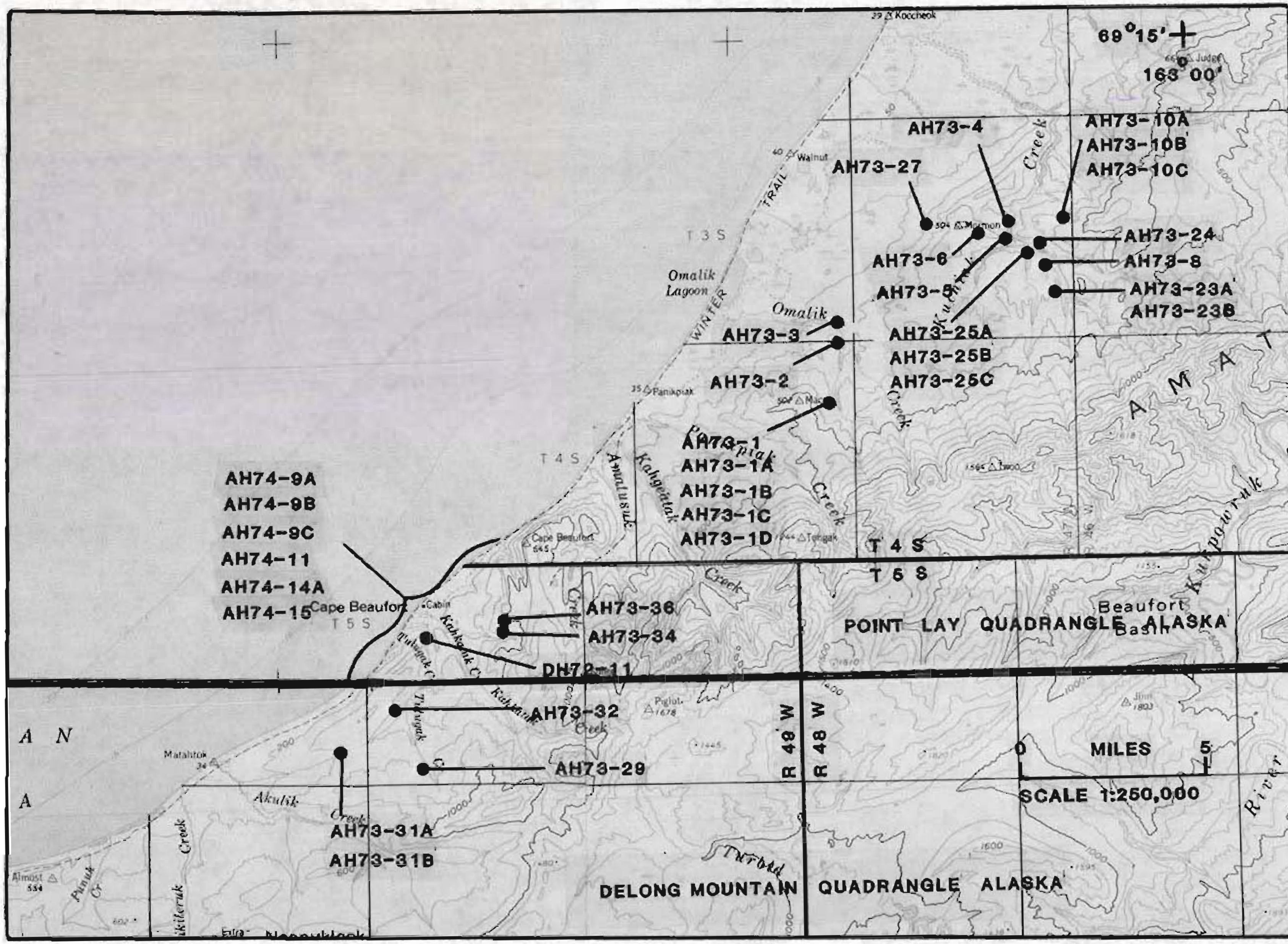


Figure 29 Location of Sampling Sites in the Cape Beaufort Area.

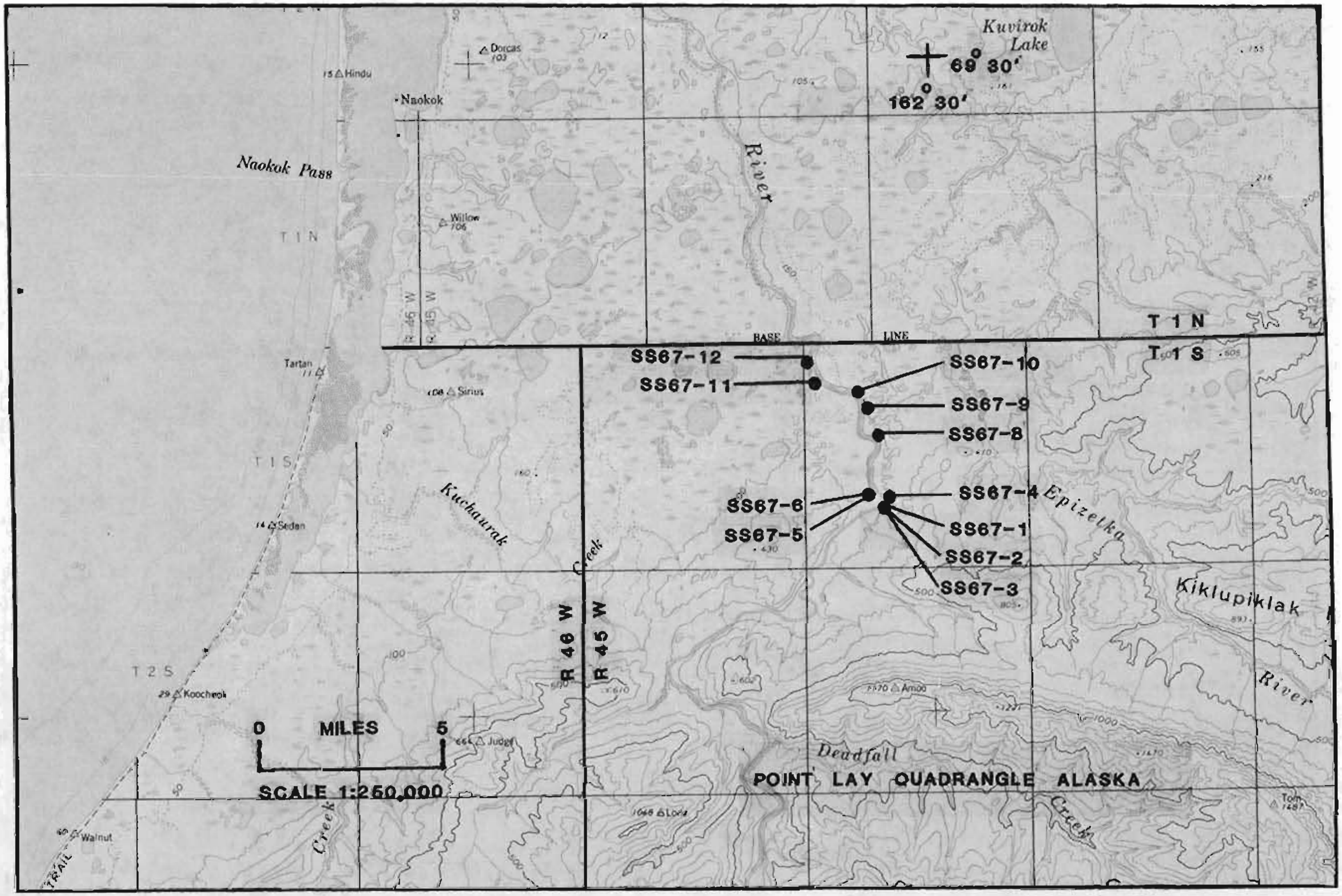


Figure 30 Location of Sampling Sites in the Kukpowruk River Area.

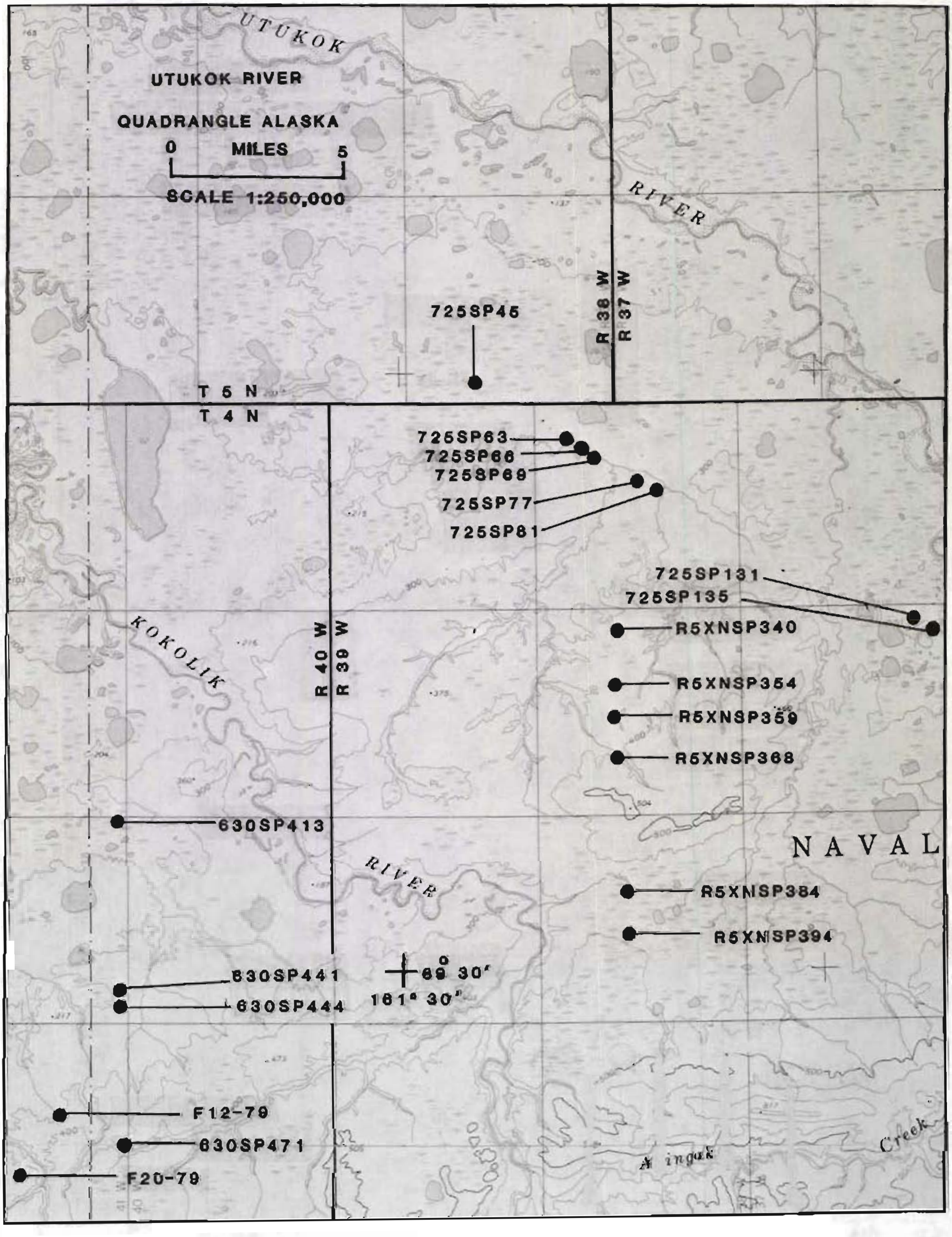


Figure 31 Location of Sampling Sites in the West Utukok River Area.

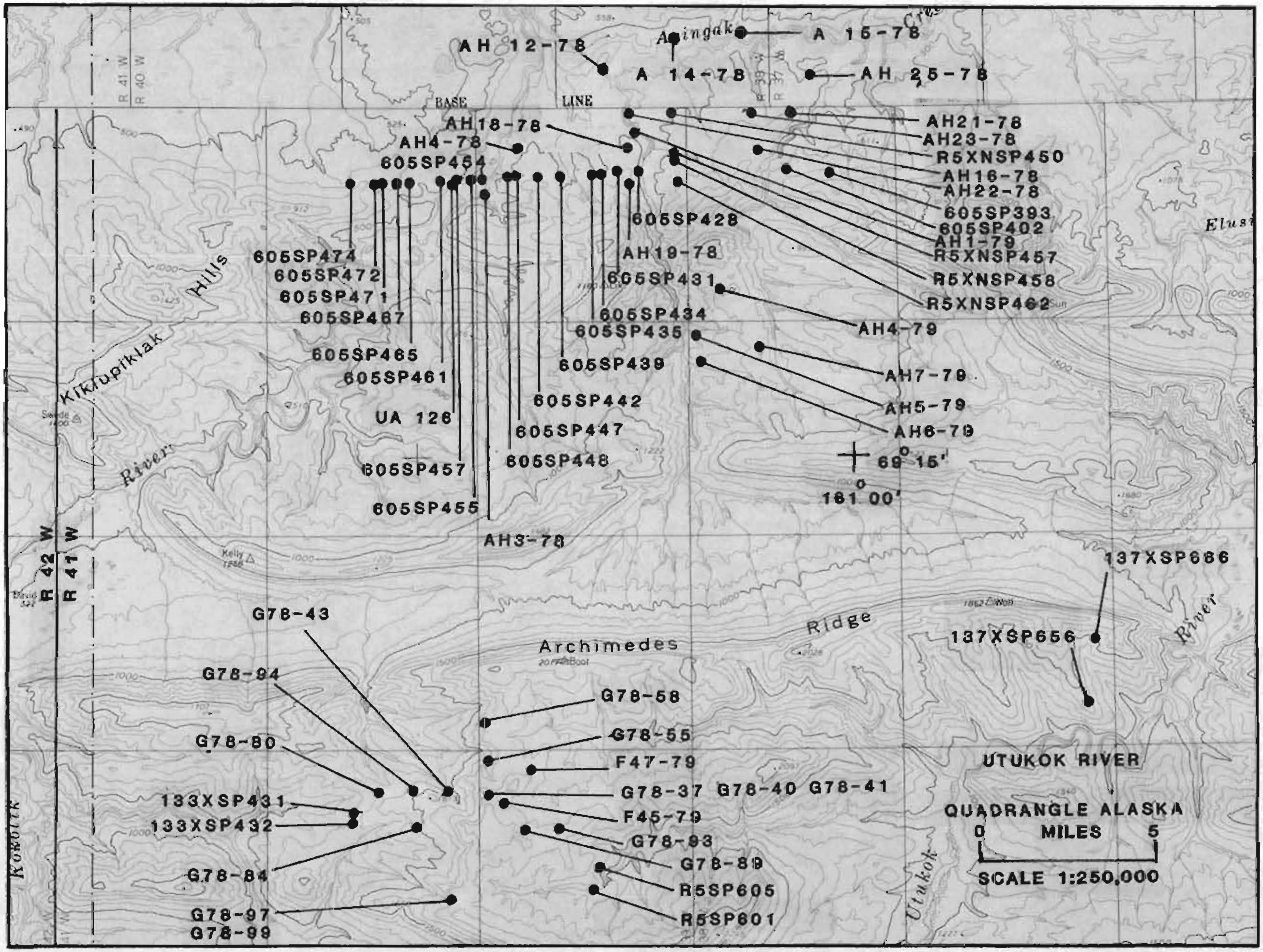


Figure **32** Location of Sampling Sites in the Kokolik River and Archimedes Ridge Areas.

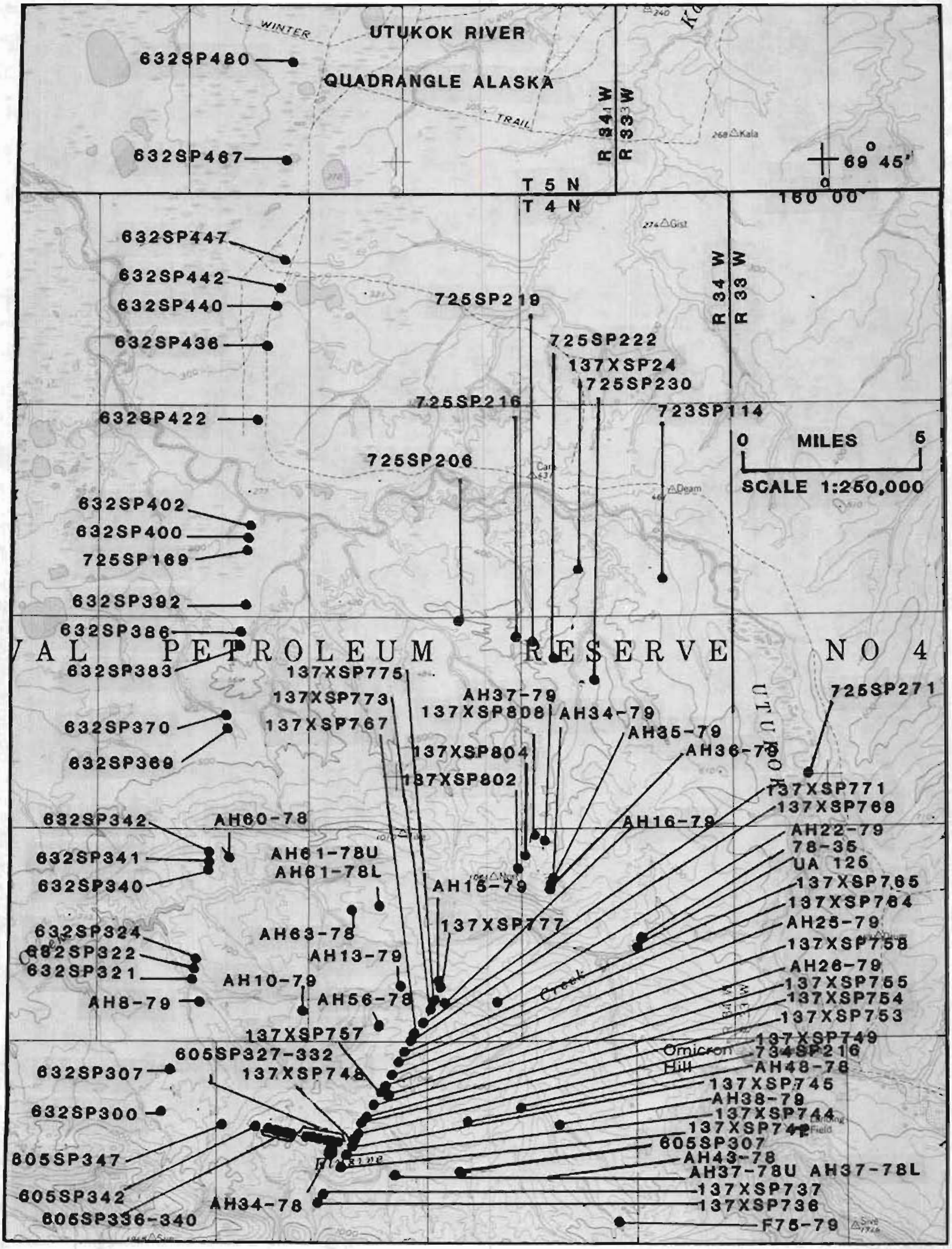


Figure 33 Location of Sampling Sites in the Elusive Creek and Central Utukok River Areas.

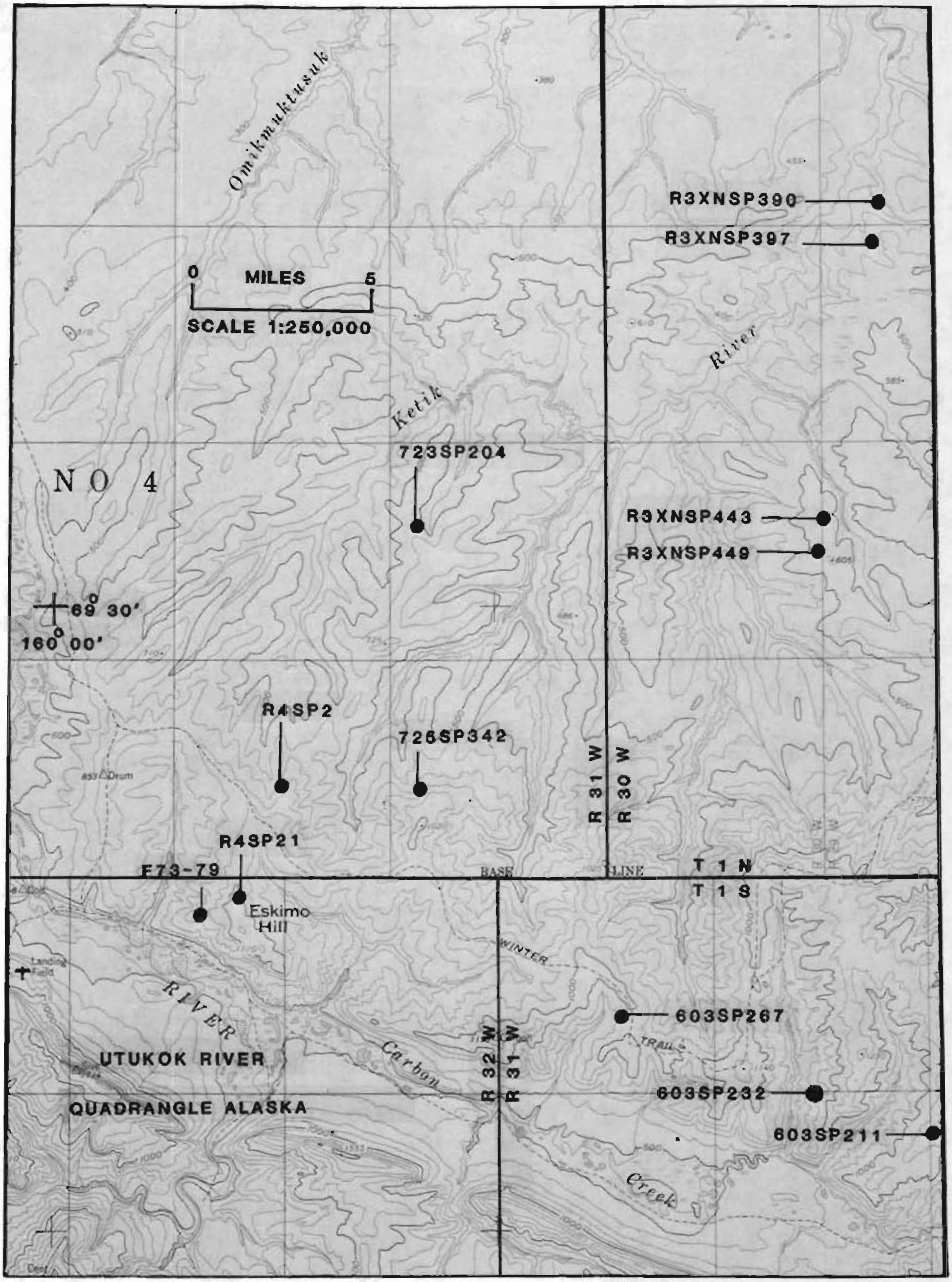


Figure 34 Location of Sampling Sites in the East Utukok River Area.

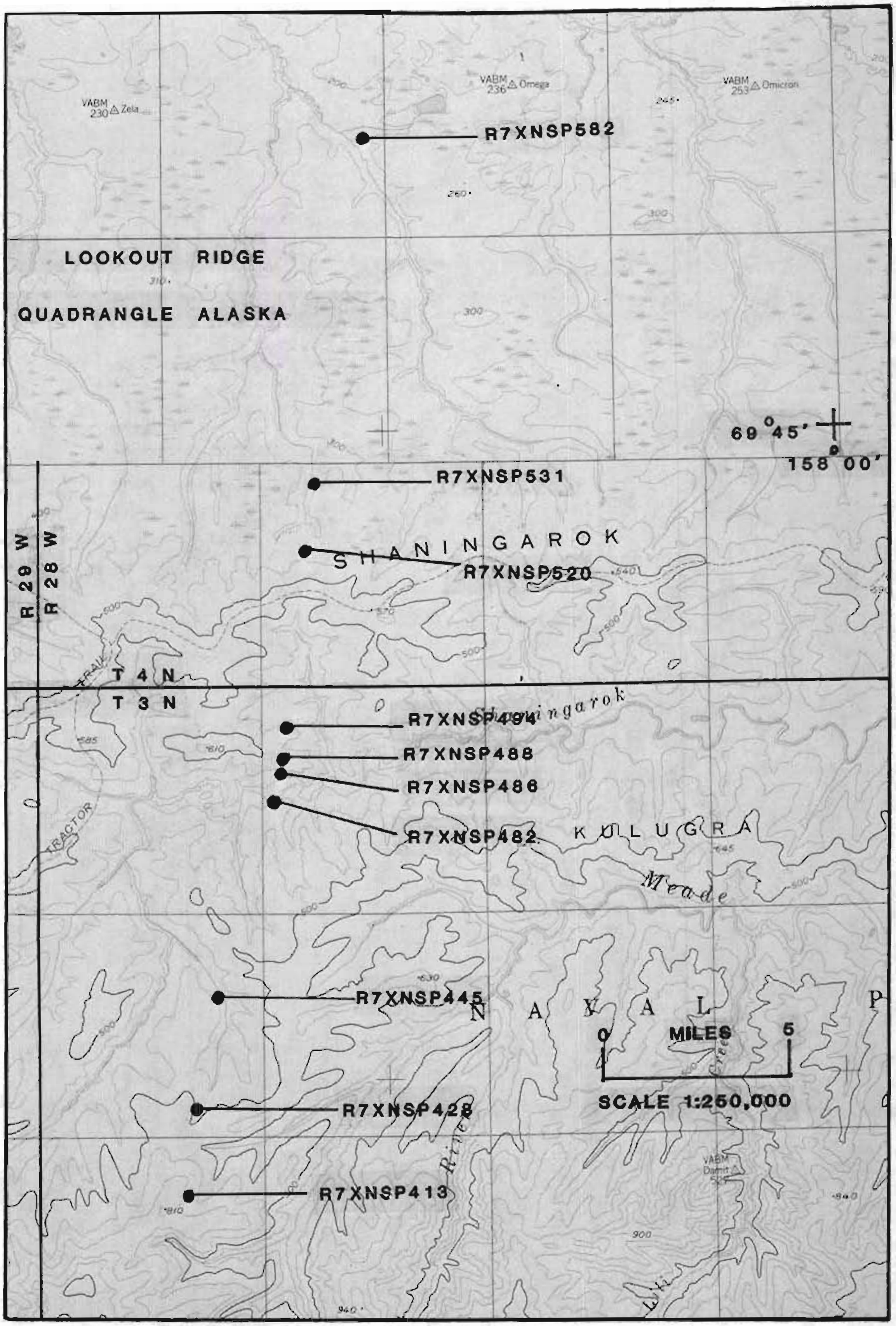


Figure 35 Location of Sampling Sites in the Lookout Ridge Quadrangle.

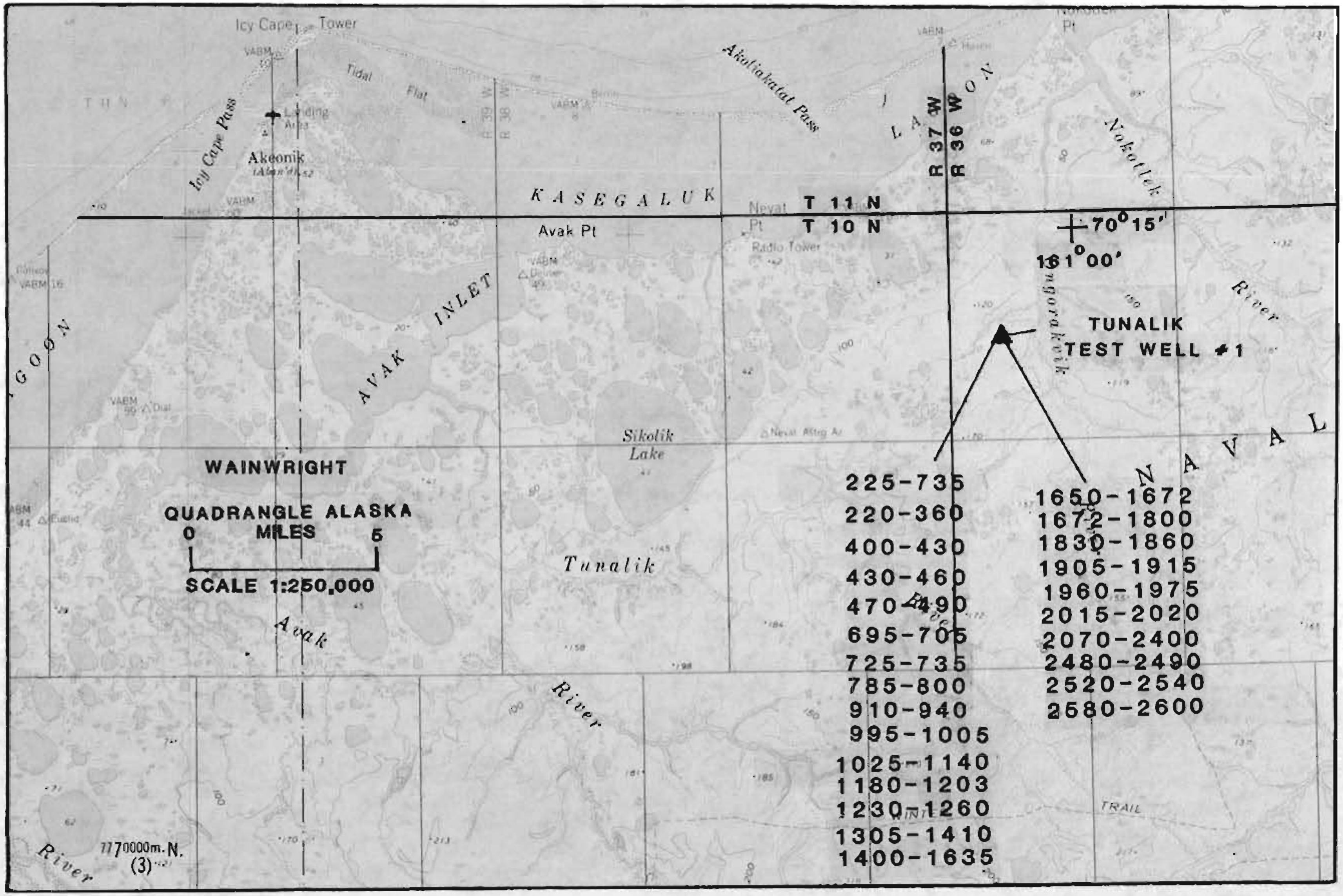


Figure 36 Location of the Tunalik Test Well No. 1 Drill Site.

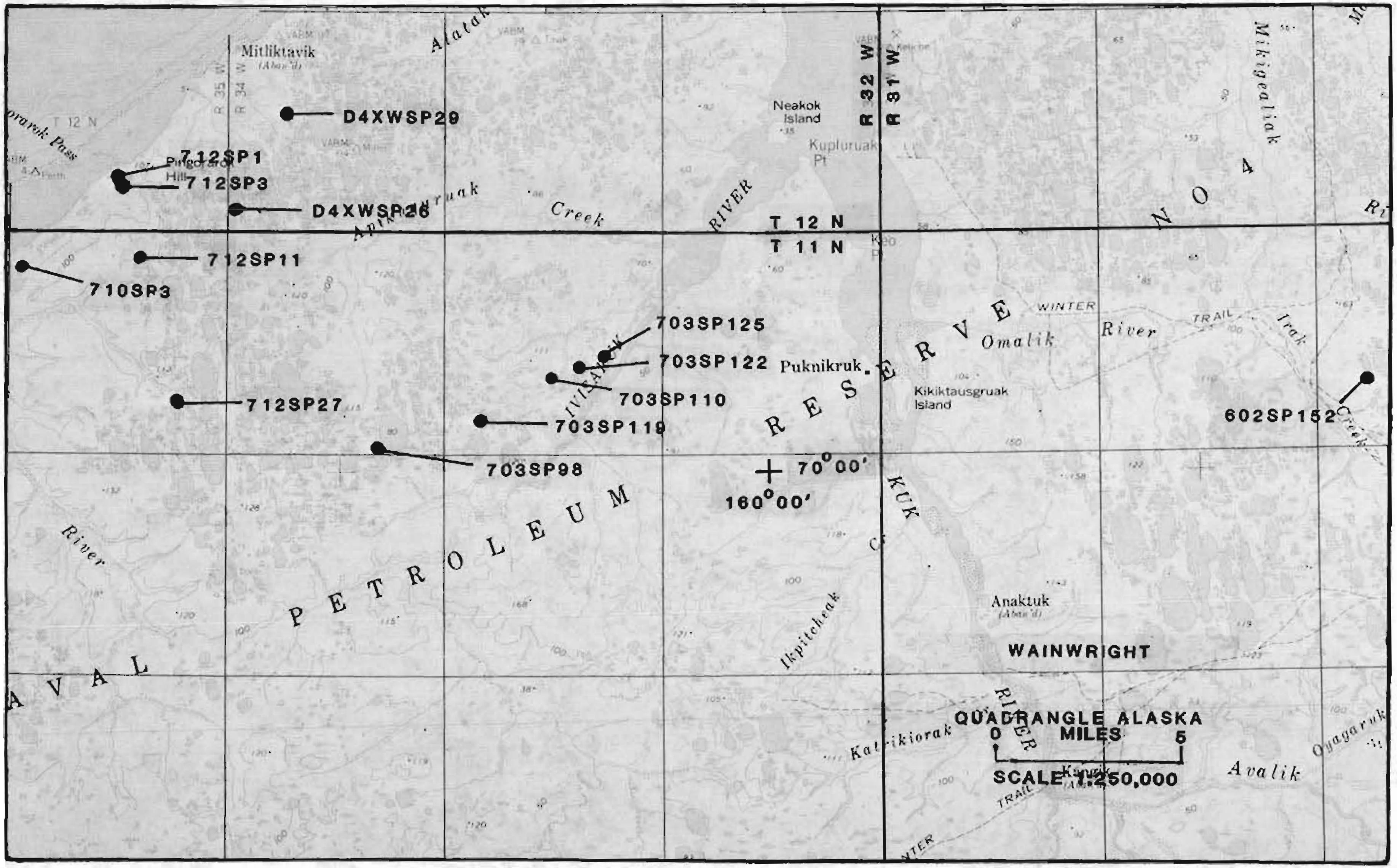


Figure 37 Location of Sampling Sites in the Kuk River Area.

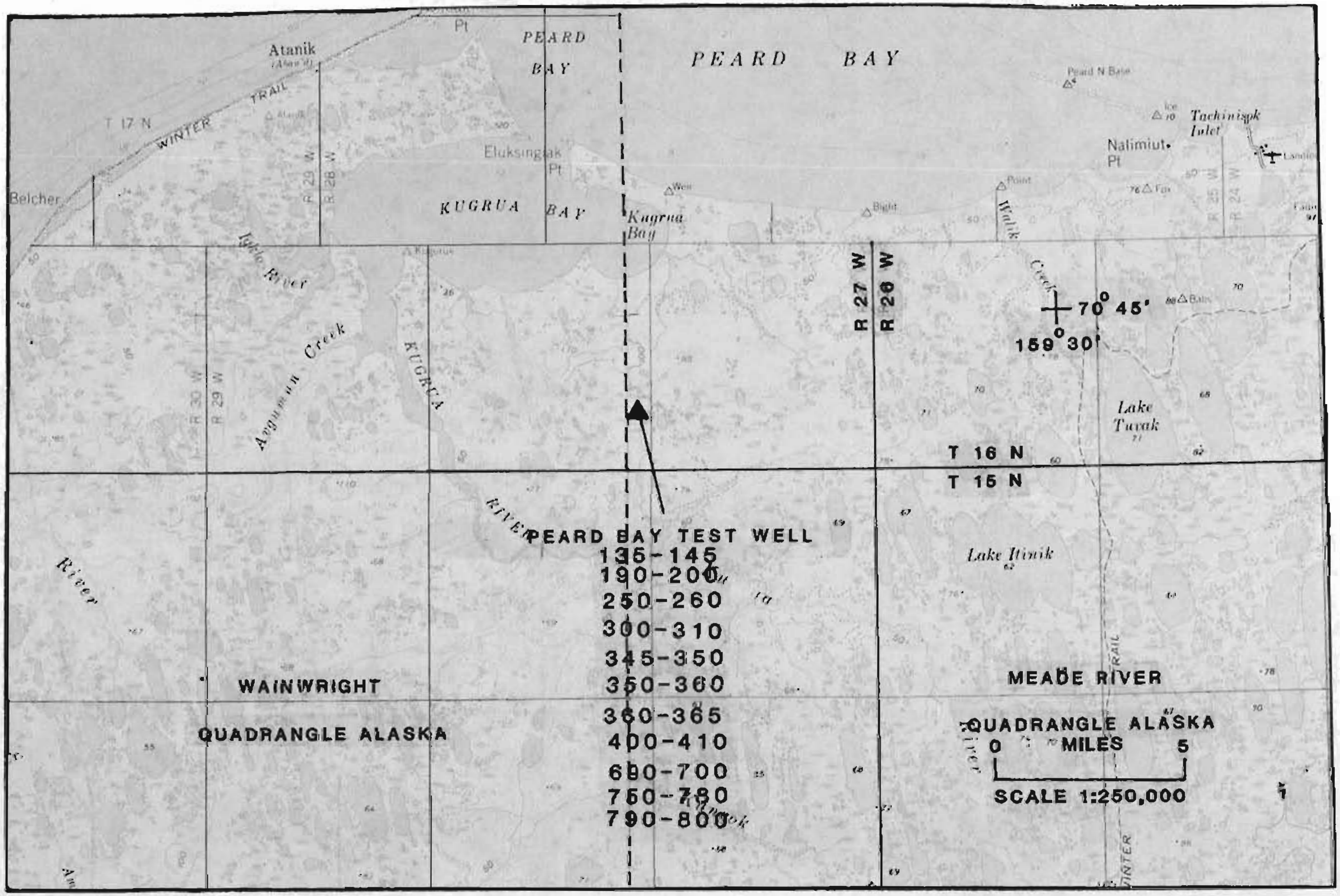


Figure 38 Location of the Peard Bay Test Well Drill Site.

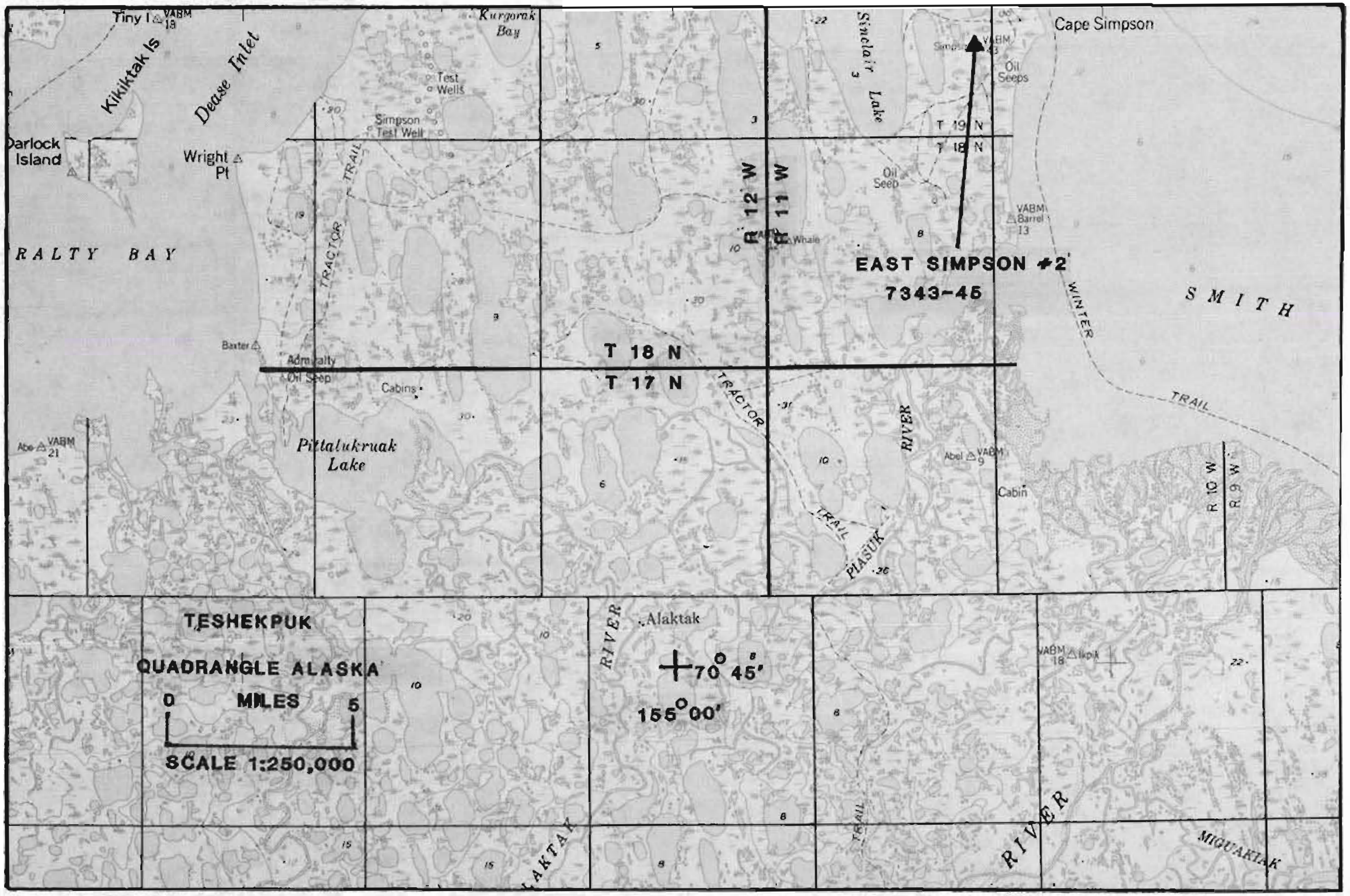


Figure 39 Location of the East Simpson Test Well No. 2 Drill Site.

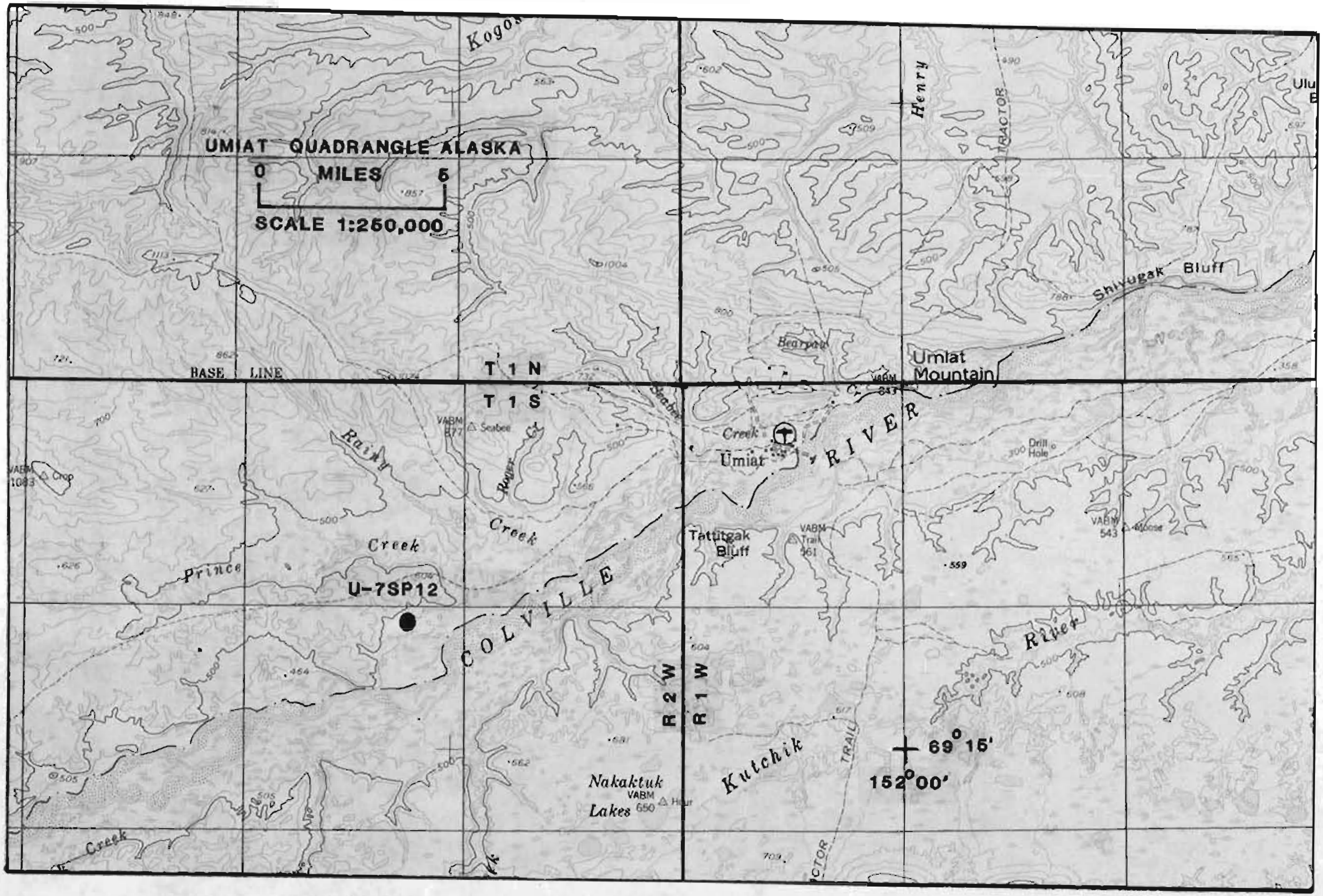


Figure **40** Location of the Sampling Site in the Umiat Quadrangle.

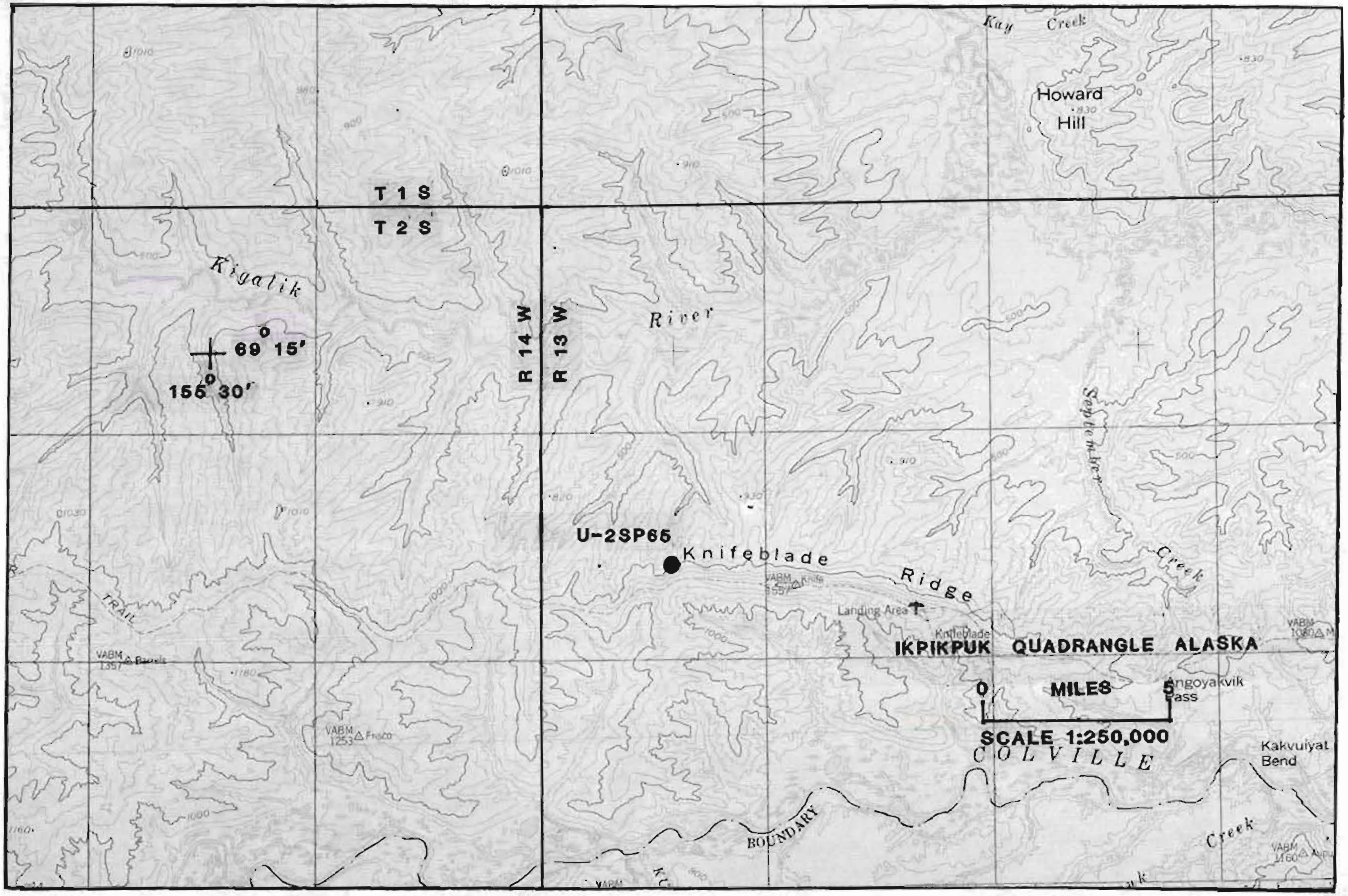


Figure **41** Location of the Sampling Site in the Ikpikpuk Quadrangle.