EXPLORATION PROGRESS REPORT

Hosmer Ridge - Wheeler Ridge

#336

KAISER RESOURCES

COAL RESERVE STUDY

HOSMER-WHEELER RIDGE AREA

CROWSNEST PROPERTY, BRITISH COLUMBIA

EXPLORATION PROGRAM

PROGRESS REPORT

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FRONT COVER

View from Hosmer Ridge eastward with Wheeler Ridge in the foreground, the Michel Creek Valley in the middle distance and the Flathead Range forming the skyline. The #9 coal seam has been exposed by bulldozer work and shows as a snow dovered area on Wheeler Ridge. Mt. Ptolemy (elev. 9228 ft.) is the high point of the skyline at a distance of 12 miles.

SUMMARY

The following preliminary progress report is a summary of the results of an exploration program which began in 1968 with reconnaissance mapping in the Hosmer - Wheeler Ridge area, as part of an overall program of coal land evaluation. Little or no previous exploration had been done in this area. During September, 1968 to May, 1969, access was established, 2 adits were completed, and several coal seams trenched and measured. Expenditures during 1968 and 1969 amounted to $35,000.

An intensive program was begun early in 1970 to explore more fully the potential reserves of this area. Some 40 persons were employed to complete 24 adits, complete 9 rotary drill holes, trace out 6 miles of coal outcrop, measure numerous stratigraphic and coal columns, partially complete excavating 3 test pits and complete washability tests on 25 bulk samples.

10 coal seams ranging in thickness from 6 to 55 feet, and varying between 24 and 33% volatile content were extensively sampled. No. 3 seam (adit 26) was found to have a fluidity (DDM) of 2300. Total expenditures during 1970 amounted to $490,000.

Some 3700 acres were explored in detail or 5.7% of the total acreage (65,000 acres) Kaiser will retain of the 108,000 acre Crows Nest Property. About 2900 acres or half of the Dominion Government Block acreage was explored in detail.

Total reserves up to 2500 feet of cover in the Hosmer-Wheeler Ridge area are

SUMMARY (CONT'D)

estimated at 676,958,000 NT of coal in place, and in the Parcel 73 (Dominion Government Block), 253,947,000 NT of coal in place.

An additional exploration expenditure of $250,000 is anticipated during 1971.

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LOCATION

General

The Hosmer-Wheeler Ridge area is situated some 10 miles south of the Michel Mining area and forms the centre of the Crows Nest Coalfield in southeastern British Columbia. The immediate area is served by the Canadian Pacific Railroad.

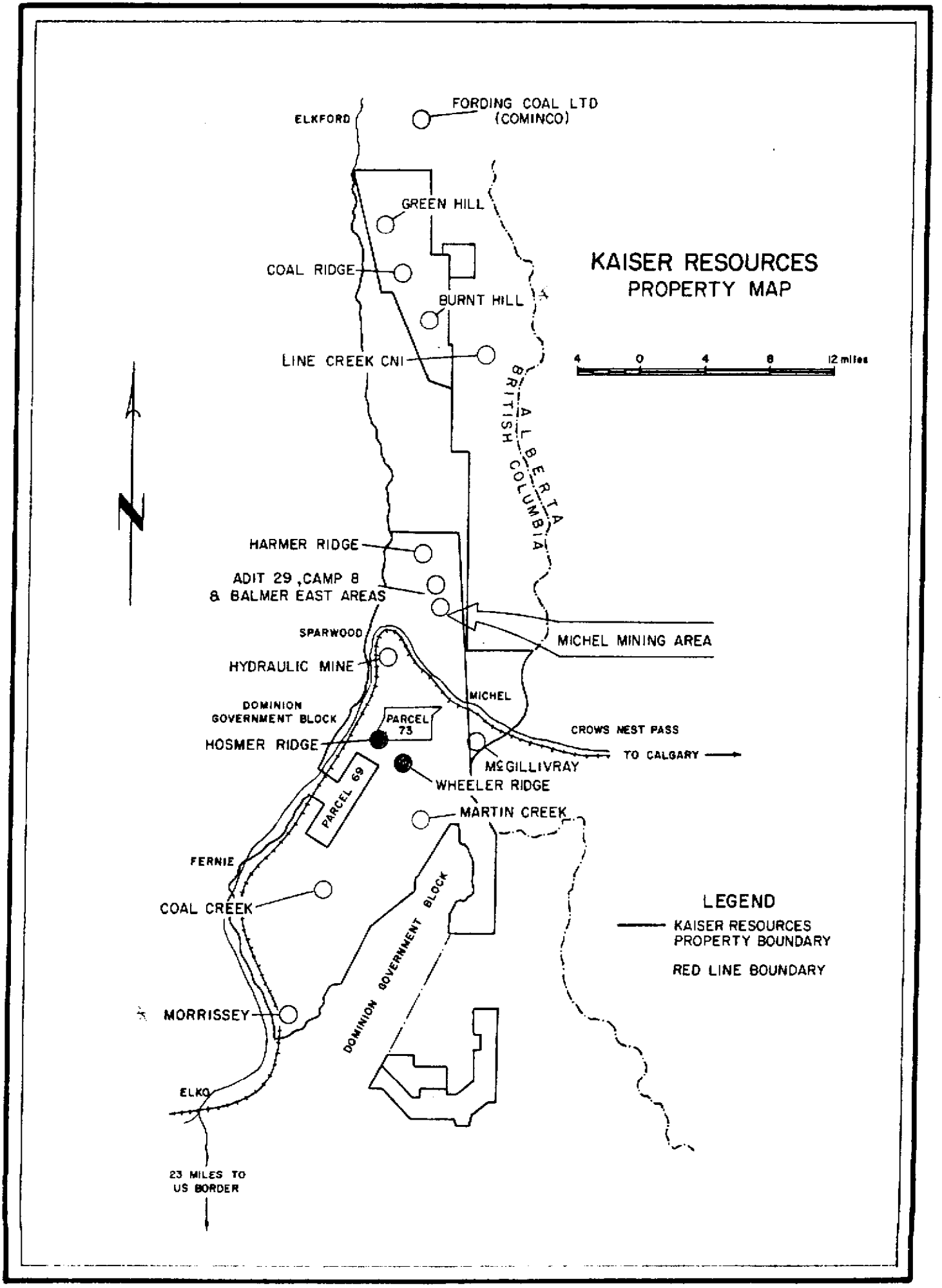
The coal deposits lie in mountainous terrain varying between 6500 and 5000 feet, valley bottom elevations vary between 3300 and 3500 feet. The Kaiser Resources strip mine, on Harmer Ridge, operates between 6900 and 5000 feet, and the underground mines at Michel vary in elevation between 6200 and 4800 feet, valley bottom in Michel is at 3500 feet.

Topography

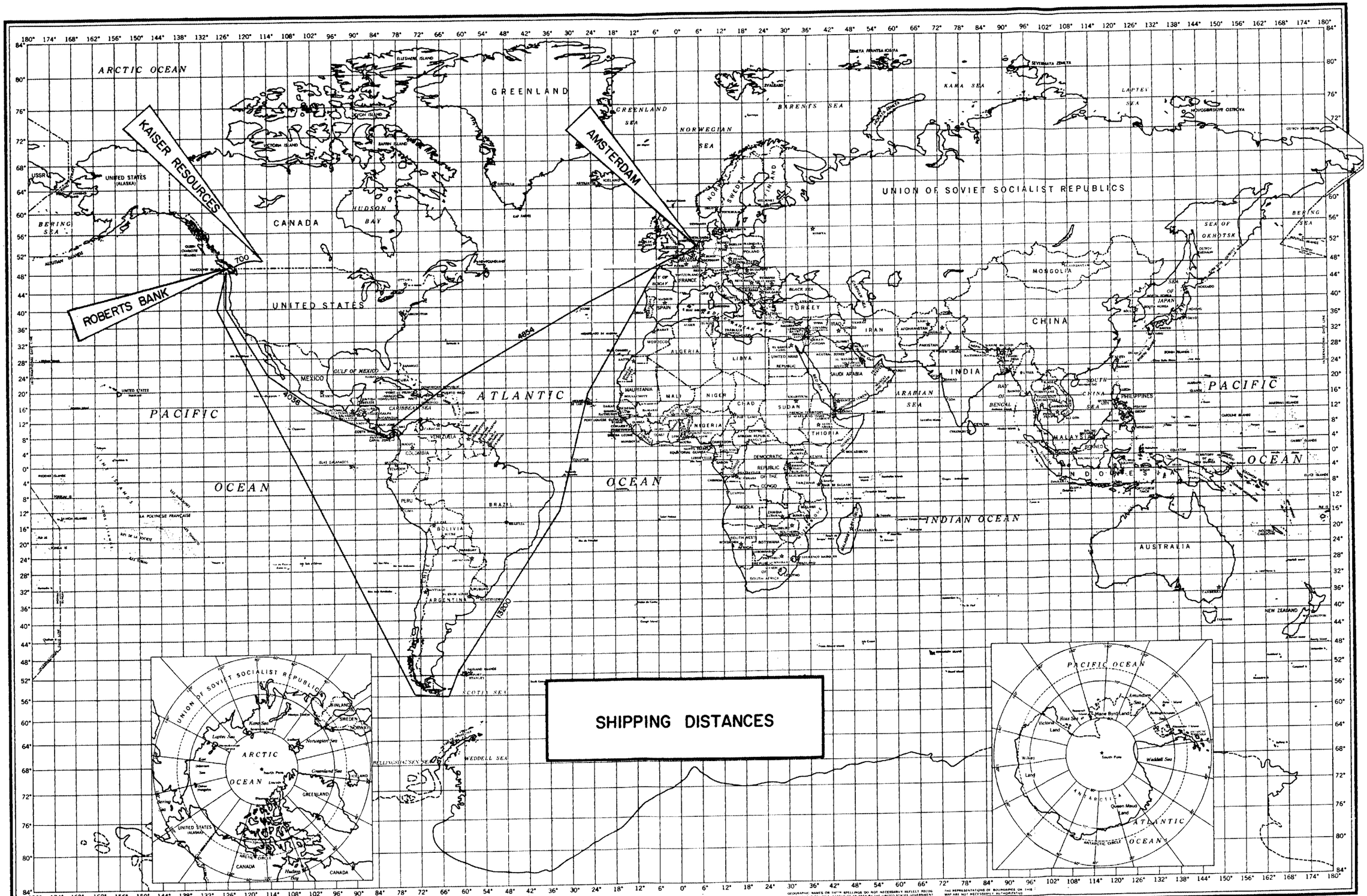
The general land forms within the area exhibit very rugged relief varying from 7300 feet on the mountain tops to 3400 feet near the valley bottoms. The topography is largely controlled by the resistant sandstones and conglomerates which tend to form cliff forming members. The more easily eroded shales and coal seams tend to erode more easily and form saddles or depressions along the ridge fronts.

Water and Power

The dominant drainage in the area is the Elk River which flows some 2 miles west of Hosmer Ridge, and Michel Creek which flows some 5 miles east. The majority of small streams in the vicinity empty into Michel Creek which is a tributary of the Elk River.


KAISER RESOURCES
PROPERTY MAP
4 0 4 8 12 miles
ELKFORD
FORDING COAL LTD
(COMINCO)
GREEN HILL
COAL RIDGE
BURNT HILL
LINE CREEK CNI
ALBERTA
BRITISH COLUMBIA
HARMER RIDGE
ADIT 29, CAMP 8
& BALMER EAST AREAS
SPARWOOD
MICHEL MINING AREA
HYDRAULIC MINE
MICHEL
DOMINION
GOVERNMENT BLOCK
PARCEL
73
HOSMER RIDGE
CROWS NEST PASS
TO CALGARY
McGILLIVRAY
WHEELER RIDGE
PARCEL 69
MARTIN CREEK
FERNIE
COAL CREEK
DOMINION GOVERNMENT BLOCK
MORRISSEY
ELKO
23 MILES TO
US BORDER
LEGEND
KAISER RESOURCES
PROPERTY BOUNDARY
RED LINE BOUNDARY

THE WORLD


KAISER RESOURCES
AMSTERDAM
ROBERTS BANK
700
4054
4036
13200
SHIPPING DISTANCES
ARCTIC OCEAN
GREENLAND
GREENLAND SEA
BARENTS SEA
NORWEGIAN SEA
KARA SEA
LAPTEV SEA
UNION OF SOVIET SOCIALIST REPUBLICS
USSR
UNITED STATES (ALASKA)
BERING SEA
CANADA
HUDSON BAY
UNITED STATES
MEXICO
GULF OF MEXICO
CARIBBEAN SEA
PACIFIC OCEAN
ATLANTIC OCEAN
INDIAN OCEAN
SEA OF OKHOTSK
SEA OF JAPAN
MONGOLIA
CHINA
INDIA
ARABIAN SEA
BAY OF BENGAL
SOUTH CHINA SEA
PHILIPPINES
INDONESIA
MALAYSIA
AUSTRALIA
NEW ZEALAND
SOUTH AMERICA
AFRICA
EUROPE
SCOTIA SEA
WEDDELL SEA
BELLINGSHAUSEN SEA
ANTARCTIC CIRCLE
ANTARCTICA
Ross Sea
Victoria Land
Marie Byrd Land
Ellsworth Land
Weddell Sea
Queen Maud Land
South Pole
Greenland Sea
Norwegian Sea
Kara Sea
Laptev Sea
Hudson Bay
Beaufort Sea
Bering Sea
North Pole

LOCATION (CONT'D)

Water and Power (Cont'd)

Power is supplied by B. C. Hydro which is owned publicly and also by Calgary Power Co. from Alberta.

Weather Conditions

Total annual precipitation in the Hosmer Area averages about 40 inches per year, with some 13 inches of this total being in the form of snow (about 10 feet) annually. Temperature ranges vary from a maximum of -30° F. in winter to 90° F. in summer. The coldest portion of winter generally occurs between late December and January. Snow generally falls between late November and remains until March in the townsites, and until June in the mountains.

The area experiences several chinooks or warm air periods during winter, such that the open-pit mines are able to work the year round, as the average winter temperature is about 22° F. and during summer about 70°F.

Access

A nine mile access road was constructed to Hosmer Ridge early in 1969, starting from the KRL 10-7 strip mine on Sparwood Ridge and lying about 2 miles east of the CPR track. A second access road extending from the southeast portion of Wheeler Ridge was built in 1970 to tie into a previous access road near the CPR station at McGillivray.

The towns of Fernie, situated some 10 miles to the south (population 7000),

LOCATION (CONT'D)

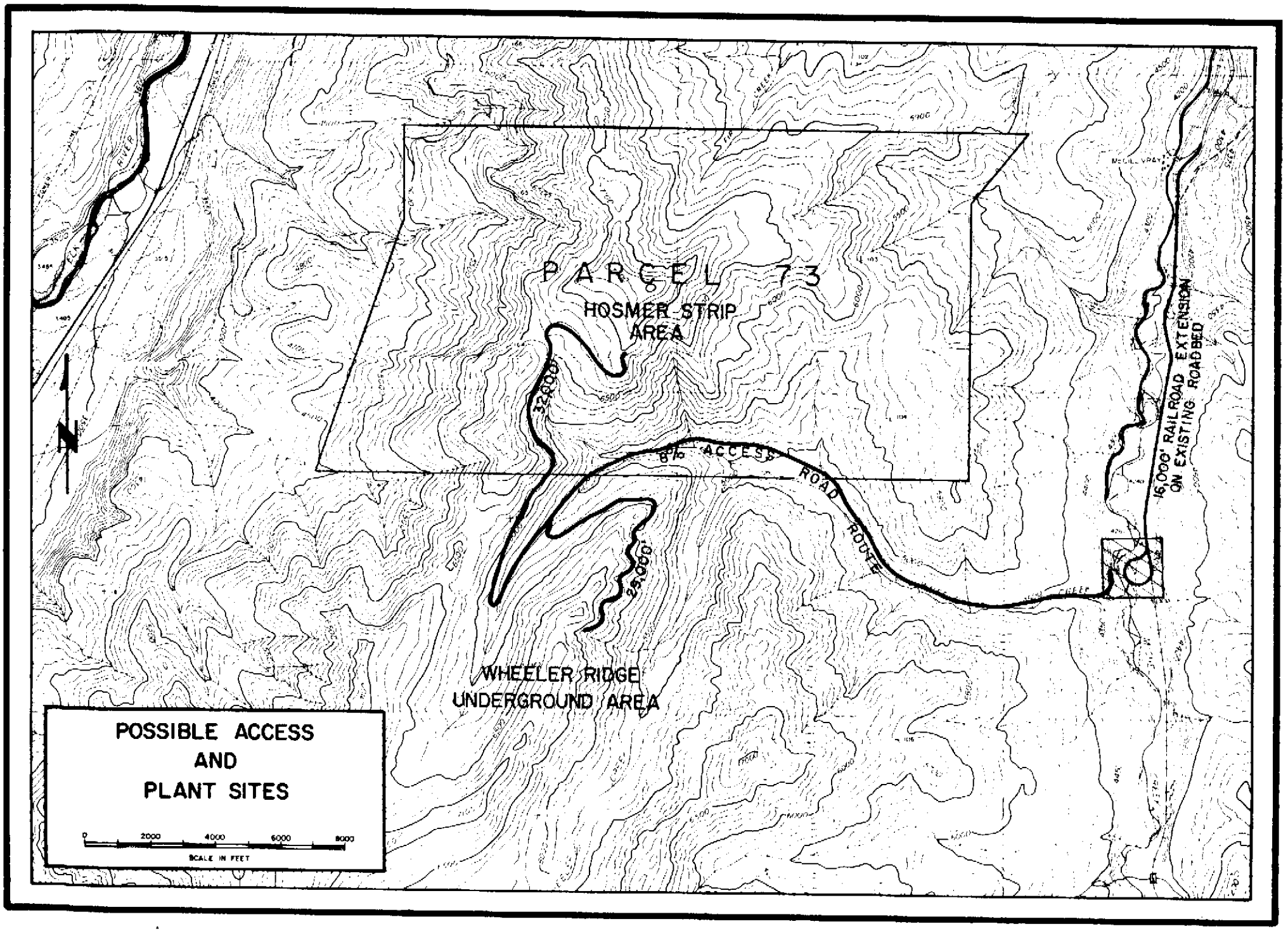
Access (Cont'd)

and Sparwood (population 2000), some ten miles to the north, serve the needs of the immediate area. Number 3 southern transprovincial highway passes through both towns, as does the CPR railway. By highway distance, Vancouver lies some 600 miles to the west, Calgary 200 miles east, and Lethbridge 120 miles southeast. Connection to U.S. highways can be made at Kingsgate and Roosville, B. C.

Airline service is available at Cranbrook, B. C., some 64 miles west of Fernie, where Pacific Western Airlines operates a daily east and west flight, or service is available from Calgary, Alberta.

The town of Fernie has recently expanded from a population of 3200 to 7000. About 150 apartments have recently been constructed as well as 150 new homes. Several new stores have recently been completed in Fernie and include a modern supermarket, furniture and appliance outlets. A 40 bed hospital serves the Fernie area with 6 medical doctors and 2 dentists available, a second hospital is located in Michel, near Sparwood, and has 2 resident medical doctors.

At Sparwood about 200 new homes, including dyplex and single units, have been completed. Several apartments are also under construction, as well as a shopping centre.

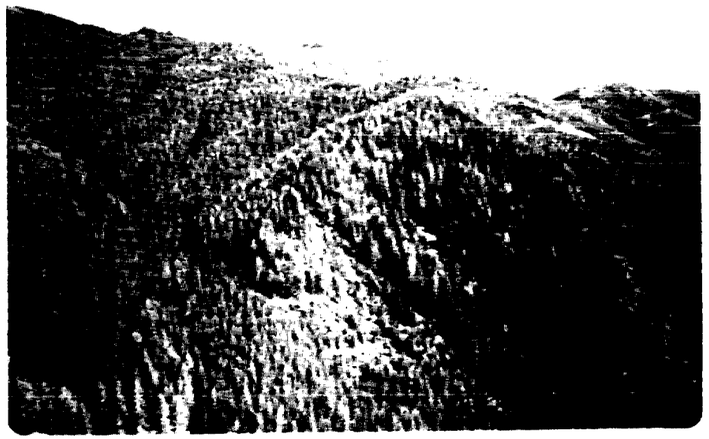

PARCEL 73
HOSMER STRIP AREA
32,000'
8% ACCESS ROAD ROUTE
25,000'
16,000' RAILROAD EXTENSION ON EXISTING ROADBED
WHEELER RIDGE UNDERGROUND AREA
POSSIBLE ACCESS AND PLANT SITES
0 2000 4000 6000 8000
SCALE IN FEET

Looking South at Wheeler Ridge (center) and Wheeler Creek (left).

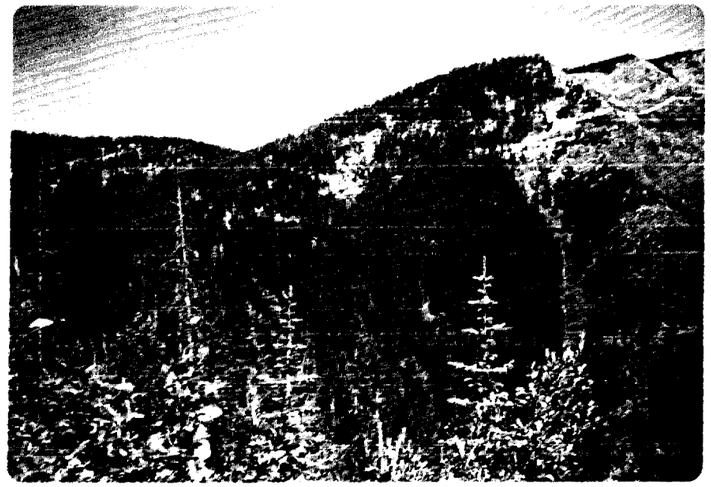
View from #9 seam on Hosmer Ridge.

Looking East across #9 seam exposure in north end of Wheeler Ridge. Access route to plant site would follow canyon to Michel Creek in middle distance. Flathead Range forms the skyline 12 miles away.

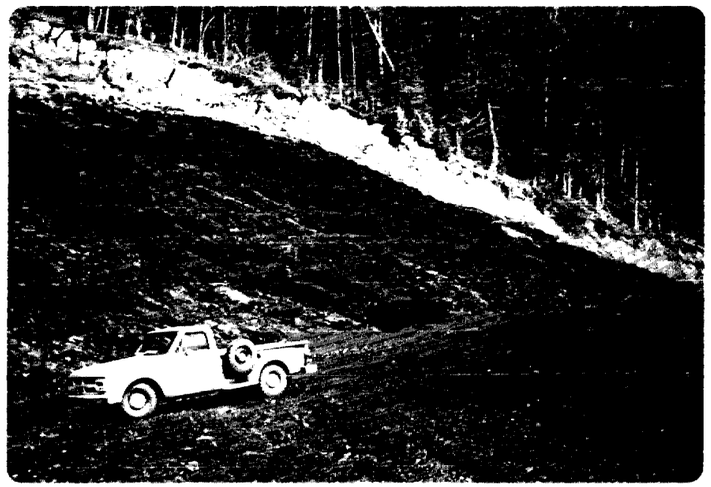
Looking North from test pit in Hosmer Ridge, #9 seam, toward Sparwood and Michel.



Looking East at Hosmer Ridge potential strip area. White line near top of hill in center is outcrop exposure of #9 seam.



Looking West at exposure of #9 seam in potential strip area, Hosmer Ridge.



Adit site #3 on Upper #9 seam, Hosmer Ridge.

PROPERTY OWNERSHIP

Land Description and Ownership

During February, 1968, Kaiser Resources Ltd., a subsidiary of Kaiser Steel Corporation, acquired the coal rights on the 108,000 acres of coal-bearing land held by Crows Nest Industries. In addition KRL also acquired the prospecting rights on any coal licenses held by CNI on Crown Lands. At the end of 5 years, Kaiser Resources Ltd. is to return to Crows Nest Industries, 43,000 acres of the land held by the agreement.

Kaiser Resources holds a non-exclusive exploration license in the Dominion owned Parcel 73. Exploration licenses are also held on lots 6743, 6744, 6746, 6747 in Parcel 69 and on approximately 3000 acres north of Parcel 81.

KAISER RESOURCES PROPERTY
(EXCEPTING NORTH ELK VALLEY)

0 1/2 1 2 3 4 5 6miles

GEOLOGY AND EXPLORATION

The area under investigation on Hosmer and Wheeler Ridge and on the Dominion Coal Block (Parcel 73) comprised about 5000 acres, or about 5% of the total acreage of the Crows Nest property. The Hosmer-Wheeler Ridge area is part of the west limb of a broad syncline. The coal measures dip inward around the rim of the ridges and the axis of the syncline plunges southerly towards the centre of the Crows Nest basin at about 7 degrees.

A geological plan map and several typical cross-sections through the coal measures have been included.

General Stratigraphy

Three principal stratigraphic units occur within the area and from the top down are:

a) the Elk formation which consists of chert conglomerates, coarse grained sandstones and grey to black shales and immediately overlies the coal measures.

b) the Kootenay or coal-bearing formation which consists of grey to black shales, coarse to medium grained sandstones and numerous coal seams.

c) the non coal-bearing Fernie marine shales which underlie the Kootenay formation.

Two complete stratigraphic columns were measured on Hosmer and Wheeler Ridge and are included for reference.

A prominent marker bed (the Basal Kootenay sandstone) forms the base of the coal measures and becomes gradational to a siltstone within the Fernie formation.

GEOLOGY AND EXPLORATION (CONT'D)

Exploration to Date

Ten coal seams were partially explored by the following:

a) dozers used to trench and trace out the outcrops

b) adits or test pits placed along the outcrops to obtain quality data

c) the use of a reverse circulation rotary drill to obtain bulk samples.

Quality data from bulk washability studies are plotted on the attached seam reserve sheets.

Future Exploration

During 1971, additional exploration should be completed to explore more fully the southwestern portion of Hosmer Ridge, with a view to the following:

a) tracing out and placing additional adits in the No. 3 seam.

b) work from the outcrop of No. 3 seam to locate and sample either by adits or trenches, the complete sequence of seams within the Kootenay formation

c) place several core holes as shown in the preliminary reserve sheets to obtain intercept thicknesses, quality data, and structural information.

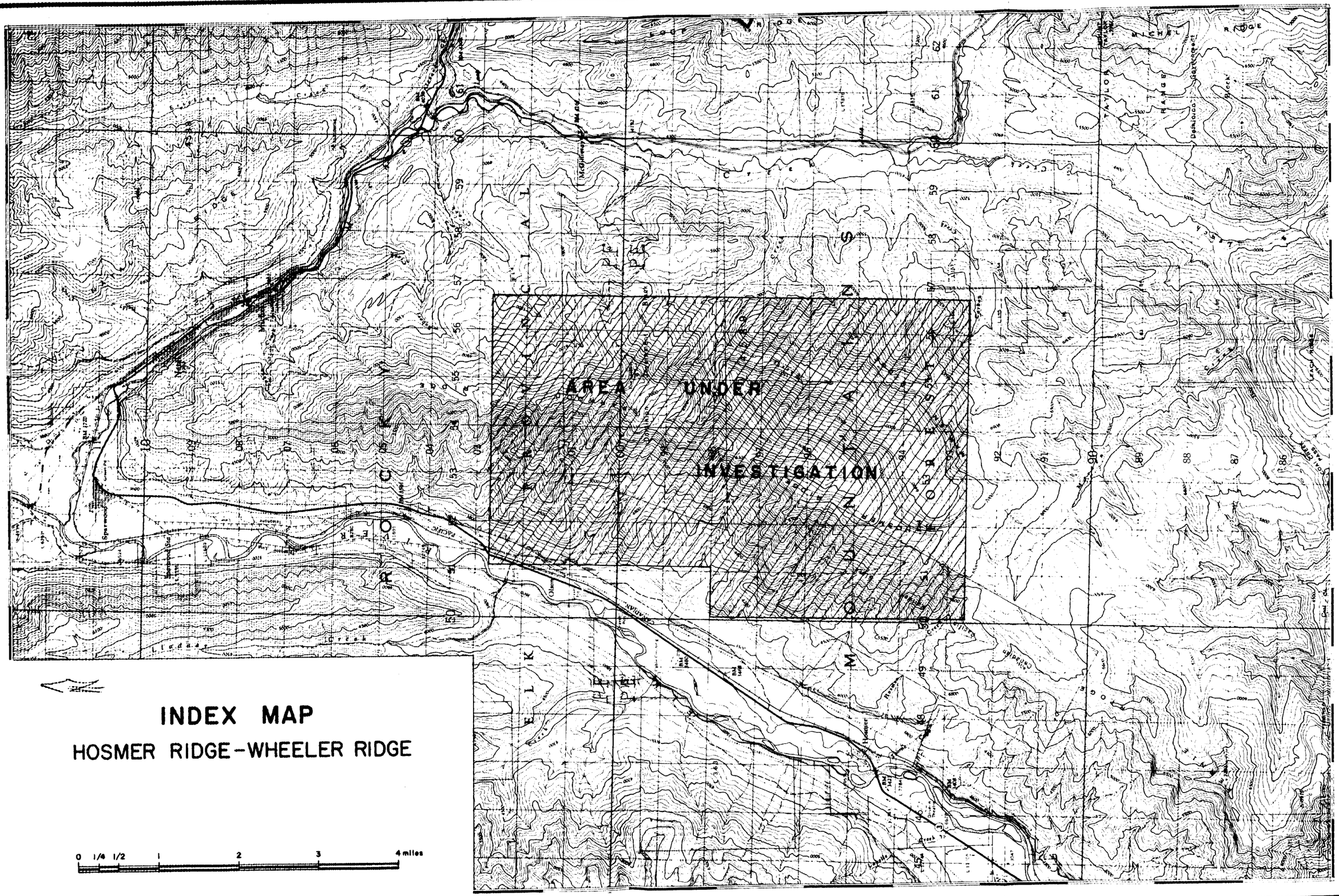
A future program might include the following:

5 to 6 core hole - 10,000 ft. @ $14.00/ft.	$140,000
2 D-8 bulldozers @ $1200/mo. ea. x 6 mo.	15,000
6 Adits @ $5,000 each	30,000
Sampling and Testing	15,000

GEOLOGY AND EXPLORATION (CONT'D)

Future Exploration (Cont'd)

Supervision, mapping	25,000
Contingency and miscellaneous	25,000
TOTAL	$250,000


AREA UNDER
INVESTIGATION
INDEX MAP
HOSMER RIDGE-WHEELER RIDGE
0 1/4 1/2 1 2 3 4 miles

ESTIMATED RESERVES DOMINION COVERNMENT BLOCK (PARCEL 73), HOSMER - WHEELER RIDGE AREA

AREA (SCALE)	SEAM NO.	ADIT REFERENCE	AVERAGE SEAM INTERCEPT	ACRES (TO 2500')	RESERVE IN PLACE 000's MT (ALL CATEGORIES) (0-2500' COVER)	RESERVE POTENTIAL a	b	a & b
Dominion Block								
North West Half	Composite coal thickness		164'		128,527,000			x
South West Half	10	4,12	30'	795 322 ha	43,113,000	1x		
	9	1,2,3,7,5,9 Test Pit 1	60'	650	72,995,000	2x		
	8 & 7	6,10, Test Pit 3	37'	112	7,938,000			x
	6	13	10'	41	875,000			x
	4	8, Test Pit 2	15'	18	589,000			x
Sub Total					253,947,000			
[redacted] Ridge Area 3170 Acres								
	1	16	5'	1,613	14,959,000		x	
	2	16,24	19'	1,897	66,890,000		x	
	3	11,14,20,26	35'	2,094	135,975,000		x	
	4	26	6'	2,191	26,800,000		x	
	5	17	7'	2,268	29,357,000		x	
	7 & 8	22,19	38'	2,313	163,085,000		x	
	9	23 Sample A (49)	19'	2,260	159,335,000		x	
		23 L9	19'					
	10	21 (21)	20'	2,171	80,557,000			
Sub Total					676,950,000			
Grand Total					930,905,000			

Reserve Potential Footnotes

a Strip mining

b Underground mining

c Both strip and underground

1x 9 seam probably strippable 5 yds. rock /Nt coal in place. See typical Section 23,000 Geologic Plan Map in Geological Drawings.

2x 10 seam ratio probably < 8:1

QUALITY CHARACTERISTICS CLEAN COAL ANALYSIS

SEAM NO.	ADIT NO.	SEAM THICK.	RAW ASH	FSI	YIELD @ S.G.	V.M.	F.C.	ASH	FSI	S	DOM	MOIST.	REMARKS
													Composite thickness of coal based on similar coal sequence measured on Sparwood Ridge No S-Z
													RESERVE AREA
10	4	23'	19.2	6 1/2	71.0 1.42	26.4	66.2	6.3	8	0.56	108	1.1	Reserve area requires 2 additional
10	4	9'	27.5	5 1/2	58.2 1.42	27.9	64.5	6.0	7 1/2	0.69	710	1.6	adits, adit 12 also to be completed.
09	1	30'	17.0	4	81.8 1.50	26.9	62.8	9.0	5	0.27	66	1.3	
N9	1	6'	26.5	3	55.0 1.45	27.4	61.6	9.0	5 1/2	0.39	310	2.0	Reserve area completely delineated,
L9	2	60'	17.4	4	71.7 1.45	27.8	61.4	9.2	5 1/2	0.33	51.5	1.6	additional drilling required.
8	6	33	13.0	3 1/2	88.2 1.50	26.8	63.5	8.5	3 1/2	0.33	0	1.2	Reserve area partially explored, Adit 6
7	10	14	25.2	2	59.1 1.42	29.1	60.9	8.2	6	0.59	20.9	1.8	to be deepened, also Adit 27 to be complet
6	13	8	15.7	2 1/2	79.4 1.44	28.4	61.4	8.6	5	0.47	7.5	1.6	
4	8	14	20.6	2 1/2	72.5 1.50	28.8	60.8	8.8	3 1/2	0.39	3.2	1.6	Reserve area complete, several shallow holes required.
													RESERVE AREA
1	16	5	23.3	1	85.0 1.70	32.1	56.9	8.5	1	0.48	1.0	2.5	Partially explored, 2 adits required, several core holes.
2	15	19	33.5	3	56.3 1.57	32.2	57.4	7.6	6 1/2		189	2.8	Partially explored, 2 adits to be complete
3	14	27.2	8.4	7 1/2	91.9 1.50	32.4	57.3	3.8	7 1/2	0.44	390	1.9	Outcrop traced in detail, excellent quality coal, 2 new adits required. Additional investigation to south of Hosmer Ridge could increase reserve potential.
4	25	13.2	23.4	2 1/2	72.4 1.50	28.7	61.0	8.4	5 1/2	0.45	5.0	1.9	On Wheeler Ridge coal only 6' thick, 2 additional adits required.
5	17	23	22.0	1 1/2	66.5 1.45	27.6	63.5	7.2	2 1/2	0.37	0.8	1.7	Outcrop partially explored on Wheeler Ridge, 2 new adits required.
7	22	14.4	31.8	2 1/2	46.4 1.46	28.6	59.7	10.2	5	0.42	891	1.5	More outcrop tracing required, 1 addi-
8	19	24	14.5	2	81.1 1.48	27.0	63.3	8.5	3	0.40	10	1.2	tional adit on Wheeler Ridge. Adit 27 to be completed on Hosmer Ridge.
09	23	21.7	23.6	4 1/2	57.4 1.52	29.5	59.3	10.2	6 1/2	0.44	244	1.0	Out crop data complete on Wheeler Ridge,
L9	23	19.4	18.7	5 1/2	81.1 1.60	29.2	60.6	8.4	6	0.41	30	1.8	more exposure and adits required on west side of Hosmer Ridge.
10	21	16.5	15.8	2 1/2	68.7 1.42	29.4	62.4	7.0	7	0.32	45	1.2	Same as above for 9 seam.

WASHABILITY OF DOMINION GOV'T BLOCK

Parcel 73
9-seam
Upper

ADIT # 1
SAMPLE B 30' THICK
X CUT @ 240 FT. (HOSMER AREA)

DATE: Nov. 19/69

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.2	27.2	17.0	54.6	#4

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2" + 1/2"	13.5		
-1/2" + 1/4"	13.5	19.0	14.6
-1/4" + 28M	50.0		
-28M + 0	23.0	12.1	2.8
	100.0		17.4

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
Float 1.30	17.9	2.6	17.9	2.6	100.0	19.1	
1.30 - 1.35	25.2	6.2	43.1	4.7	82.1	22.7	
1.35 - 1.40	20.0	9.6	63.1	6.3	56.9	30.0	68.5 @ 1.40
1.40 - 1.45	9.0	17.0	72.1	7.6	36.9	41.1	
1.45 - 1.50	5.6	18.4	77.7	8.4	27.9	48.8	22.2 @ 1.50
1.50 - 1.55	2.9	28.7	80.6	9.1	22.3	56.5	
1.55 - 1.60	1.9	36.3	82.5	9.7	19.4	60.6	8.9 @ 1.60
1.60 - 1.70)							
1.70 - 1.80)	4.6	37.1	87.1	11.2	17.5	63.3	
Sink 1.80	12.5	72.6	100.0	19.1	12.9	72.6	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
Float @	1.50	86.0	6.3	5.4
Sink @	1.50	14.0	48.2	6.7
				12.2

Calculated Yield of -2" + 0 Product:
Yield 81.8 @ 1.50 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.3	26.9	9.0	62.8	#5	66	0.27

WASHABILITY OF DOMINION GOVERNMENT
BLOCK SEAM SPARWOOD RIDGE
SAMPLE 'C' - 6 FT. THICK
ADIT #1 X-CUT @ 240 FT.

Parcel 73
9-seam
middle

DATE:

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.6	23.8	26.5	48.1	#3

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2" x 1/2"	13.9)		
-1/2" + 1/4"	15.9)	28.2	24.2
-1/4" + 28M	56.3)		
-28M + 0	13.9	19.6	2.7
			26.9

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	9.4	2.8	9.4	2.8	100.0	28.2	
1.30-1.35	16.7	6.7	26.1	5.3	90.6	30.9	
1.35-1.40	11.4	10.2	37.5	6.8	73.9	36.4	69.6% @ 1.40
1.40-1.45	14.0	14.2	51.5	8.8	62.5	41.2	
1.45-1.50	10.4	16.2	61.9	10.0	48.5	49.0	42.0% @ 1.50
1.50-1.55	2.9	25.9	64.8	10.7	38.1	57.9	
1.55-1.60	4.4	28.2	69.2	11.8	35.2	60.5	16.2% @ 1.60
1.60-1.70	4.9	36.9	74.1	13.5	30.8	65.2	
1.70-1.80	1.1	41.8	75.2	13.9	25.9	70.5	
SINK 1.80	24.8	71.8	100.0	28.2	24.8	71.8	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT @	1.50	77.3	7.8	6.0
SINK @	1.50	22.7	59.8	13.6
				19.6

CALCULATED YIELD OF -2" + 0 Product:
Yield 55.0 @ 1.45 S.B.

COAL ANALYSIS: (RAW COAL FLOATED @1.45) Sp. Gr.

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
2.0	27.4	9.0	61.6	# 5 1/2	310	0.39

P. 73
9 seam lower

WASHABILITY OF #9 SEAM (LOWER)
HOSMER MOUNTAIN
ADIT #2 X-CUT @ 150' SEAM THICKNESS 60' DATE:

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
0.9	26.5	17.4	55.2	#4

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2" + 7/8"	13.8)		
-7/8" + 3/8"	17.8)	18.8	15.2
-3/8" + 28M	52.5)		
-28M + 0	15.9	13.4	2.2
			17.4

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	14.0	2.3	14.0	2.3	100.0	18.8	
1.30-1.35	21.7	5.8	35.7	4.4	86.0	21.5	
1.35-1.40	21.0	9.5	56.7	6.3	64.3	26.8	70.0% @ 1.40
1.40-1.45	13.9	14.7	70.6	8.0	43.3	35.2	
1.45-1.50	5.7	21.0	76.2	8.9	29.4	44.8	29.4% @ 1.50
1.50-1.55	4.3	27.2	80.5	9.9	23.8	50.5	
1.55-1.60	2.3	28.0	82.8	10.4	19.5	55.7	11.8% @ 1.60
1.60-1.70	3.9	36.3	86.7	11.6	17.2	59.3	
1.70-1.80	2.0	42.9	88.7	12.3	13.3	66.1	
SINK 1.80	11.3	70.2	100.0	18.8	11.3	70.2	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT	@ 1.50	76.6	6.5	5.0
SINK	@ 1.50	23.4	36.1	8.4
				13.4

YIELD 71.7 @ 1.45 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @1.45)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.6	27.8	9.2	61.4	#5 1/2	51.5	0.33

WASHABILITY OF #9 SEAM
HOSMER MOUNTAIN

P. 73
9-seam
upper

ADIT #3 X-CUT @ 85' SEAM THICKNESS 30'
#9 SEAM

RAW COAL:

PROX. ANALYSIS -	MOIST.%	V.M.%	ASH %	F.C.%	F.S.I.
	2.2	24.5	13.8	59.5	#5

SCREEN ANALYSIS-	WT. %	ASH %	CALCULATED ASH
-2" + 7/8"	20.8		
-7/8" + 3/8"	16.8	15.0	12.8
-3/8" + 28M	45.5		
-28M + 0	16.9	11.8	2.0
			14.8

WASHABILITY OF -2" + 28M FRACTION:

SP. GR.	WT.%	ASH %	CUM WT.% FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	16.5	2.6	16.5	2.6	100.0	15.0	
1.30-1.35	23.8	5.4	40.3	4.3	83.5	17.5	
1.35-1.40	28.5	8.1	68.8	5.8	59.7	22.3	71.6% @ 1.4
1.40-1.45	8.4	13.8	77.2	6.7	31.2	35.2	
1.45-1.50	5.0	18.2	82.2	7.4	22.8	43.1	20.6% @ 1.5
1.50-1.55	4.1	23.0	86.3	8.1	17.8	50.1	
1.55-1.60	1.5	29.4	87.8	8.5	13.7	58.2	9.0% @ 1.6
1.60-1.70	2.7	33.7	90.5	9.2	12.2	61.7	
1.70-1.80	1.1	43.2	91.6	9.7	9.5	69.5	
SINK 1.80	8.4	73.1	100.0	15.0	8.4	73.1	

WASHABILITY OF -28M + 0 FRACTION:

	WT. %	ASH %	CALCULATED ASH
FLOAT @ 1.50	67.0	4.9	3.3
SINK @ 1.50	33.0	25.6	8.5
			11.8

CALCULATED YIELD OF -2" + 0 PRODUCT:

YIELD 63.0 @ 1.55 S.G.

CLEAN COAL ANALYSIS : (RAW COAL FLOATED @ 1.55)

MOIST.%	V.M.%	ASH %	F.C.%	F.S.I.	D.D.M.	SULPHUR
1.2	25.5	7.2	66.1	#5	45.5	0.30

ADIT #4 X-CUT @ 170' SEAM THICKNESS 23'
SAMPLE E

Parcel 73
10 - seam
Upper

RAW COAL:

PROX. ANALYSIS -	MOIST. %	V.M.%	ASH %	F.C. %	F.S.I.
	1.4	24.2	19.2	54.9	#6½

SCREEN ANALYSIS-	WT. %	ASH %	CALCULATED ASH
-2" + 7/8"	8.0)		
-7/8" + 3/8"	13.5)	19.5	15.3
-3/8" + 28M	57.0)		
-28M + 0	21.5	14.3	3.1
			18.4

WASHABILITY OF -2" + 28M FRACTION:

SP. GR.	WT.%	ASH %	CUM WT.% FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	10.1	4.2	10.1	4.2	100.0	19.5	
1.30-1.35	19.9	6.3	30.0	5.6	89.9	21.2	
1.35-1.40	19.5	9.9	49.5	7.3	70.0	25.5	73.5 @ 1.40
1.40-1.45	18.3	14.0	67.8	9.1	50.5	31.5	
1.45-1.50	7.5	20.6	75.3	10.2	32.2	41.5	39.1 @ 1.50
1.50-1.55	5.5	25.5	80.8	11.3	24.7	47.8	
1.55-1.60	3.4	31.3	84.2	12.1	19.2	54.1	13.5 @ 1.60
1.60-1.70	3.1	37.4	87.3	13.0	15.8	59.1	
1.70-1.80	1.4	44.7	88.7	13.5	12.7	64.4	
SINK 1.80	11.3	66.8	100.0	19.5	11.3	66.8	

WASHABILITY OF -28M + 0 FRACTION:

	WT. %	ASH %	CALCULATED ASH
FLOAT @ 1.50	82.8	8.1	6.7
SINK @ 1.50	17.2	44.1	7.6
			14.3

CALCULATED YIELD OF -2" + 0 PRODUCT:

YIELD 71:0 @ 1.42 S.G.

CLEAN COAL ANALYSIS : (RAW COAL FLOATED @ 1.42)

MOIST.%	V.M.%	ASH %	F.C.%	F.S.I.	D.D.M.	SULPHUR
1.1	26.4	6.3	66.2	#8	108	0.56

Parcel 73
10 lower seam

WASHABILITY OF #10 SEAM
HOSMER MOUNTAIN
ADIT #4 X-CUT @ 170' SEAM THICKNESS 9'
SAMPLE F

DATE:

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.6	21.8	27.5	49.1	# 5 1/2

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2" + 7/8"	7.0)		
-7/8" + 3/8"	10.8)	28.7	21.3
-3/8" + 28M	56.6)		
-28M + 0	25.6	21.3	5.5
			26.8

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	5.2	2.5	5.2	2.5	100.0	28.7	
1.30-1.35	12.9	4.8	18.1	4.1	94.8	30.2	
1.35-1.40	14.2	10.5	32.3	6.9	81.9	34.2	75.1 @ 1.40
1.40-1.45	23.1	14.6	55.5	10.1	67.7	39.2	
1.45-1.50	7.3	19.8	62.8	11.3	44.5	51.9	50.6 @ 1.50
1.50-1.55	4.9	23.7	67.6	12.1	37.2	58.2	
1.55-1.60	3.4	26.0	71.1	12.8	32.4	63.4	14.5 @ 1.60
1.60-1.70	2.9	34.2	73.9	13.7	28.9	67.9	
1.70-1.80	2.8	44.7	76.7	14.8	26.1	71.6	
SINK 1.80	23.3	74.8	100.0	28.7	23.3	74.8	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT	@ 1.50	66.0	8.6	5.7
SINK	@ 1.50	34.0	46.0	15.6
				21.3

CALCULATED YIELD OF -2" + 0 PRODUCT:

YIELD 58.2 @ 1.42 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @ 1.42)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.6	27.9	6.0	64.5	# 7 1/2	710	0.69

Parcel 73

WASHABILITY OF LOWER #9 SEAM
HOSMER MOUNTAIN
ADIT #5 LOWER BENCH X-CUT @ 150'
SEAM THICKNESS - 47'

DATE: May 6, 1970

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.1	24.7	24.5	49.7	# 3 1/2

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2 + 7/8"	7.8		
-7/8" + 3/8"	10.1	24.7	18.4
-3/8" + 28M	56.7		
28M + 0	25.4	20.7	5.4
	100.0		23.8

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	20.9	3.4	20.9	3.4	100	24.7	
1.30-1.35	16.1	5.9	37.0	4.5	79.1	30.3	
1.35-1.40	14.7	7.6	51.6	5.4	63.0	36.5	64.0% @ 1.40
1.40-1.45	14.3	12.9	65.9	7.0	48.4	45.2	
1.45-1.50	4.1	18.8	70.0	7.7	34.1	58.8	28.8% @ 1.50
1.50-1.55	2.4	23.5	72.3	8.2	30.0	64.2	
1.55-1.60	1.4	27.3	73.7	8.6	27.7	67.6	6.6% @ 1.60
1.60-1.70	1.4	35.8	75.1	9.1	26.3	69.7	
1.70-1.80	1.7	43.9	76.8	9.8	24.9	71.7	
SINK 1.80	23.2	73.7	100.0	24.7	23.2	73.7	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT	@ 1.50	64.5	8.3	5.4
SINK	@ 1.50	35.5	43.1	15.3
		100.0		20.7

CALCULATED YIELD OF -2" + 0 PRODUCT:

YIELD 71.4 @ 1.6 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @ 1.60)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.6	28.0	11.9	58.5	#5	0.7	

Parcel 73

WASHABILITY OF LOWER #9 SEAM
HOSMER MOUNTAIN
ADIT #5 UPPER BENCH X-CUT @ 150'
SEAM THICKNESS - 41'

DATE: MAY 4, 1970

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.0	26.5	16.0	56.5	#4 1/2

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2" + 7/8"	12.9		
-7/8" + 3/8"	20.5	16.0	13.4
-3/8" + 28M	50.4		
28M + 0	16.2	14.2	2.3
	100.0		15.7

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	3.1	2.8	3.1	2.8	100.0	16.0	
1.30-1.35	12.9	6.5	15.9	5.8	96.9	16.4	
1.35-1.40	38.4	10.7	54.3	9.3	94.1	17.9	80.0% @ 1.40
1.40-1.45	16.0	13.6	70.4	10.7	45.7	24.0	
1.45-1.50	10.1	19.3	80.5	11.8	29.6	28.5	38.6% @ 1.50
1.50-1.55	7.4	23.0	87.9	12.7	19.5	33.3	
1.55-1.60	3.7	27.8	91.7	13.3	12.1	39.7	15.7% @ 1.60
1.60-1.70	4.1	33.0	95.7	14.2	8.3	45.0	
1.70-1.80	1.3	36.4	97.0	14.5	4.3	56.4	
SINK 1.80	3.0	65.2	100.0	16.0	3.0	65.2	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT	@ 1.50	80.0	8.0	6.4
SINK	@ 1.50	20.0	39.1	7.8
		100.0		14.2

YIELD 58.4 @ 1.40 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.4	28.8	8.2	61.6	#6	50.7	

Parcel 73

WASHABILITY OF #8 SEAM
HOSMER MOUNTAIN
ADIT #6 UPPER SEAM X-CUT @ 230' SEAM THICKNESS 33' DATE: MAY 7, 1970

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.4	25.7	13.0	59.9	#3 1/2

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2" + 7/8"	22.8		
-7/8" + 3/8"	18.2	12.6	10.8
-3/8" + 28M	44.8		
-28M + 0	14.2	8.7	1.3
			12.1

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	8.8	4.4	8.8	4.4	100.0	12.6	
1.30-1.35	25.5	6.8	34.3	6.2	91.2	13.4	
1.35-1.40	19.4	7.2	53.7	6.6	65.7	16.0	79.8% @ 1.40
1.40-1.45	23.7	11.0	77.4	7.9	46.3	19.7	
1.45-1.50	8.5	17.2	86.0	8.8	22.6	28.8	42.4% @ 1.50
1.50-1.55	7.4	21.0	93.3	9.8	14.0	35.9	
1.55-1.60	1.5	31.0	94.8	10.1	6.7	52.3	10.5% @ 1.60
1.60-1.70	1.4	33.6	96.2	10.5	5.2	58.3	
1.70-1.80	0.6	43.6	96.8	10.7	3.9	67.0	
SINK 1.80	3.2	71.7	100.0	12.6	3.2	71.7	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT	@ 1.50	89.2	4.5	4.0
SINK	@ 1.50	10.8	43.9	4.7
				8.7

YIELD 88.2 @ 1.50 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.2	26.8	8.5	63.5	#3 1/2	0	

HOSMER SAMPLE "A"

L9 SEAM, SEAM THICKNESS 35 Ft.

Adit 7

Hosmer Parcel 73

RAW COAL:

PROX. ANALYSIS -	MOIST.%	V.M.%	ASH %	F.C.%	F.S.I.
	1.6	24.3	22.4	52.3	#6

SCREEN ANALYSIS -	WT. %	ASH %	CALCULATED ASH
-2" + 7/8"	13.2)		
-7/8 + 3/8"	17.9)	24.8	20.8
-3/8" + 28M	52.8)		
28M + 0	16.1	13.2	2.1
			22.9

WASHABILITY OF -2" + 28M FRACTION:

SP. GR.	WT. %	ASH %	CUM. WT.% FLOAT	CUM. ASH % FLOAT	CUM. WT.% SINK	CUM. ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	16.5	2.9	16.5	2.9	100.0	24.8	
1.30-1.35	11.8	6.6	28.3	4.4	83.5	29.1	
1.35-1.40	18.8	10.0	47.0	6.7	71.7	32.8	59.4% @ 1.4
1.40-1.45	13.4	16.2	60.4	8.8	53.0	40.9	
1.45-1.50	5.1	19.1	65.5	9.6	39.6	49.2	32.4% @ 1.5
1.50-1.55	4.7	25.8	70.3	10.7	34.5	53.7	
1.55-1.60	3.5	31.2	73.7	11.6	29.7	58.1	16.5% @ 1.6
1.60-1.70	5.3	38.2	79.1	13.4	26.3	61.7	
1.70-1.80	3.4	49.6	82.5	14.9	20.9	67.7	
SINK 1.80	17.5	71.2	100.0	24.8	17.5	71.2	

WASHABILITY OF -28M + 0 FRACTION:

	WT.%	ASH %	CALCULATED ASH
FLOAT @ 1.50	82.2	5.8	4.8
SINK @ 1.50	17.8	47.2	8.4
			13.2

CALCULATED YIELD OF _2" + 0 PRODUCT:

YIELD 63.7 @ 1.45 S.G.

CLEAN COAL ANALYSIS : (RAW COAL FLOATED @ 1.44)

MOIST. %	V.M.%	ASH %	F.C.%	F.S.I.	D.D.M.	SULPHUR %
1.1	27.1	7.7	64.1	#6	391.1	0.39

WASHABILITY OF ADIT # 8 - ROCHER
X-CUT @ 150 FT.
NO. 4 SEAM
SEAM THICKNESS 14 FT.

Parcel 73 Adit #8

RAW COAL:

PROX. ANALYSIS -	MOIST. %	V.M.%	ASH %	F.C.%	F.S.I.
	2.7	26.0	20.6	50.7	#2½

SCREEN ANALYSIS -	WT.%	ASH %	CALCULATED ASH
-2" + 7/8"	16.6		
-7/8" + 3/8"	16.1	22.0	18.3
-3/8" + 28M	50.7		
28M + 0	16.6	20.2	3.3
	100.0		21.6

WASHABILITY OF -2" + 28M FRACTION:

SP. GR.	WT. %	ASH%	CUM. WT.% FLOAT	CUM. ASH % FLOAT	CUM. WT. % SINK	CUM. ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	6.4	2.6	6.4	2.6	100.0	22.0	
1.30-1.35	34.1	5.9	40.5	5.4	93.6	23.3	
1.35-1.40	16.1	10.5	56.6	6.8	59.5	33.2	79.3% @ 1.4
1.40-1.45	12.0	14.4	68.6	8.2	43.4	41.7	
1.45-1.50	4.4	19.5	73.0	8.8	31.4	52.2	25.8% @ 1.5
1.50-1.55	3.2	25.6	76.2	9.5	27.0	57.4	
1.55-1.60	2.1	30.1	78.3	10.1	23.8	61.7	10.4% @ 1.6
1.60-1.70	3.4	39.8	81.7	11.4	21.7	64.8	
1.70-1.80	2.3	47.3	84.0	12.3	18.2	69.6	
SINK 1.80	16.0	72.7	100.0	22.0	16.0	72.7	

WASHABILITY OF -28M + 0 FRACTION:

	WT.%	ASH%	CALCULATED ASH
FLOAT @ 1.50	71.9	9.7	7.0
SINK @ 1.50	28.1	47.2	13.2
			20.2

CALCULATED YIELD OF -2" + 0 PRODUCT:

YIELD 72.5 @ 1.50 S.G.

CLEAN COAL ANALYSIS: (RAW COAL FLOATED @ 1.49)

MOIST. %	V.M.%	ASH%	F.C.%	F.S.I.	D.D.M.	SULPHUR
1.6	28.8	8.8	60.8	#3½	3.2	0.39

Parcel 73

WASHABILITY OF UPPER #9 SEAM
HOSMER MOUNTAIN
ADIT #9 X-CUT 100' SEAM THICKNESS 17'

DATE: APRIL 30, 1970

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.1	26.1	17.8	55.0	#4

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2" + 7/8"	10.5		
-7/8" + 3/8"	14.7	16.4	13.3
-3/8" + 28M	55.8		
28 M + 0	19.0	16.1	3.6
			16.9

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	20.8	2.9	20.8	2.9	100.0	16.4	
1.30-1.35	23.7	6.1	44.6	4.6	79.2	19.9	
1.35-1.40	19.5	9.1	64.1	6.0	55.4	25.8	67.0% @ 1.40
1.40-1.45	12.0	15.0	76.1	7.4	35.9	34.9	
1.45-1.50	5.1	19.2	81.2	8.1	23.9	44.9	24.8% @ 1.50
1.50-1.55	3.1	23.5	84.3	8.7	18.8	51.9	
1.55-1.60	2.2	29.8	86.5	9.2	15.7	57.5	7.6% @ 1.60
1.60-1.70	2.6	35.6	89.1	10.0	13.5	62.1	
1.70-1.80	1.1	45.5	90.1	10.4	10.9	68.3	
SINK 1.80	9.9	70.7	100.0	16.4	9.9	70.7	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT	@ 1.50	64.3	5.6	3.6
SINK	@ 1.50	35.7	34.8	12.5
				16.1

YIELD 82.2 @ 1.60 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.2	28.6	9.2	61.0	#5 1/2	51.5	

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WASHABILITY OF #7 SEAM
HOSMER MOUNTAIN
ADIT #10 X-CUT @ 150', SEAM THICKNESS 14'

DATE: _____

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.6	25.1	25.2	48.1	#2

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2" + 7/8"	9.0		
-7/8" + 3/8"	13.0	27.8	20.3
-3/8" + 28M	51.0		
28M + 0	27.0	17.9	4.8
			25.1

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	11.5	3.6	11.5	3.6	100.0	27.8	
1.30-1.35	17.0	5.8	28.5	4.9	88.5	30.9	
1.35-1.40	13.6	10.5	42.1	6.7	71.5	36.9	62.9% @1.40
1.40-1.45	12.9	16.9	55.0	9.1	57.9	43.1	
1.45-1.50	5.6	19.7	60.6	10.1	45.0	50.7	32.8% @1.50
1.50-1.55	4.1	23.3	64.7	10.9	39.4	55.0	
1.55-1.60	3.0	29.7	67.7	11.8	35.3	58.7	16.4% @1.60
1.60-1.70	5.7	36.9	73.4	13.7	32.3	61.4	
1.70-1.80	4.8	44.2	78.2	15.6	26.6	66.7	
SINK 1.80	21.8	71.7	100.0	27.8	21.8	71.7	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT	@ 1.50	70.4	6.1	4.3
SINK	@ 1.50	29.6	46.0	13.6
				17.9

CALCULATED YIELD OF -2" + 0 PRODUCT:

YIELD 59.1 @ 1.42 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @ 1.42)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.8	29.1	8.2	60.9	#6		

WASHABILITY OF #3 SEAM
HOSMER MOUNTAIN
ADIT 11 X-CUT 150' SEAM THICKNESS 20'2 FT.

DATE: September 18, 1970

Hosmer
Wheeler

RAW COAL:

PROX. ANALYSIS -	MOIST. %	V.M.%	ASH %	F.C.	F.S.I.
	2.0	31.3	7.0	59.7	7½

SCREEN ANALYSIS -	WT.	WT. %	ASH %	CALCULATED ASH
2" + 7/8"	25 lbs	20.5		
7/8" + 3/8"	28 1/4	23.2	6.5	5.8
3/8 + 28M	55 3/4	45.7		
28M + 0	13	10.6	9.3	1.0
				6.8

WASHABILITY OF - 2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM. WT. % FLOAT	CUM. ASH % FLOAT	CUM. WT. % SINK	CUM. ASH % SINK	DIFFICULT CURVE
Flt. 1.30	68.2	2.7	68.2	2.7	100.0	6.5	
1.30 - 1.35	16.1	6.5	84.3	3.4	31.8	14.6	
1.35 - 1.40	6.8	11.3	91.1	4.0	15.7	22.8	28.4% @ 1
1.40 - 1.45	3.5	15.7	94.6	4.4	8.9	31.6	
1.45 - 1.50	1.5	21.1	96.1	4.7	5.4	41.9	6.3% @ 1
1.50 - 1.55	0.7	26.0	96.8	4.9	3.9	49.9	
1.55 - 1.60	0.5	30.5	97.3	5.0	3.2	55.2	1.8% @ 1
1.60 - 1.70	0.6	35.7	97.9	5.2	2.7	59.8	
1.70 - 1.80	0.4	43.8	98.3	5.3	2.1	66.6	
SK 1.80	1.7	72.0	100.0	6.5	1.7	72.0	

WASHABILITY OF - 28 M + 0 FRACTION:

	WT.	WT. %	ASH %	CALCULATED ASH
Float @ 1.50	843	87.0	3.9	3.4
Sink @ 1.50	126	13.0	45.3	5.9
				9.3

CALCULATED YIELD OF - 2" + 0 PRODUCT:

YIELD 95.1 @1.50 S.G.

COAL ANALYSIS: (RAW COAL)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
2.0	31.3	7.0	59.7	7 1/2	72.5	0.38

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WASHABILITY OF #5 SEAM
HOSMER MOUNTAIN
ADIT #13 X-CUT @ 150', SEAM THICKNESS 8'

DATE: _____

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.0	26.7	15.7	56.6	#2.5

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2" + 7/8"	8.8		
-7/8" + 3/8"	12.8	14.9	11.5
-3/8" + 28M	55.7		
28M + 0	22.7	15.9	3.6
			15.1

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	15.5	2.8	15.5	2.8	100.0	14.9	
1.30-1.35	20.3	5.7	35.8	4.4	84.5	17.2	
1.35-1.40	23.5	9.3	59.3	6.4	64.2	20.8	76.6% @1.40
1.40-1.45	21.1	15.5	80.4	8.8	40.7	27.4	
1.45-1.50	7.2	20.7	87.6	9.7	19.6	40.2	33.6% @1.50
1.50-1.55	2.5	24.6	90.1	10.2	12.4	51.5	
1.55-1.60	0.8	27.3	90.9	10.3	9.9	58.4	5.9% @1.60
1.60-1.70	2.3	32.6	93.2	10.9	9.1	61.0	
1.70-1.80	1.0	43.2	94.2	11.2	6.8	70.8	
SINK 1.80	5.8	75.7	100.0	14.9	5.8	75.7	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT	@ 1.50	76.4	10.0	7.6
SINK	@ 1.50	23.6	35.1	8.3
				15.9

CALCULATED YIELD OF -2" + 0 PRODUCT:

YIELD 79.4 @ 1.44 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @ 1.44)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.6	28.4	8.6	61.4	#5		

WASHABILITY OF 3 SEAM
ADIT # 14 HOSHER RIDGE
SEAM THICKNESS 27.2'
X-CUT @ 90 FT.

DATE: Sept. 14, 1970

Hosmer-Wheeler

RAW COAL:

PROX. ANALYSIS - MOIST. % V.M.% ASH % F.C. F.S.I.

SCREEN ANALYSIS -	WT.	WT. %	ASH %	CALCULATED ASH
2" + 7/8"	12	10.5		
7/8" + 3/8"	15	13.2	8.0	6.3
3/8" + 28 M	63	55.3		
28 M + 0	24	21.0	10.6	2.2
				8.5

WASHABILITY OF - 2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM. WT. % FLOAT	CUM. ASH % FLOAT	CUM. WT. % SINK	CUM. ASH % SINK	DIFFICULT CURVE
Flt. 1.30	53.0	2.5	53.0	2.5	100.0	8.0	
1.30 - 1.35	30.0	4.7	83.0	3.3	47.0	14.2	
1.35 - 1.40	6.8	9.2	89.8	3.7	17.0	30.9	12.6891.40
1.40 - 1.45	2.6	14.9	92.4	4.1	10.2	45.4	
1.45 - 1.50	1.3	19.3	93.7	4.3	7.6	55.8	5.1891.50
1.50 - 1.55	0.7	25.3	94.4	4.4	6.3	53.3	
1.55 - 1.60	0.3	30.3	94.7	4.5	5.6	68.0	1.6891.60
1.60 - 1.70	0.5	37.8	95.2	4.7	5.3	70.2	
1.70 - 1.80	0.4	47.7	95.6	4.9	4.8	73.6	
SK. 180	4.4	75.9	100.0	8.0	4.4	75.9	

WASHABILITY OF - 28 M + 0 FRACTION:

	WT.	WT. %	ASH %	CALCULATED ASH
Float @ 1.50	809	85.1	3.3	2.8
Sink @ 1.50	142	14.9	52.2	7.8
				10.6

CALCULATED YIELD OF - 2" + 0 PRODUCT:

YIELD 91.9 @ 1.50 S.G.

COAL ANALYSIS: (RAW COAL)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.9	32.4	8.4	57.3	# 7 1/2	390.0	0.44

Hosmer Wheeler

WASHABILITY OF 1 SEAM
WHEELER RIDGE
ADIT #16
X-CUT @ 135 FT. SEAM THICKNESS 5 FT.

DATE: September 21, 1970

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
2.2	27.0	23.3	47.5	#1

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
2" + 7/8"	21.9		
7/8" + 3/8"	21.7	24.6	20.9
3/8" + 28M	41.3		
28M + 0	15.1	17.0	2.6

23.5

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	6.7	3.6	6.7	3.6	100.0	24.6	
1.30-1.35	17.4	4.9	24.1	4.5	93.3	26.2	
1.35-1.40	23.8	8.0	47.9	6.3	75.9	31.0	71.2% @ 1.40
1.40-1.45	13.5	13.3	61.4	7.8	52.1	41.5	
1.45-1.50	4.5	20.7	65.9	8.7	38.6	51.4	25.9% @ 1.50
1.50-1.55	1.9	29.9	67.8	9.3	34.1	55.5	
1.55-1.60	1.6	33.4	69.4	9.8	32.2	57.0	66.0% @ 1.60
1.60-1.70	2.0	40.2	71.4	10.7	30.6	58.2	
1.70-1.80	11.7	49.5	83.1	16.2	28.6	59.5	
SINK 1.80	16.9	66.4	100.0	24.6	16.9	66.4	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT @	1.50	70.8	6.4	
SINK @	1.50	29.2	42.6	17.0

YIELD 85.0 @ 1.70 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
2.5	32.1	8.5	56.9	#1	1.0	0.48

Hosmer Wheeler

WASHABILITY OF #2 SEAM

HOSMER RIDGE
ADIT #15 X-CUT @90' SEAM THICKNESS 19'

DATE: _____

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
2.6%	24.0	33.5	39.9	# 3

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2" + 7/8"	9.2		
-7/8" + 3/8"	13.4	36.5	24.8
-3/8" + 28M	45.4		
28M + 0	32.0	24.0	7.7
			32.5

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	23.4	2.8	23.4	2.8	100.0	36.5	
1.30-1.35	14.0	8.0	37.4	4.7	76.6	46.8	
1.35-1.40	7.7	12.5	45.1	6.1	62.7	55.4	45.0% @1.40
1.40-1.45	3.1	16.2	48.2	6.7	55.0	61.4	
1.45-1.50	2.4	20.7	50.6	7.4	51.9	64.1	18.2% @1.50
1.50-1.55	1.3	27.1	51.9	7.9	49.5	66.2	
1.55-1.60	4.2	29.6	56.1	9.5	48.1	67.3	7.3% @1.60
1.60-1.70	2.4	39.0	58.5	10.8	43.9	70.9	
1.70-1.80	2.0	48.7	60.5	12.0	41.5	72.8	
SINK 1.80	39.5	74.0	100.0	36.5	39.5	74.0	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT	@ 1.50	65.6	4.9	3.2
SINK	@ 1.50	34.4	60.6	20.8
				24.0

CALCULATED YIELD OF -2" + 0 PRODUCT:

YIELD 56.3 @ 1.57 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @1.57)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
2.8	32.2	7.6	57.4	#6 1/2	189.0	

WASHABILITY OF #5 SEAM
WHEELER RIDGE
ADIT #17
X-CUT @160' SEAM THICK 23 FT.

Mosmer Wheeler

DATE: September 1970

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.7	24.8	22.0	51.5	#1 1/2

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
2" + 7/8"	16.7		
7/8" + 3/8"	24.5	21.6	18.9
3/8" + 28M	46.5		
28M + 0	12.3	13.0	1.6
			20.5

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	17.6	3.1	17.6	3.1	100.0	21.6	
1.30-1.35	24.0	5.8	41.6	4.7	82.4	25.6	
1.35-1.40	14.5	10.4	56.1	6.1	58.4	33.7	65.4% @1.40
1.40-1.45	8.7	15.2	64.8	7.4	43.9	41.5	
1.45-1.50	7.9	19.0	72.7	8.6	35.2	48.0	28.1% @1.50
1.50-1.55	4.5	24.7	77.2	9.6	27.3	56.3	
1.55-1.60	2.6	29.6	79.8	10.2	22.8	62.0	11.5% @1.60
1.60-1.70	2.6	35.1	82.4	11.0	20.2	66.8	
1.70-1.80	1.9	40.1	84.3	11.7	17.6	71.5	
SINK 180	15.7	75.3	100.0	21.6	15.7	75.3	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT	@ 1.50	79.0	5.7	4.5
SINK	@ 1.50	21.0	40.4	8.5
		100.0		13.0

CALCULATED YIELD OF -2" + 0 PRODUCT:

YIELD 66.5 @ 1.45 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @ 1.45)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.7	27.6	7.2	63.5	#2 1/2	0.8	0.37

WASHABILITY OF #8 SEAM

DATE: October 1, 1970

Adit # 19

Hosmer

Sample A SEAM THICKNESS 24 FT.

CROSSCUT @ 140 FT.

Hosmer Wheeler

RAW COAL:

PROX. ANALYSIS -	MOIST. %	V.M.%	ASH %	F.C.	F.S.I.
	1.4	26.0	14.5	58.1	# 2

SCREEN ANALYSIS -	WT.	WT. %	ASH %	CALCULATED ASH
-2" + 1/8"	23	2312		
-1/8" + 3/8"	19	19.2	14.5	12.6
-3/8" + 28M	44	44.4		
28M + 0	13	13.2	11.9	1.6
				4.2

WASHABILITY OF - 2" + 28 M FRACTION:

SP. GR.	WT. %	WT. %	ASH %	CUM. WT. % FLOAT	CUM. ASH % FLOAT	CUM. WT. % SINK	CUM. ASH % SINK	DIFFICULTY CURVE
FLT.-1.30	5117	13.2	2.7	13.2	2.7	100.0	14.5	
1.30-1.35	7835	20.3	5.2	33.5	4.2	86.8	16.3	
1.35-1.40	8266	21.4	8.6	54.9	5.9	66.5	19.7	71.2881.
1.40-1.45	6702	17.3	13.6	72.2	7.8	45.1	24.9	
1.45-1.50	3526	8.6	18.2	80.8	8.9	27.8	32.0	36.0781.
1.50-1.55	2122	5.5	23.0	86.3	9.8	19.2	38.1	
1.55-1.60	1063	2.8	27.8	89.1	10.3	13.7	44.2	13.1581.
1.60-1.70	1586	4.1	32.4	93.2	11.3	10.9	48.4	
1.70-1.80	705	1.8	34.8	95.0	11.8	6.8	58.1	
SK.-1.80	1914	5.0	66.5	100.0	14.5	5.0	66.5	

WASHABILITY OF - 28 M + 0 FRACTION:

	WT.	WT. %	ASH %	CALCULATED ASH
FLOAT @ 1.50	817	83.8	5.8	4.9
SINK @ 1.50	158	16.2	43.2	7.0
	975	100.0		11.9

CALCULATED YIELD OF - 2" + 0 PRODUCT:

YIELD 81.1 @ 1.48 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @ 1.48)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.2	27.0	8.5	63.3	# 3	10.0	0.40

Hosmer Wheeler

WASHABILITY OF #3 SEAM
HOSMER RIDGE
ADIT #20
X-CUT @ 106' SEAM THICKNESS 15'

DATE: SEPTEMBER 1970

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.8	28.8	15.4	54.0	#6

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
2" + 1/2"	0.4		
1/2" + 1/4"	5.1	17.6	10.9
1/4" + 28 M	56.5		
28 M + 0	38.0	9.1	3.5
			14.4

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	51.7	2.1	51.7	2.1	100.0	17.6	
1.30-1.35	9.6	4.3	61.3	2.4	48.3	34.2	
1.35-1.40	7.0	7.0	68.3	2.9	38.7	41.6	31.9% @ 1.40
1.40-1.45	8.3	15.5	76.6	4.3	31.7	49.2	
1.45-1.50	2.0	18.6	78.6	4.6	23.4	61.2	15.3% @ 1.50
1.50-1.55	1.6	25.1	80.2	5.0	21.4	65.1	
1.55-1.60	1.0	30.7	81.2	5.4	19.8	68.4	5.2% @ 1.60
1.60-1.70	1.8	37.8	83.0	6.1	18.8	70.4	
1.70-1.80	1.4	47.5	84.0	6.8	17.0	73.8	
SINK 1.80	15.6	76.2	100.0	17.6	15.6	76.2	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT @	1.50	88.1	3.6	3.2
SINK @	1.50	11.9	49.5	5.9
				9.1

YIELD 85.0 @ 1.70 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
2.5	32.0	6.0	59.5	#6	55.0	0.66

WASHABILITY OF #10 SEAM
WHEELER RIDGE
ADIT #21 X-CUT @ 120' SEAM THICKNESS 16.5'

DATE: OCTOBER 27, 1970

Hosmer-Wheeler

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.4	25.9	15.8	56.9	#2 1/2

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2" + 1/8"	5.2		
-1/8" + 3/8"	7.0	16.2	12.9
-3/8" + 28M	67.9		
28M + 0	19.9	17.9	3.6
			16.5

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	11.4	3.0	11.4	3.0	100.0	16.2	
1.30-1.35	19.7	5.5	31.1	4.6	88.6	17.9	
1.35-1.40	22.2	9.1	53.3	6.5	68.9	21.5	70.8% @ 1.40
1.40-1.45	15.4	14.1	68.7	8.2	46.7	27.4	
1.45-1.50	9.5	18.4	78.2	9.4	3.3	33.9	37.4% @ 1.50
1.50-1.55	6.2	24.6	84.4	10.5	21.8	40.6	
1.55-1.60	4.2	29.9	88.6	11.5	15.6	47.0	14.9% @ 1.60
1.60-1.70	3.7	36.6	92.3	12.5	11.4	53.3	
1.70-1.80	2.1	44.5	94.4	13.2	7.7	61.3	
SINK 1.80	5.6	67.6	100.0	16.2	5.6	67.6	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT	@ 1.50	68.0	7.6	5.2
SINK	@ 1.50	32.0	39.9	12.7
				17.9

YIELD 68.7 @ 1.42 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.2	29.4	7.0	62.4	#7	45.0	0.32

WASHABILITY OF

DATE: October 6, 1970

2 Seam Hosmer Ridge

Adit # 22 X-cut @ 110' Seam Thickness 14.4'.

Hosmer Wheeler

RAW COAL:

PROX. ANALYSIS -	MOIST. %	V.M.%	ASH %	F.C.	F.S.I.
	1.2	23.8	31.8	43.2	# 2 1/2

SCREEN ANALYSIS -	WT.	WT. %	ASH %	CALCULATED ASH
-2" + 1/8"	6.5	6.0		
-1/8" + 3/8"	12.5	11.6	30.5	28.9
-3/8" + 28M	69.0	63.9		
28M + 0	20.0	18.5	32.4	6.0
				30.9

WASHABILITY OF - 2" + 28 M FRACTION:

SP. GR.	WT. %	WT. %	ASH %	CUM. WT. % FLOAT	CUM. ASH % FLOAT	CUM. WT. % SINK	CUM. ASH % SINK	DIFFIC. CUR.
FLT.-1.30	6447	17.0	3.9	17.0	3.0	100.0	30.5	
1.30-1.35	5383	14.2	7.1	31.2	5.4	83.0	36.0	
1.35-1.40	3800	10.0	11.9	41.2	6.9	68.8	41.9	48.3 31.
1.40-1.45	2584	6.8	16.2	48.0	8.3	58.8	47.0	
1.45-1.50	2211	5.8	19.5	53.8	9.5	52.0	51.1	29.3 31.
1.50-1.55	2008	5.3	27.3	59.1	11.1	46.2	55.0	
1.55-1.60	1673	4.4	31.3	63.5	12.5	40.9	58.6	22.8
1.60-1.70	2939	7.7	37.6	71.2	15.2	36.5	61.9	
1.70-1.80	1913	5.0	43.8	76.2	17.1	28.8	68.4	
SK.-1.80	9067	23.8	73.6	100.0	30.5	23.8	73.6	

WASHABILITY OF - 28 M + 0 FRACTION:

	WT.	WT. %	ASH %	CALCULATED ASH
FLOAT @ 1.50	396	39.4	10.6	4.2
SINK @ 1.50	604	60.6	46.5	28.2
				32.4

CALCULATED YIELD OF - 2" + 0 PRODUCT:

YIELD-46.4 @ 1.46 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @ 1.46)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.5	28.6	10.2	597	# 5	891.0	0.42

WASHABILITY OF #9 LOWER SEAM DATE: Nov. 5, 1970
HOSMER RIDGE
ADIT #23 X-CUT @ 90' SEAM THICKNESS 19.4 FT.

Hosmer Wheeler

RAW COAL:

PROX. ANALYSIS -	MOIST. %	V.M.%	ASH %	F.C.	F.S.I.
	1.5	26.4	18.7	46.6	$ 5 1/2

SCREEN ANALYSIS -	WT.	WT. %	ASH %		CALCULATED ASH
-2" + 7/8"		6.0			
-7/8" + 3/8"		11.3	79.0	20.8	16.4
-3/8" + 28M		61.7			
-28M + 0"		21.0	21.0	13.2	2.7

WASHABILITY OF - 2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM. WT. % FLOAT	CUM. ASH % ASH	CUM. WT. % SINK	CUM. ASH % SINK	DIFFICULT CURVE
Flt. 1.30	23.8	2.9	23.8	2.9	100.0	20.8	
1.30-1.35	16.2	5.7	40.0	4.0	76.2	26.3	
1.35-1.40	19.0	9.0	59.0	5.6	60.0	31.9	60.7 @ 1.40
1.40-1.45	10.7	14.0	69.7	6.9	41.0	42.5	
1.45-1.50	5.4	18.3	75.1	7.7	30.3	52.6	25.0 @ 1.50
1.50-1.55	2.6	24.6	77.7	8.3	24.9	60.0	
1.55-1.60	2.4	29.1	80.1	8.9	22.3	64.1	9.0 @ 1.60
1.60-1.70	2.6	35.6	82.7	9.8	19.9	68.4	
1.70-1.80	1.8	44.0	84.5	10.5	17.3	73.3	
Sk. 1.80	15.5	76.7	100.0	20.8	15.5	76.7	

WASHABILITY OF - 28 M + 0 FRACTION:

	WT.	WT. %	ASH %	CALCULATED ASH
Float @ 1.50	858	84.1	6.4	5.4
Sink @ 1.50	162	15.9	49.4	7.8
				13.2

YIELD 81.1 @ 1.60"

COAL ANALYSIS: (RAW COAL FLOATED @ 1.60)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.8	29.2	8.4	60.6	#6	30.0	0.41

Hosmer Wheeler

WASHABILITY OF #9 SEAM
WHEELER RIDGE SAMPLE A
ADIT #23 X-CUT @90' SEAM THICKNESS 21.7'

DATE: October 15, 1970

RAW COAL:

PROXIMATE ANALYSIS

MOIST.%	V.M.%	ASH %	F.C.	F.S.I.
1.2	26.2	23.6	49.0	# 4 1/2

SCREEN ANALYSIS	WT %	ASH %	CALCULATED ASH
-2" + 1/8"	7.0		
-1/8" + 3/8"	12.0	25.9	21.4
-3/8" + 28M	63.5		
28M + 0	17.5	17.8	3.1
			24.5

WASHABILITY OF -2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM WT. % FLOAT	CUM ASH % FLOAT	CUM WT.% SINK	CUM ASH % SINK	DIFFICULTY CURVE
FLOAT 1.30	15.7	2.5	15.7	2.5	100.0	25.9	
1.30-1.35	19.0	5.5	34.7	4.1	84.3	30.2	
1.35-1.40	16.9	9.5	51.6	5.9	65.3	37.4	64.4% @1.40
1.40-1.45	9.0		60.0	7.3	48.4	47.2	
1.45-1.50	5.0	17.8	65.6	8.1	39.4	54.5	27.1% @1.50
1.50-1.55	4.3	23.0	69.9	9.0	34.4	59.8	
1.55-1.60	2.7	29.4	72.6	9.7	30.1	65.1	12.9% @1.60
1.60-1.70	3.0	36.4	75.6	10.8	27.4	68.6	
1.70-1.80	1.9	45.7	77.5	11.7	24.4	72.5	
SINK 1.80	22.5	74.8	100.0	25.9	22.5	74.8	

WASHABILITY OF -28 M + 0 FRACTION:

		WT. %	ASH %	CALCULATED ASH
FLOAT	@ 1.50	76.2	7.1	5.4
SINK	@ 1.50	23.8	52.2	12.4
				17.8

YIELD 67.4 @1.52 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @ 1.52)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.0	29.5	10.2	59.3	#6 1/2	244.0	0.44

WASHABILITY OF # 2 SEAM

DATE: Nov. 20, 1970

HOSMER RIDGE

ADIT #24 X-CUT @ 70' SEAM THICKNESS 21.4'

Hosmer Wheeler

RAW COAL:

PROX. ANALYSIS -	MOIST. %	V.M.%	ASH %	F.C.	F.S.I.
	1.6	17.3	53.6	27.5	# 1 1/2

SCREEN ANALYSIS -	WT.	WT. %	ASH %	CALCULATED ASH
-2" + 7/8"		6.4		
-7/8" + 3/8"		12.4	58.3	43.3
-3/8" + 28M		55.5		
-28M + 0"		25.7	33.6	8.6

WASHABILITY OF - 2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM. WT. % FLOAT	CUM. ASH % ASH	CUM. WT. % SINK	CUM. ASH % SINK	DIFFICULT CURVE
Flt. 1.30	5.4	3.0	5.4	3.0	100.0	58.3	
1.30-1.35	8.1	6.0	13.5	4.8	94.6	61.5	
1.35-1.40	3.8	10.8	17.3	6.1	86.5	66.7	60.3% @ 1.3
1.40-1.45	6.0	13.1	23.3	7.9	82.7	69.2	
1.45-1.50	3.7	15.8	27.0	9.0	76.7	73.6	37.7% @ 1.4
1.50-1.55	2.2	23.1	29.2	10.1	73.0	76.5	
1.55-1.60	1.6	30.2	30.8	11.1	70.8	78.2	18.1% @ 1.5
1.60-1.70	2.7	40.6	33.5	13.5	69.2	79.3	
1.70-1.80	2.3	49.9	35.8	15.8	66.5	80.9	
Sk. 1.80	64.2	82.0	100.0	58.3	64.2	82.0	

WASHABILITY OF - 28 M + 0 FRACTION:

	WT.	WT. %	ASH %	CALCULATED ASH
Float @ 1.50	531	53.1%	6.3	3.3
Sink @ 1.50	469	46.9%	64.7	30.3

YIELD 33.4 @ 1.48 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @ 1.48)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
3.8	32.7	7.5	56.0	#7	238.0	0.47

WASHABILITY OF #4 Seam

DATE: December, 1970

Hosmer Ridge

Adit #25 X-Cut @ 90° Seam Thickness 13.2Ft.

Hosmer-Wheeler

RAW COAL:

PROX. ANALYSIS -	MOIST. %	V.M.%	ASH %	F.C.	F.S.I.
	2.0	24.6	23.4	50.0	#2½

SCREEN ANALYSIS -	WT.	WT. %	ASH %	CALCULATED ASH
-2" - 7/8"		16.3		
-7/8" - 3/8"		17.8	23.4	19.0
-3/8" - 28m		47.1		
-28m - 0		18.8	19.6	3.7
				22.7

WASHABILITY OF - 2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM. WT. % FLOAT	CUM. ASH % ASH	CUM. WT. % SINK	CUM. ASH % SINK	DIFFICULT CURVE
Flt. 1.30	12.2	3.3	12.2	3.3	100.0	23.4	
1.30 - 1.35	22.3	5.9	34.5	5.0	87.8	26.2	
1.35 - 1.40	21.3	9.6	55.8	6.7	65.5	33.1	74,291.50
1.40 - 1.45	10.8	14.3	66.6	8.0	44.2	44.4	
1.45 - 1.50	6.1	17.2	72.7	8.7	33.4	54.1	25,091.50
1.50 - 1.55	1.7	26.4	74.4	9.1	27.3	62.4	
1.55 - 1.60	1.8	30.0	76.2	9.6	25.6	64.8	8,181.50
1.60 - 1.70	3.1	37.2	79.3	10.7	23.8	67.4	
1.70 - 1.80	2.2	46.3	81.5	11.7	20.7	71.9	
sk. 1.80	18.5	75.0	100.0	23.4	18.5	75.0	

WASHABILITY OF - 28 M + 0 FRACTION:

	WT.	WT. %	ASH %	CALCULATED ASH
FLOAT @ 1.50		71.5	6.5	4.6
SINK @ 1.50		28.5	52.5	15.0
				19.6

YIELD 72.4 @ 1.50 S.G.

COAL ANALYSIS: (RAW COAL FLOATED @ 1.50)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.9	28.7	8.4	61.0	#5½	5.0	0.45

WASHABILITY OF #3 SEAM

DATE: DECEMBER 15, 1970

WHEELER RIDGE

ADIT #26 X-CUT @ 120' SEAM THICKNESS 55'

Hosmer Wheeler

RAW COAL:

PROX. ANALYSIS -	MOIST. %	V.M.%	ASH %	F.C.	F.S.I.
	1.7	32.3	13.0	53.0	#7½

SCREEN ANALYSIS -	WT.	WT. %	ASH %	CALCULATED ASH
-2" + 7/8"		9.8		
-7/8" + 3/8"		14.5	13.4	10.6
-3/8" + 28m		54.9		
-28m + 0"		20.8	13.2	2.7
				13.3

WASHABILITY OF - 2" + 28 M FRACTION:

SP. GR.	WT. %	ASH %	CUM. WT. % FLOAT	CUM ASH % FLOAT	CUM WT. % SINK	CUM ASH % SINK	DIFFICULT CURVE
FLT. 1.30	61.4	3.0	61.4	3.0	100.0	13.4	
1.30 - 1.35	11.1	7.3	72.5	3.7	38.6	30.0	
1.35 - 1.40	6.7	11.6	79.2	4.3	27.5	39.1	27.3% @1.4
1.40 - 1.45	5.7	22.0	84.9	5.5	20.8	46.0	
1.45 - 1.50	1.3	24.7	86.2	5.8	15.1	57.8	10.1% @1.5
1.50 - 1.55	1.3	26.3	87.5	6.1	13.8	61.0	
1.55 - 1.60	0.9	31.4	88.4	6.4	12.5	64.6	4.3% @1.
1.60 - 1.70	1.7	39.5	90.1	7.0	11.6	67.1	
1.70 - 1.80	0.9	47.6	91.0	7.4	9.9	71.9	
SK. 1.80	9.0	74.3	100.0	13.4	9.0	74.3	

WASHABILITY OF - 28 M + 0 FRACTION:

	WT.	WT. %	ASH %	CALCULATED ASH
FLOAT @ 1.50		82.7	4.7	3.9
SINK @ 1.50		17.3	54.0	9.3
				13.2

YIELD 88.6 @ 1.80 S.G. @ 6.8% ASH

COAL ANALYSIS: (RAW COAL FLOATED @ 1.8)

MOIST. %	V.M. %	ASH %	F.C. %	F.S.I.	D.D.M.	SULPHUR
1.6	32.9	8.6	56.9	#8	2300.0	0.45

Industrial Confidential

CANADA

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DIVISIONAL REPORT FRC 71/31 PREP

EVALUATION OF COAL SAMPLES FROM KAISER RESOURCES LIMITED, BRITISH COLUMBIA, FROM ADIT #26, WHEELER RIDGE AREA

by

B. N. Nandi and D. S. Montgomery

May 1971

CONTENTS

CONTENTS (CONT'D)

Evaluation of Coal Samples from Kaiser Resources Limited, British Columbia, From Adit #26, Wheeler Ridge Area

by

B. N. Nandi* and D. S. Montgomery**

INTRODUCTION

This report is in continuation of the previous reports on the "Evaluation of Coal Samples from the Sparwood Ridge, Crowsnest Coalfield, British Columbia Part I, II and III" (1, 2, 3).

LOCATION OF PROPERTY, COAL SEAMS AND SAMPLING STATION

The property from which the sample was taken is located in Wheeler Ridge area as shown in the map (Figure 1).

This sample of coal was taken by Kaiser Resources Limited and the description of the sample, the seam thickness, Adit number and sampling location were sent along with sample by Mr. J. B. Murphy, Chief Geologist, Kaiser Resources Limited to the Fuels Research Centre. For convenience these data are given below.

Sample No.	FRC No.	Location	Adit No.	Seam Thickness	Sampling Station Location
1	2203-71 - Raw Coal	Wheeler Ridge	26	47 feet	Crosscut at 150 ft. from the portal
2	2016-71 - Clean Coal	Wheeler Ridge	26	47 feet	Crosscut at 150 ft. from the portal

SAMPLES STUDIED

About five pounds of raw coal sample, taken from the bulk sample, was sent separately in a plastic bag on January 13, 1971. The clean sample of five pounds immersed in water in air-tight container to prevent oxidation in transit was forwarded by mail on December 23, 1970 for petrographic evaluation.

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* Research Scientist

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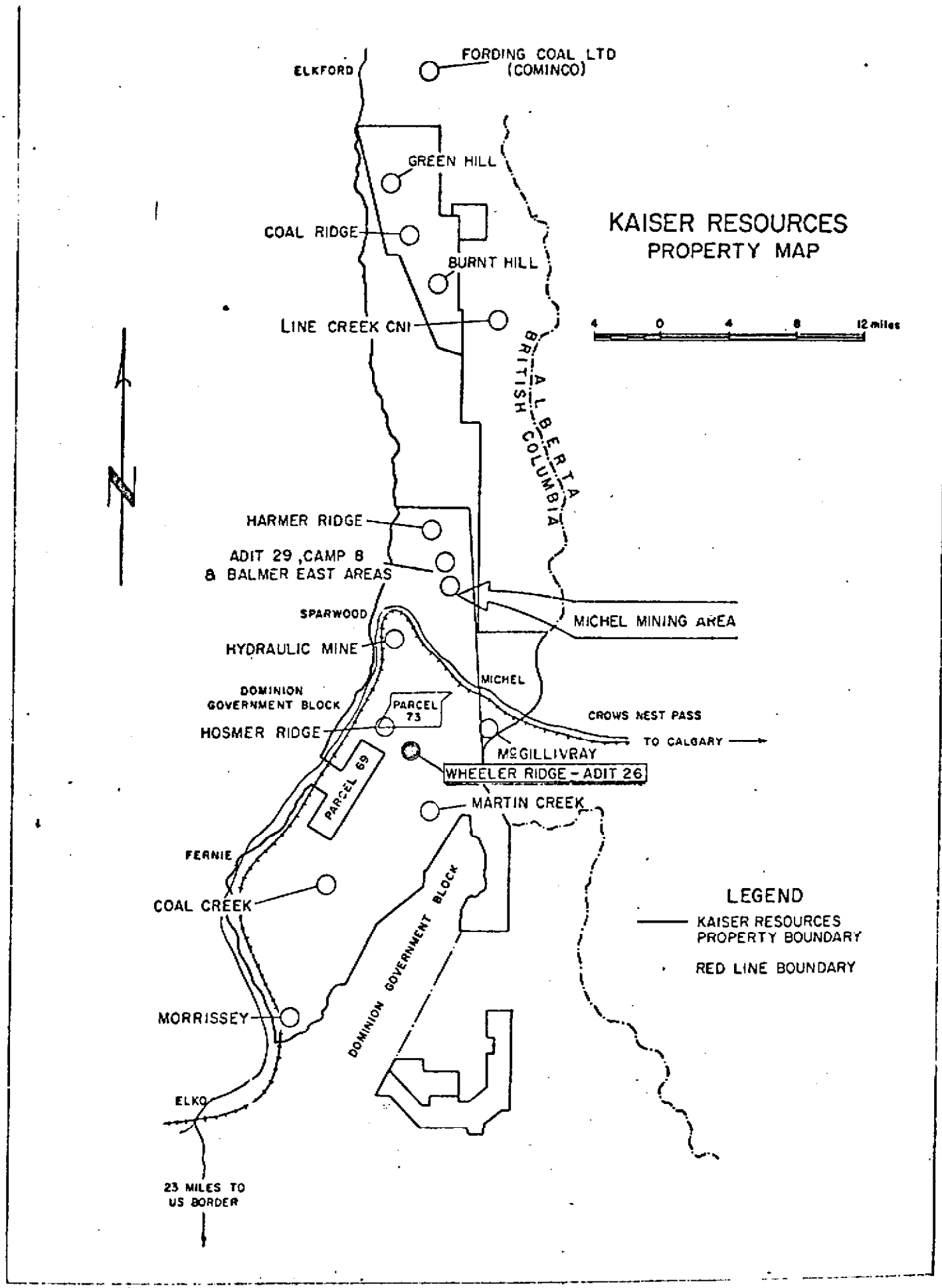

Figure 1. Map showing detailed location of Adit #26, Wheeler Ridge Area.

The coal particle size of both samples as received was 1/4" X 0. The clean sample was floated at 1.50 S.G and the resulting product contained approximately 9 per cent mineral matter.

The clean sample was first centrifuged to separate the majority of the water and then dried under vaccuum at room temperature and the raw sample was dried in air at room temperature. Both samples were crushed in accordance with the ASTM Specification for the preparation of samples for microscopic examination, proximate analysis and dilatation in the Ruhr dilatometer.

EVALUATION PROCEDURE AND RESULTS

(a) Proximate Analysis (Moisture, Ash, Volatile Matter and Fixed Carbon) and
(b) Calorific Value

The Standard ASTM procedure was followed for these determinations and the results are given in Table 1.

(c) Free-Swelling Index

The ASTM Standard Method of Test for Free-Swelling Index of Coal, ASTM Designation D720-67 procedures was followed and the results are presented in Table 1.

(d) Ruhr Dilatometer Test

Reflectance measurements do not, except in severe cases, indicate the extent to which the coal has been oxidized. However, the determination of the dilatation properties using the Ruhr dilatometer together with the microscopic examination of the residue from the dilatometer test gives a better understanding of the nature of the coal and some indication of the state of oxidation of coal. The test measures quantitatively the contraction and dilation of a coal when heated at a constant rate of temperature increase of 3°C per minute. This test was conducted according to the German Specification DIN 51739. Coals which show no dilation and very low contraction although they may agglomerate, are not considered to have the required quality that will yield a commercial grade of metallurgical coke. The results of this test are given in Table 2.

(e) Microscopic Examination - Maceral Analysis

The samples were polished in accordance with the procedure described in ASTM Designation D-2797, "Method of Preparing Coal Samples for Microscopic Analysis by Reflected Light".

The maceral analyses were conducted according to the ASTM Designation D-2799, "Method for Microscopic Determination of Volume Percent of Physical Components of Coals". The macerals were counted at a magnification of 600. The results are given in Table 3.

(f) Reflectance Measurement of Vitrinoid

The reflectance measurements were performed on the polished sample (prepared for microscopic examination described above) according to the ASTM Designation D-2798, Tentative Method for "Determining Microscopically the Reflectance of the Organic Components in a Polished Specimen of Coal". The results are given in Table 3.

DISCUSSION

The proximate analyses of clean and raw samples are similar when calculated on ash free basis and the free swelling of the clean sample is higher than 9 (max. limit is 9) and that of raw sample is 9. The high swelling index of 9 indicates that this coal is a highly fluid coal.

Both samples possess similar dilatation but the contraction and plasticity index are slightly higher in the clean coal as may be seen in Table 2.

Petrographic analysis given in Table 3 shows that this coal is rich in exinoid (Figure 2) which is very unusual in the western Canadian cretaceous coals. Exinoid generally increases the fluidity of coal when heated to the plastic state. Both clean and raw coal possess similar percentages of reactive macerals but the exinoid content is about 5 per cent higher in the clean coal. Some naturally crushed vitrinoid was observed in both coals (Figure 3). In some cases the reflectances of fusinoid and semifusinoid are practically the same in this particular coal (Figure 4) although reflectance of fusinoid is normally higher than semifusinoid in this particular coal and

in coal in general. It is therefore difficult to differentiate the boundaries of the fusinoid from semifusinoid in some cases. Figure 5 shows the inclusion of mineral matter in the semifusinoid which is brownish in colour under the microscope. We mention in our previous paper (4) that finely disseminated iron and calcium appear to be concentrated in the semifusinoid part of the coal as detected by electron proble analysis. The presence of mineral matter can also be observed in the semifusinoid part of the semi-coke obtained at 550°C from the residue of the Ruhr dilatometer (Figure 6 and 7). In Figure 7 the mineral matter was not surrounded by cracks and semifusinoid was fused completely with the vitrinoid part giving a very smooth granular structure in the semi-coke. It is very difficult at this stage to interpret the role of mineral matter in the semifusinoid on coke quality but it appears that there exists good bonding between the mineral matter, coal inerts and reactives macerals without any boundary cracks.

The microscopic examination of the semi-coke obtained from the residue at 550°C from raw coal shows formation of fine grain coke structure with the inclusion of mineral matter and big cavities (Figure 8) Identical semi-coke obtained from clean coal shows good bonding between reactives and inerts (Figure 9). This coke is slightly anisotropic and the grain structure is very fine. Highly fluid coals generally give coke with a fine granular structure.

CONCLUSION

The clean coal at 1.50 S.G from Adit 26, Wheeler Ridge, possesses exinoid which is very unusual for western Canadian cretaceous type coal. Dilatometer tests and swelling index indicate that this coal is extremely fluid when heated to the plastic state. The rather large cavities (Figure 8) tend to confirm the general observation that very fluid coals on carbonization alone tend to give weak cokes due to the rather thin cell walls caused by the large gas bubbles evolved during heating. However, this coal gives every indication of being excellent for blending with other western Canadian medium volatile coals of low fluidity. It is a coal which itself may command

a premium price as it is our understanding that the Japanese require fluid coals for blending.

The crushed vitrinoid may indicate that on washing there will be problems with fines of low specific gravity since as far as it is possible to see there is little associated mineral matter with this type of vitrinoid. This is a marked contrast with some of the other coals of this region where the fine coal consists of semifusinoid and fusinoid laden with mineral matter.

ACKNOWLEDGEMENT

The authors wish to acknowledge the assistance of Mr. S. E. Nixon in the preparation of the coal samples for microscopic examination, the counting and the Ruhr dilatation tests performed, and Mr. W. J. Montgomery and his staff of Solid Fuels Laboratory for the proximate analysis, calorific value and free-swelling index.

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3. B. N. Nandi and D. S. Montgomery - "Evaluation of Coal Samples for Kaiser Resources Limited from Baldy Mountain Area and Camp 8 East, in Sparwood Ridge Area, Crowsnest Coalfield, British Columbia Divisional Report FRC 71/16 Prep February 1971.

4. B. N. Nandi and D. S. Montgomery - "The Study of Coal by a Scanning Electron Microscope and Electron Probe", Preprints of the American Chemical Society Division of Fuel Chemistry, Vol. 14, No. 1 pp 81-86, Toronto, 1970.

TABLE 1

Proximate Analyses (as received)

FRC Laboratory No.	Sample 1 2203-71 Wheeler Ridge Adit 26, Raw Coal	Sample 2 2016-71 Wheeler Ridge Adit 26, Clean Coal at 1.50 S.G
Moisture	0.84	1.79
Ash	12.92	4.27
Volatile Matter	31.68	33.50
Fixed Carbon	54.56	60.44
	100.00	100.00
Free-Swelling Index	9	more than 9
Calorific Value BTU/per lb/gross	12,773	14,150

TABLE 2

Ruhr Dilatometer Test

	Sample 1	Sample 2
Softening Point θ_s °C	390	381
Contraction % C	20	25
Dilatation %	69	67
Temp. of Max. Dilatation °C	486	480
Temp. of Max. Contraction θ_c °C	445	440
Plasticity Index $\frac{C}{\theta_c - \theta_s}$	0.36	0.42

TABLE 3

Microscopic Analysis

	Sample 1	Sample 2
Vitrinoid	62.9	60.0
Micrinoid	4.2	4.8
Exinoid	2.0	7.2
Fusinoid	5.2	9.6
Semifusinoid	18.9	16.0
Mineral Matter	6.8	2.4
	100.0	100.0
R_o (Reflectance in oil)	0.72	0.77
Reactives %	71.2	72.5
Inerts %	28.8	27.5

Figure 2. Micrograph of the clean coal from Adit #26, Wheeler Ridge.
V - Vitrinoid, E - Exinoid, F - Fusinoid, S.F. - Semifusinoid X 600.

Figure 3. Micrograph of the naturally occurring crushed vitrinoid in Adit #26 coal X 600.

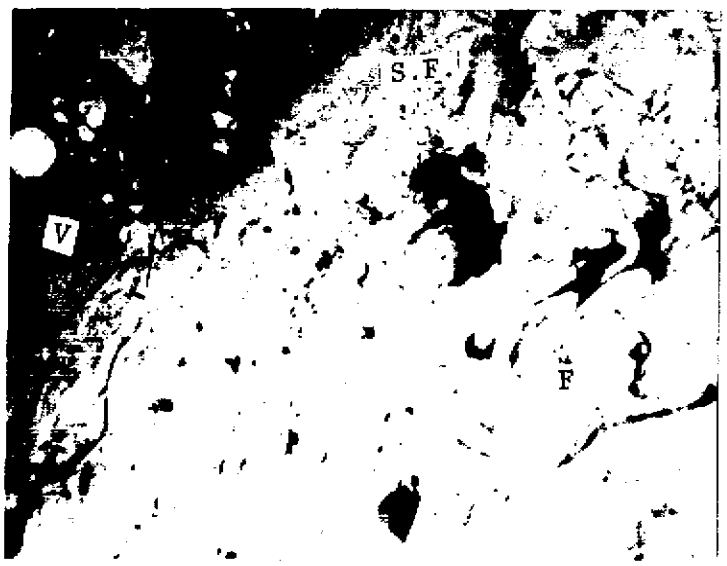


Figure 4. Micrograph of the fusinoid and semifusinoid of the same reflectance.
V - Vitrinoid, F - Fusinoid, S.F. - Semifusinoid X 600.

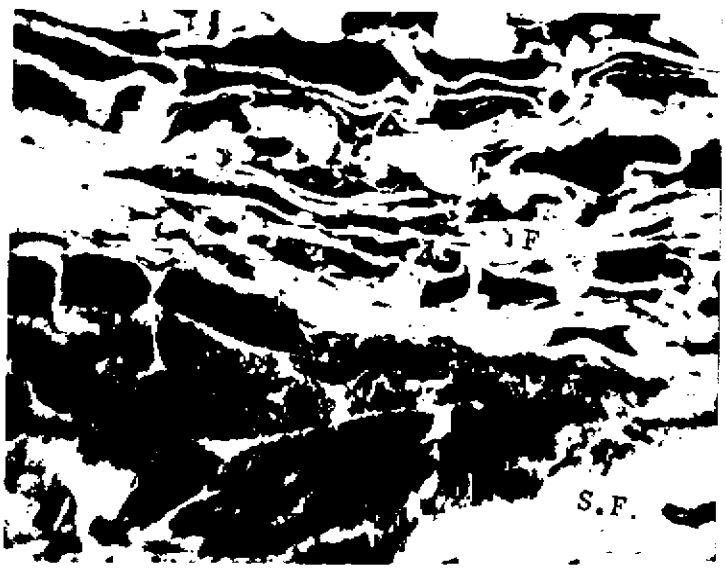
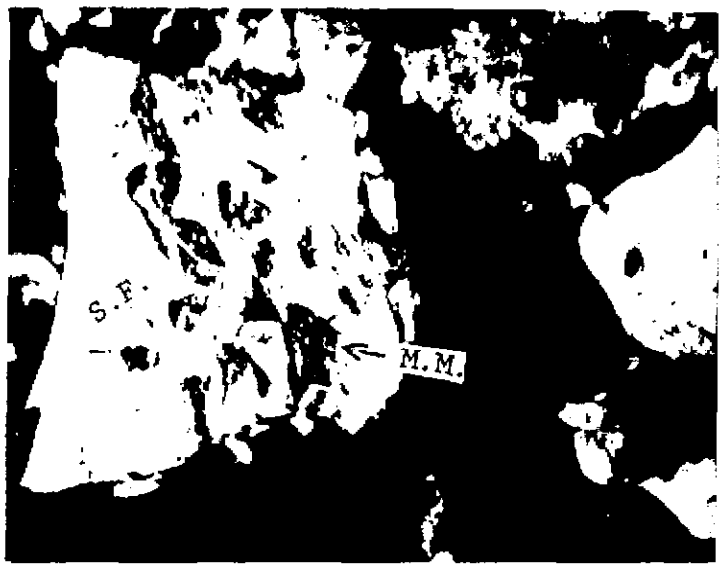


Figure 5. Micrograph of the inclusion of mineral matter in the semifusinoid and fusinoid. F - Fusinoid, S.F. - Semifusinoid X 600.



gure 6. Micrograph of the semi-coke (raw coal) from the residue of the Ruhr dilatometer test at 550°C. Showing inclusion of fine mineral matter m the semifusinoid. M.M. - Mineral Matter, S.F. - Semifusinoid.

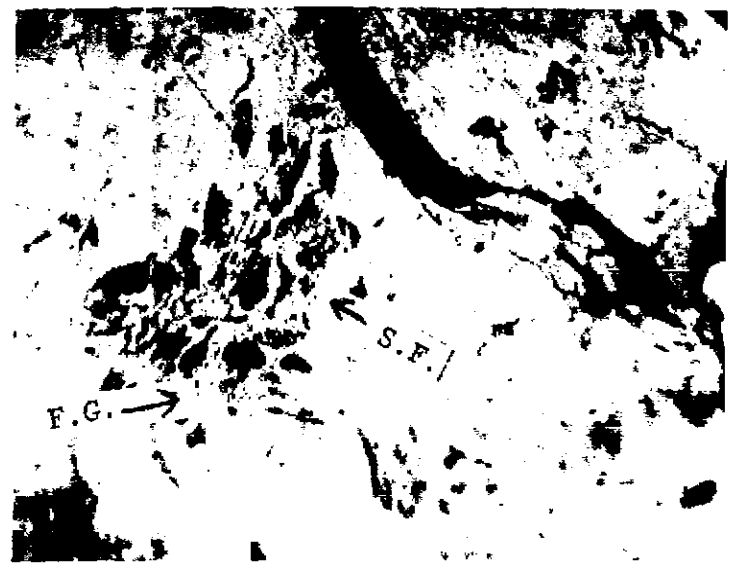


Figure 7. Micrograph of the semi-coke (clean coal) from the residue of the Ruhr dilatometer test at 550°C showing good bonding and fusion between mineral matter of the semifusinoid and vitrinoid. F.G. - Fine Grains, S.F. - Semifusinoid, M.M. - Mineral Matter.

igure 8. Micrograph of the semi-coke (raw coal) from the residue of the Ruhr dilatometer test at 0°C showing the cavities and the inclusion of mineral matter. C - Cavity, M.M. - Mineral Matter.

Figure 9. Micrograph of the semi-coke (clean coal) from the residue of the Ruhr dilatometer showing good bonding and fusion between reactives and inerts. S.F. - Semifusinoid, F.G. - Structure of Fine Grain.

CARBONIZATION TEST IN KINES RANCH 12 inch, M.W. COKE OVEN.

PROJECT No. 3-2-1 | 16-19.

Test Identification Number..... 787
Date of Test..... 28 APRIL 71
Laboratory Number
(refer for analysis of charge)..... 2461-71

COMPONENT COALS IN CHARGE
(% by wt. on db)

ADIT 26 - KAISER ..... 100 %

CARBONIZATION DATA

Net Weight of Charge (wet)....lb	526.8
Moisture in Charge....%	3.8
ASTM Bulk Density (wet)....lb/ft^3	48.5
Oven Bulk Density (db)....lb/ft^3	51.0

CARBONIZATION RESULTS

Gross Cooking Time....hr:min	10:30
Maximum Wall Pressure....lb/in^2	0.30
Coke Yield Actual....%	71.7
Mean Coke size....in	2.00
Apparent Specific Gravity....	0.890

Screen Analysis of Coke
(cumulative percentage retained on)

3 inch sieve....	5.4
2 inch sieve....	50.9
1 1/2 inch sieve....	77.3
1 inch sieve....	91.0
3/4 inch sieve....	93.6
1/2 inch sieve....	94.7
Percentage -1/2 inch (breeze)....	5.3

Tumbler Test (ASTM)

Stability Factor....	35.9
Hardness Factor....	63.5

Japanese Tumbler Test (JIS)
(cumulative percentage retained on)

30 mm sieve....	5.3
25 mm sieve....	64.7
15 mm sieve....	85.3

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TABLE

Analyses of Component Coals
(Project No. 3-2-1/16-19

Identification		
Laboratory Number	2461-71	2487-71
Description	KAISER ADIT 2E	COKE FROM M.W. OVEN TEST.
Classification		
Rank (ASTM)		
Specific Volatile Index	164	
Volatile Matter (dmmfb)....%	36.2	
Carbon (dmmfb)....%	86.5	
Proximate Analysis (db)		
Ash....%	8.95	12.7
Volatile Matter....%	33.47	1.3
Fixed Carbon....%	57.58	86.0
Gross Calorific Value (db)		
Btu per pound	13,700	
Ultimate Analysis (db)		
Carbon....%	78.04	
Hydrogen....%	4.97	
Sulphur....%	0.40	0.29
Nitrogen....%	0.05	
Ash....%	8.95	
Oxygen (by difference)....%	7.59	
Ash Analysis (db)		
SiO_2....%	–	
Al_2O_3....%	–	
Fe_2O_3....%	–	
TiO_2....%	–	
P_2O_5....%	–	
CaO....%	–	
MgO....%	–	
SO_3....%	–	
Na_2O....%	–	
K_2O....%	–	
Grindability		
Hardgrove Index	87	
Coal Pulverization		
Total Passing 1/8 in....%	90.4	

PRELIMINARY COPY ONLY

TABLE

Thermal Rheological Properties
(Project No. 3-2-1 16-19)

Identification	
Laboratory Number	2461-71
Description	KAISER ADIT 26
Linear Expansion	
Bd. 52 lb/ft^3 at 2% moisture.....%	-16.8
Gieseler Plasticity	
Start.....°C	406
Fusion Temp.....°C	418
Max. Fluid Temp.....°C	449
Final Fluid Temp.....°C	477
Solidification Temp.....°C	482
Melting Range.....°C	71
Max. Fluidity.....dd/m	520
Total.....dd	3,200
Dilatation	
Ti - Softening Temp.....°C	386
Tii - Max. Contraction Temp.....°C	425
Tiii - Max. Dilatation Temp.....°C	458
Contraction.....%	26
Dilatation.....%	43
Free Swelling Index	8

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HOSMER RIDGE DRILLING, 1970

DRILL HOLE SUMMARY

DRILL HOLE NO.	CONTRACTOR	ROCK DRILLING RATE FT/HR AVERAGE	DEPTH OF HOLE	DEPTH OF COAL	COAL THICKNESS IN HOLE	COAL SEAM NO.	RAW COAL		CLEAN COAL COMPOSITE							LOCATION		
							ASH	F.S.I.	MOISTURE	VOLATILES	FIXED CARBON	ASH	SULPHUR	YIELD	F.S.I.	LATITUDE	DEPARTURE	ELEVATION
HM-1	BK		940	206	42	9	26.7	2½	1.1	23.6	66.9	8.3	0.23	52.7	6	S23329	E8463	6667
				260	12	M9												
				276	40	L9	35.0	2	1.1	23.5	48.7	10.2	0.26	47.7	5½			
				317	4	L9			TOTAL	COAL	ZONE	95'	RUN AS	COMPOSITE				
				326	29	L9				SAMPLE								
				360	27	L9	20.0	2½	1.0	27.6	56.9	9.7	0.26	70.5	6½			
				526	42	10	23.3	3	1.4	25.6	59.6	13.2	0.34	64.6	4½			
				580	5	M10												
				620	10	L10	23.1	4½	0.9	24.0	63.6	11.3	0.50	58.2	5½			
HM-2	BK		760	408	4											S24173	E9677	6680
				415	5		18.6	3½	1.3	27.7	61.0	10.6	0.29	50.0	5			
				424	15	9	28.3	2	1.0	28.9	59.0	11.0	0.30	63.8	5			
				460	47	L9			TOTAL	COAL	ZONE	86'	RUN AS	COMPOSITE	SAMPLE			
				543	28	10	35.6	1	1.2	27.3	74.0	12.1	0.25	36.6	4			
				590	3													
				618	9	M10	40.5	1	1.0	24.8	60.7	14.1	0.36	50.8	4½			
				632	3		SAMPLE	FROM	618-635'									
				692	7	L10												
HM-3	BK		660	220	35	9	29.2	1½	1.1	25.5	58.5	14.6	0.30	64.3	3½	S22058	E8147	6973
				260	20													
				285	22	M9	25.8	4½	0.9	26.7	60.7	11.8	0.34	68.0	5			
				320	50	L9	26.1	2½	1.1	27.3	60.6	9.0	0.28	41.5	5½			
				491	26	10	21.8	4	1.2	26.3	60.0	12.5	0.36	73.2	5			
				560	9	M10	24.2	3	0.8	25.2	62.1	11.9		55.6	4½			

DRILL HOLE SUMMARY

DRILL HOLE NO.	CONTRACTOR	ROCK DRILLING RATE FT/HR AVERAGE	DEPTH OF HOLE	DEPTH OF COAL	COAL THICKNESS IN HOLE	COAL SEAM NO.	RAW COAL		CLEAN COAL COMPOSITE							LOCATION		
							ASH	F.S.I.	MOISTURE	VOLATILES	FIXED CARBON	ASH	SULPHUR	YIELD	F.S.I.	LATITUDE	DEPARTURE	ELEVATION
HM-3				570	6	M10												
				592	1	L10												
HM-4	BK		640	308	7	9	57.3	1	1.1	28.4	53.4	16.6	0.56	12.6	6½	S21133	E8740	7219
				318	4	M9?												
				387	3	?												
				420	6	L9?												
				469	11	10?	25.0	1½	1.0	21.7	63.0	14.2	0.44	73.6	1½			
				592	24	10?	21.3	2½	1.2	28.5	62.0	8.3	0.30	61.2	6½			
HM-5	BK		865	413	29	9	26.9	3	1.0	26.8	60.8	12.2	0.36	56.6	5½	S29,913	E8463	6322
				547	66	L9	21.2	4	0.9	28.6	62.6	7.9	0.32	46.3	5½			
				687	22	10	15.9	4	1.0	28.4	63.5	7.2	0.37	43.5	6			
				737	45		24.5	2	1.0	27.3	60.1	11.6	0.34	65.3	3½			
				819	6		24.7	3½	0.8	28.0	60.9	10.0	0.47	55.0	6			
				848	7		17.1	2½	1.7	28.7	61.4	8.3	0.45	61.2	6			
HM-6	BK		900	158	19.5	9	17.4	2½	1.1	26.0	65.7	7.1	0.24	69.8	3	S25,798	E7807	6168
				203	3													
				376	32	9	25.9	5	1.0	28.1	61.7	9.2		57.9	5			
				416	13	L9												
				520	27	10	25.8	4½	1.0	28.1	61.9	9.0		47.2	6			
				602	12	L10	25.3	3½	1.0	26.6	61.4	11.0		51.4	6			
				733	32	10	36.0	2	1.0	25.5	58.6	13.9		45.2	4			
				774	2													
				809	9	L10	40.4	1½	1.0	26.9	58.5	13.6		29.8	4½			

DRILL HOLE SUMMARY

DRILL HOLE NO.	CONTRACTOR	ROCK DRILLING RATE FT/HR AVERAGE	DEPTH OF HOLE	DEPTH OF COAL	COAL THICKNESS IN HOLE	COAL SEAM NO.	RAW COAL		CLEAN COAL COMPOSITE							LOCATION		
							ASH	F.S.I.	MOISTURE	VOLATILES	FIXED CARBON	ASH	SULPHUR	YIELD	F.S.I.	LATITUDE	DEPARTURE	ELEVATION
HM-7	BK		1000	76	13	3	17.5	7	1.7	32.0	62.2	4.1		69.4	7	S29,709	E7523	6328
				142	3													
				168	11	4	21.8	5	1.4	29.8	62.4	6.5		48.2	7			
				320	10	5												
				337	5													
				344	2													
				379	5	6	26.3	3	1.1	27.0	59.6	12.3		58.5	5½			
				550	3	7?	29.5	3	1.0	28.1	56.2	14.7	0.66	61.6	5½			
				646	9													
				668	28	8	27.1	2½	1.1	27.4	62.8	8.7	0.33	58.4	5½			
				702	5													
HM-8	BK		1050	85	19	4	22.8	3	1.4	28.9	59.1	10.6	0.42	72.2	5	S28422	E7629	6593
				242	7													
				252	6	5	24.7	3	1.2	29.6	62.6	6.6	0.39	45.9	6			
				259	3													
				331	7	6	40.9	1½	1.1	28.0	55.4	15.5	0.60	43.1	7			
				503	4	7	33.5	1½	0.9	29.0	60.0	10.1			6			
				598	9	8	16.5	4½	1.2	28.6	62.6	7.6	0.36	65.3	6½			
				646	3													
HM-9			905	197	5	1	22.5	5	1.5	32.9	55.3	10.3		72.4	7	S31201	E7453	6463
						2	SAMPLE NOT COLLECTED											
				483	20	3	19.6	7	1.5	31.4	61.7	5.4		64.4	8			
				595	18	4	26.3	3½	1.5	28.5	59.6	10.4		56.6	4½			
				735	10	5	24.2	2½	1.3	28.0	61.1	9.6	0.44	62.6	5			
				807	7	6	19.3	2	1.3	26.1	63.5	9.1	0.39	62.3	3½			

Sheet 1
Table

SERIES NO.	1F	2F	3F	4F	5F	6F	7F	8F	9F	10F	11F	12F	13F	14F	15F	16F
Coal Components																
#10 Seam Adit 69	100%															
#7 Seam Adit 71		100%														
#7 Seam Adit 21			100%													
#7 Seam Adit 46				100%												
Hosmer Mtn. Adit 2 Seam #9					100%											
Sparwood Rg. Adit 34 Seam #1						100%										
Hosmer Mtn Adit 3 Seam #9							100%									
Hosmer Mtn. Adit 4 Seam #10								100%								
Hosmer Mtn. Adit 5 Seam #9									100%							
Hosmer Mtn. Adit 9 Seam #9										100%						
Hosmer Mtn. Adit 7 Seam #9 (lower)											100%					
Hosmer Mtn. Adit 11 Seam #8												100%				
Hosmer Mtn. Adit 8 Seam #4													100%			
Hosmer Mtn. Adit 10 Seam #7														100%	100%	
Hosmer Mtn. Adit 14 Unknown																Adit 13-100%
No/Lab No.	577	578	593	594	595	596	597	631	632	660	661	662	663	664	665	688
Carbonization																
Charge Weight (W)	517.8	517.8	518.2	517.5	516.4	517.0	516.4	514.6	517.3	517.4	515.8	517.5	517.0	517.2	517.5	518.0
Moisture in Cynoce %	4.0	3.0	3.5	3.1	3.6	3.0	3.0	3.1	3.1	3.0	2.9	2.5	3.8	3.1	3.7	2.7
ASTM Cone (50) 1F/F3 (W)	48.5	48.8	48.6	48.6	48.5	48.8	48.7	48.7	48.6	48.7	48.7	48.7	48.5	48.6	48.5	48.7
LSS Coal (50) Ft 3 lbs	50.5	51.0	50.8	51.0	50.6	51.0	50.9	50.7	50.9	51.0	50.9	51.3	50.5	50.9	50.7	51.2
Cooking Time H.M.	10:30	10:05	10:25	10:30	9:35	10:23	9:25	10:15	9:20	9:48	10:13	9:40	9:50	9:55	9:35	9hrs 30 m
Kg/Lt Coke	1.1	1.01	1.13	1.06	1.06	1.05	1.01	1.1	0.96	1.01	1.02	0.99	1.02	1.05	1.02	1.02
Coke Yield % Actual	77.6	79.8	80.4	79.1	75.1	78.6	76.7	75.8	76.2	74.6	76.1	74.5	75.6	74.4	74.5	74.4
Max. Wall Pressure	0.37	0.49	0.16	0.35	0.25	1.49	0.32	0.67	0.28	0.23	0.44	0.96	0.36	0.30	0.40	0.4
Coke Distribution																
3"	8.3	5.3	17.4	17.0	6.7	8.8	10.2	8.2	6.0	8.9	8.6	4.3	7.6	5.4	4.9	6.5
2"	50.9	49.5	54.6	58.3	47.1	64.4	52.9	57.3	51.6	48.9	53.7	38.1	41.0	46.3	41.2	44.2
1 1/2"	76.1	77.3	66.8	73.5	75.6	85.3	78.1	86.0	79.9	77.1	81.1	67.5	67.7	77.4	66.5	72.3
1"	87.9	91.2	72.1	80.8	92.5	93.7	91.0	94.9	94.0	93.2	94.7	91.3	89.4	93.4	86.1	89.5
3/4"	89.1	92.6	73.3	81.9	94.5	95.1	92.4	95.9	95.8	95.6	96.4	95.1	92.1	95.4	92.3	91.6
1/2"	89.6	93.1	74.1	82.4	95.1	95.7	92.8	96.4	96.4	96.1	97.0	96.1	95.6	96.0	95.2	92.2
Coke Parameters																
% Breeze (-1/2")	10.4	6.9	25.9	17.6	4.9	4.3	7.2	3.6	3.6	3.9	3.0	3.9	4.4	4.0	4.8	7.8
Mean Coke Size	1.99	1.99	1.92	2.06	1.99	2.19	2.05	2.14	2.05	2.04	2.11	1.85	1.89	1.98	1.85	2.02
Apparent Spec. Gravity	0.960	0.897	Missing	0.994	0.944	0.922	0.936	0.878	0.945	0.959	0.942	0.882	0.921	0.930	0.873	0.947
Tumbler Test																
ASTM Stability %	62.5	50.6	26.1	34.4	48.2	48.5	44.5	54.4	53.7	45.5	51.8	39.6	49.0	48.2	18.5	45.4
Hardness	65.2	69.3	39.8	48.4	66.2	65.5	62.5	64.0	67.0	64.0	66.3	71.2	68.1	65.3	65.5	65.7
7.1.5 50 mm	22.2	12.0	12.7	6.1	6.3	14.8	10.6	14.4	12.5	15.8	12.0	0.7	15.4	7.8	0.8	11.3
25 mm	86.6	83.1	55.5	66.1	83.3	84.2	81.4	89.7	89.2	81.4	83.6	63.4	85.6	85.1	47.4	81.2
15 mm	92.1	90.5	66.3	75.8	92.1	91.6	89.7	93.6	96.0	94.0	89.0	82.3	93.0	90.5	77.8	92.5
Seam No.	Adit 69 10	7	7	7	Hos 9	Spar 1	Hos 9	Hos 10	Hos 9	Hos 9	Hos 9	Hos 8	Hos 4	Hos 7	Adit 14	Adit 13

KAISER STEEL CORPORATION
Steel Manufacturing Division
Interoffice Memorandum

TO: Glenn C. Soth
Chief Chemist

DATE: 28 May 1970

FROM: Marshall E. Numan
Supervisor
Coal & Coke Laboratory

cc: R. G. Hears (3) J. G. John
G. E. Balsley M. D. Mittelman
R. L. Wilson C. F. Banninghoff

PROGRESS REPORT NO. 1

LABORATORY OVEN COKING TESTS USING CANADIAN DOMINION GOVERNMENT BLOCK HOSMER MOUNTAIN COALS WITH SUNNYSIDE AND YORK CANYON COALS

KAISER STEEL CORPORATION - STEEL MANUFACTURING DIVISION
FONTANA, CALIFORNIA FEBRUARY - MAY 1970

I. INTRODUCTION:

1. Coking tests using Dominion Government Block Coal were requested by Mr. R. G. Hears, Vice President, Mining and Raw Materials, Oakland.

2. The purpose of these tests was to determine if the Hosmer Mountain coal compares favorably with the Crows Nest Balmer coal for use in coal blends to make metallurgical coke.

II. SUMMARY:

1. Three samples of Hosmer Mountain coal were received at Fontana between February and May 1970. Each sample was tested for coking qualities at 100% and as 30% of a coal blend with 70% high volatile coal consisting of equal portions of Sunnyside and York Canyon coals.

2. Physical properties of cokes produced were compared with coke results in which Crows Nest Balmer coal was carbonized at 100% and as 30% of a coal blend with Sunnyside and York Canyon coals.

III. CONCLUSIONS:

1. Carbonization of Hosmer Mountain coals, both at 100% and as 30% of a coal blend with high volatile coal, have produced cokes with physical properties satisfactory for metallurgical use.

2. Blending of Hosmer Mountain coals with high volatile Sunnyside and York Canyon coals produced a weaker coke than coke produced by blending Balmer coal with the same high volatile coals.

IV. PROCEDURES:

1. Sunnyside and York Canyon coals were obtained from plant stock for blending with the three Hosmer Mountain coals.

2. Standard laboratory procedures were followed for preparing and sampling the test mixtures, and testing the resulting cokes.

V. DISCUSSION:

1. The coals from the Hosmer Mountain area show variations in volatile matter content. Adits 1 and 2 have volatile matter content of 28%; whereas, Adit 3 shows a volatile matter of 25.5%. On a dry mineral matter free basis, Adits 1 and 2 are on the borderline between medium volatile and high volatile bituminous coal. Adit 3 is definitely in the medium volatile range.

2. No signs of weathering were visible in the samples of Hosmer Mountain coal as received at Fontana. However, from the results of the Gieseler Plastometer tests, this coal is subject to oxidation. As may be noted in Table I, Adit 1 coal, when first checked in February, showed a maximum fluidity of 95 DD/min. A second test run in May showed a maximum fluidity of 20 DD/min. Adits 2 and 3 were tested in a much shorter period so no degree of oxidation was noticeable, although Adit 3 gave a maximum of only 8 DD/min.

3. Adit 1 coal retained a free swelling index of 5, Adit 2 showed an FSI of 4, and Adit 3 showed an FSI of 3-1/2. Adit 3 coal, which showed a plastometer maximum of only 8 DD/min, and an FSI of 3-1/2, also gave the poorest coke physical results of the three Hosmer Mountain coals tested.

4. Screen test results, given in Table II, showed that Adit 3 coal produced less large sized coke than Adits 1 and 2 coal, and also produced more -5/8" coke breeze. This condition held true in both the 100% coking tests and in the 30% blends with Sunnyside and York Canyon coals.

5. Adit 1 coal, when carbonized at 100%, produced coke with a tumbler stability of 56.5 and a hardness factor of 69.1. This is slightly better than the 100% Balmer test which gave a tumbler stability factor of 56.9 and a tumbler hardness factor of 66.3. Adit 2 coal, when carbonized at 100%, gave a tumbler stability of 54.3 and a tumbler hardness of 66.4. Adit 3, gave the poorest tumbler results of the three Hosmer Mountain coals with a stability factor of 50.1 and a hardness factor of 63.7.

6. Also shown in Table II are the results of the 30% coal blends. Each of the three Hosmer Mountain coals, when blended at 30% with Sunnyside and York Canyon coals, produced coke with a stability factor of 58

V. DISCUSSION (Continued):

and hardness factors ranging from 65.6 to 68.1. Balmer coal, on the other hand, when blended at the same percent with Sunnyside and York Canyon coals produced a coke tumbler stability of 58.4 and a hardness of 70.1.

7. Blending the Hosmer Mountain coals with Sunnyside and York Canyon coals improved the coke physical results over the 50-50 Sunnyside, York Canyon coke results by increasing the coke size, and generally decreasing the -5/8" coke breeze. Coke shatter test size was also increased and the -1/2" coke breeze decreased. Coke tumbler stability factors were doubled in all three coking tests, but coke tumbler hardness factors were slightly lower.

8. Hosmer Mountain coals produced a heavy dense coke. Apparent specific gravity tests ran 1.00, .97, and .94 respectively for coke produced from 100% tests of Adits 1, 2, and 3. Likewise, the percent cells ran 48.5, 50.0, and 46.7 for the same cokes. Coke produced from Sunnyside and York Canyon coals, with or without Balmer coal, will have approximately 54% cells.

9. Chemical analyses of the individual coals, coal mixes, and cokes produced are given in Table I. Coke physical test results are given in Table II.

MEM:rb

LABORATORY OVEN COKING TESTS USING CANADIAN DOMINION GOVERNMENT BLOCK HOSMER MOUNTAIN COALS WITH SUNNYSIDE AND YORK CANYON COALS

KAISER STEEL CORPORATION - STEEL MANUFACTURING DIVISION
FONTANA, CALIFORNIA FEBRUARY - MAY 1970

TABLE I

PROXIMATE ANALYSIS, SULFUR AND PLASTIC PROPERTIES OF INDIVIDUAL COALS AND COAL BLENDS, AND ANALYSIS OF COKES PRODUCED

SAMPLE				DRY BASIS V.M.	F.C.	ASH	SUL.	GIESELER P. MAX.	FSI
Hosmer Mountain Coals									
Adit #1									
Test 764				28.5	62.2	9.3	.25	95	5
779				28.1	62.9	9.0	.27	19	4-1/2
Adit #2									
Test 776				28.1	63.7	8.2	.34	16	4
778				28.1	63.7	8.2	.34	25	4
Adit #3									
Test 775, 777				25.5	66.8	7.7	.33	8	3-1/2
Sunnyside									
Test 779				40.3	53.9	5.8	.85	55	
778				40.1	53.3	6.6	.89	50	
777				38.7	54.7	6.6	.89	45	
York Canyon									
Test 779				37.0	55.5	7.5	.44	7700	
778, 777				37.3	55.5	7.2	.44	6800	
Coal Blends	% S.S.	% Y.C.	% HOSMER						
Test 779	35	35	30	36.0	56.5	7.5	.53	180	6
778	35	35	30	34.7	57.9	7.4	.53	75	6
777	35	35	30	35.6	58.9	7.5	.56	190	6

Laboratory Oven Coking Tests Using Canadian Dominion Government Block Hasmar Mountain Coals with Sunnyside and York Canyon Coals

TABLE I (Continued):

SAMPLE	DRY BASIS V.M.	F.C.	ASH	SUL.	GIESELER P. MAX	FSI
Cokes Produced						
Test 764	1.0	87.1	11.9	.22		
779	1.0	87.7	11.3	.43		
776	1.1	87.4	11.5	.25		
778	1.1	87.3	11.6	.43		
775	1.3	88.0	10.7	.31		
777	1.5	86.7	11.8	.44		

PROGRESS REPORT NO. 1

LABORATORY OVEN COKING TESTS USING CANADIAN DOMINION GOVERNMENT BLOCK HOSMER MOUNTAIN COALS WITH SUNNYSIDE AND YORK CANYON COALS

KAISER STEEL CORPORATION - STEEL MANUFACTURING DIVISION
FONTANA, CALIFORNIA FEBRUARY - MAY 1970

TABLE II

CARBONIZATION CONDITIONS AND COKE PHYSICAL TEST RESULTS

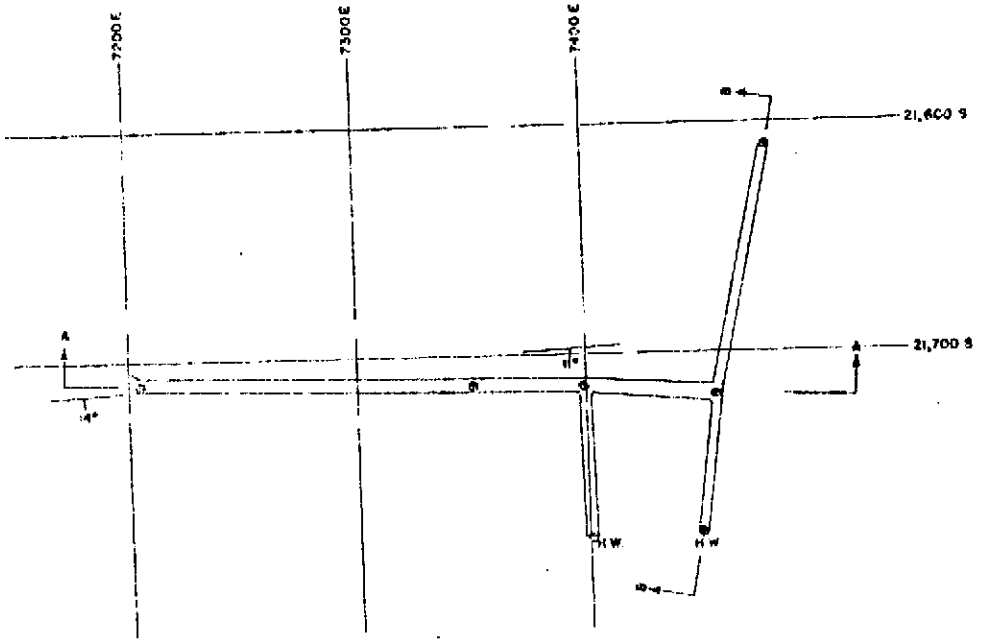
% Sunnyside		35		35		35	50		35
% York Canyon		35		35		35	50		35
% Hosmer Adit #1	100	30							
% Hosmer Adit #2			100	30					
% Hosmer Adit #3					100	30			
% Balmer								100	30
Test No.	**764**	**779**	**776**	**778**	**773**	**777**	**748**	**612**	**745**
Coal Pulv. +1/4"	5.9	12.9	10.1	15.1	10.2	11.0	5.8	10.8	6.0
-1/8"	80.9	67.5	74.2	66.2	72.0	70.0	78.1	75.2	79.8
Coal Moisture %	2.4	3.3	3.1	3.2	3.4	3.1	2.8	6.2	3.7
Bulk Density, Oven PCF	51.9	51.2	51.0	51.6	51.6	51.8	51.8	50.8	51.3
P. Max., Mix DD/min.	95	180	16	75	8	190	350	20	35
Final Coke Temp. °F.	1910	1910	1910	1910	1980	1910	1900	1970	1910
Time to 1600°F., Hrs.	11:00	11:24	10:45	11:19	10:36	11:08	12:30	9:45	11:38
Coke Screen Test +4"	3.6	4.5	1.9	3.6	2.2	2.5	2.6	4.1	7.4
+2"	66.9	72.7	65.1	74.3	67.6	69.2	63.6	73.4	70.6
+1-1/2"	89.0	87.3	87.9	88.7	86.3	85.1	84.3	88.6	90.6
-1"	5.7	7.4	6.2	6.4	9.1	8.9	8.7	7.0	5.7
-5/8"	4.2	4.7	4.7	3.8	7.3	5.6	4.4	5.7	4.0
Coke Shatter Test +2"	60.8	56.7	60.3	66.6	55.2	55.8	42.8	61.2	63.6
+1-1/2"	91.4	82.2	89.1	83.0	86.8	83.9	77.2	87.0	89.4
-1/2"	1.6	3.4	2.2	3.2	3.0	2.6	4.0	2.2	2.0
Coke Tumbler Test Stab.	56.5	38.1	58.5	37.8	50.1	38.0	18.7	55.9	58.4
Hard.	69.1	68.1	68.4	68.2	65.7	65.6	69.2	65.5	70.1
Coke Porosity A.S.G.	1.00	.92	.97	.91	1.03	.94	.83	.98	.90
T.S.G.	1.93	1.91	1.98	1.94	1.95	1.93	1.90	1.94	1.93
% Cells	48.5	51.8	50.8	53.1	46.7	51.3	54.7	49.5	53.4
Physical Fuel Value	57	46	56	48	52	46	31	58	60
Coke Physical Index	89	65	84	74	74	66	45	88	94

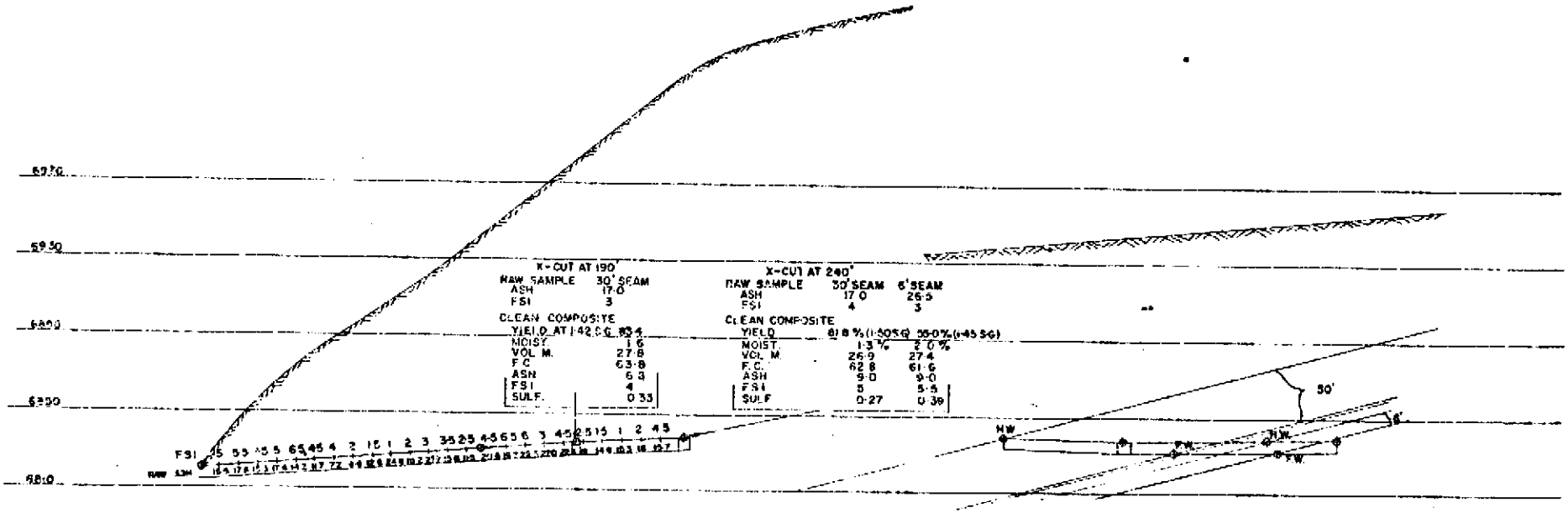
ADIT H-1

HOSMER AREA

SCALE: 1"=40'

U9 SEAM-3.0'
M9 SEAM-6'





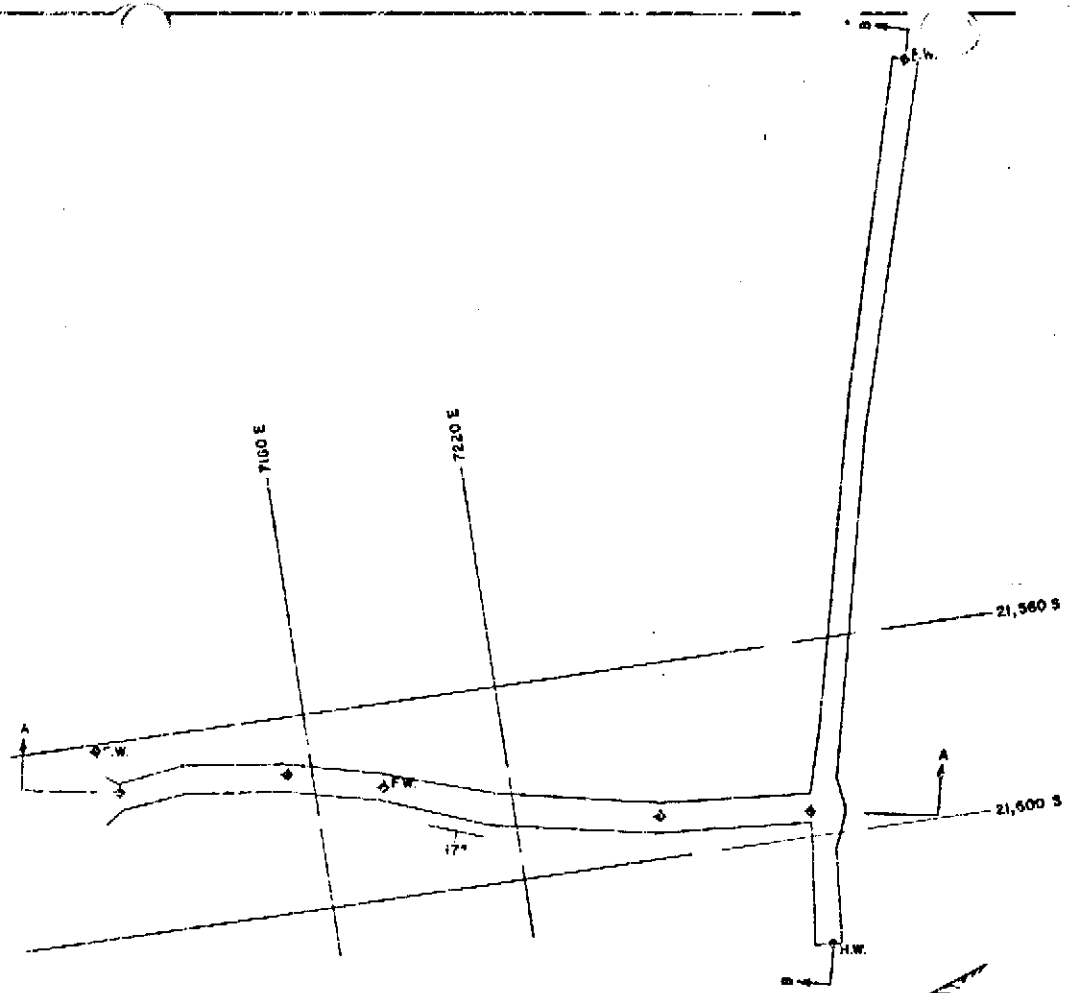
SECTION AA

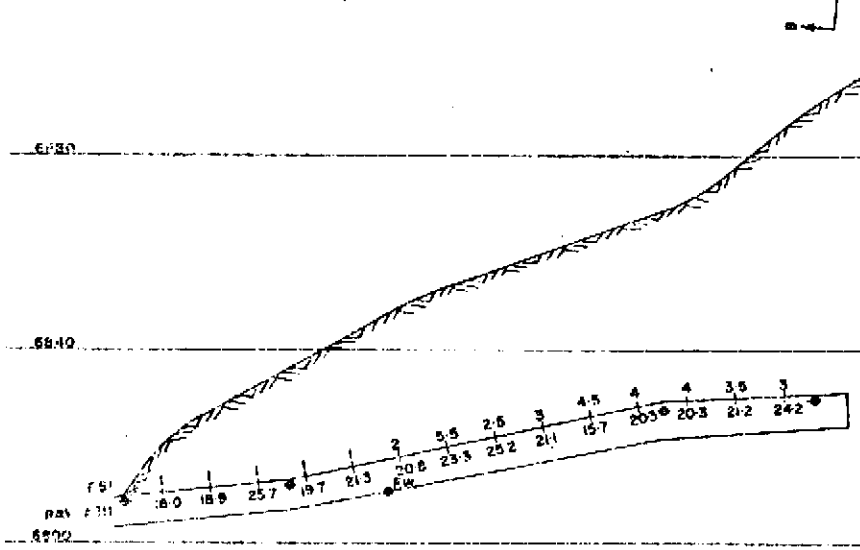
SECTION BB

ADIT H-2

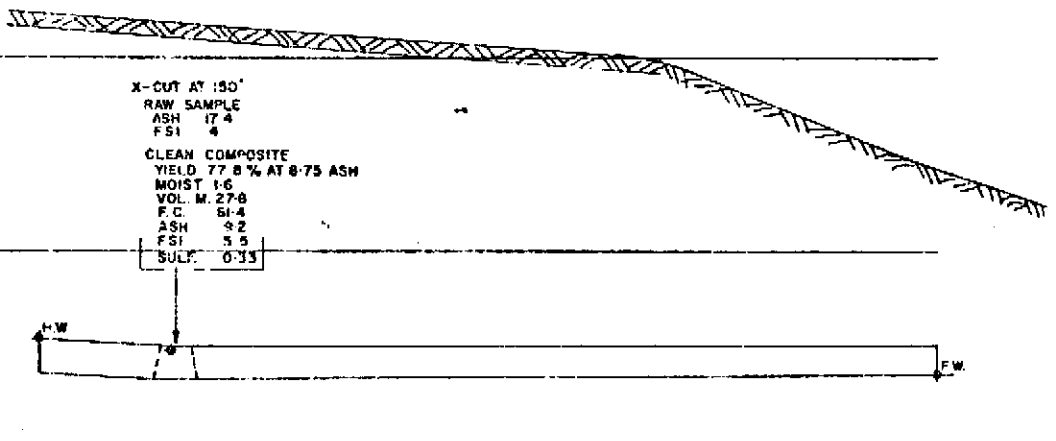
HOSMER AREA (L 9 SEAM-60')

SCALE: 1"=20'





SECTION AA



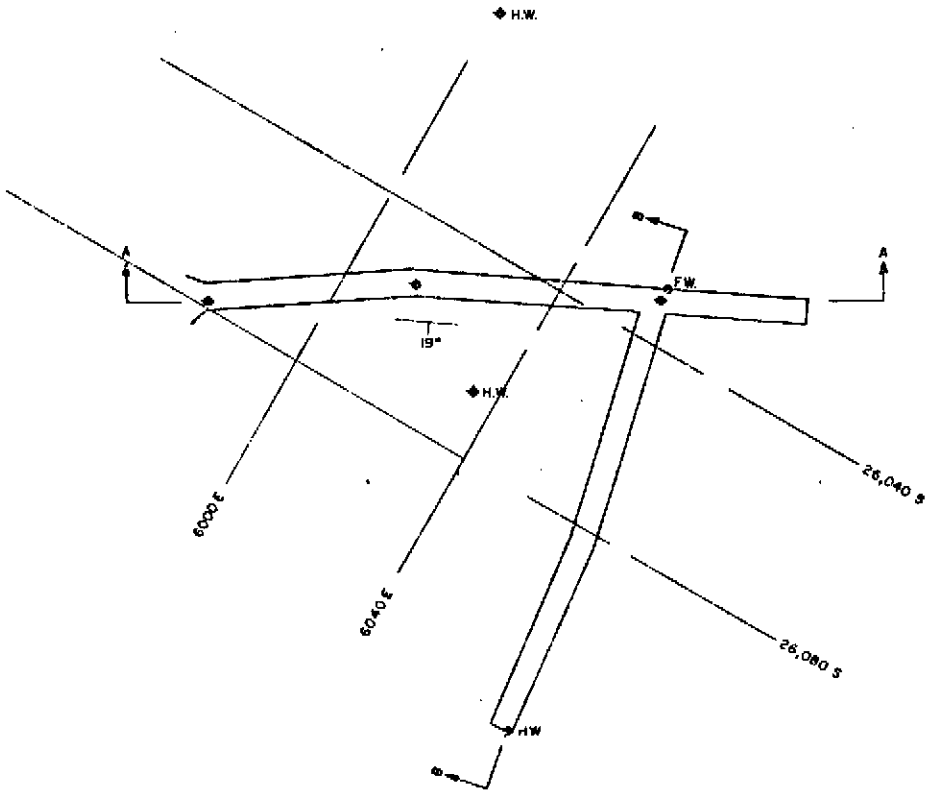
SECTION BB

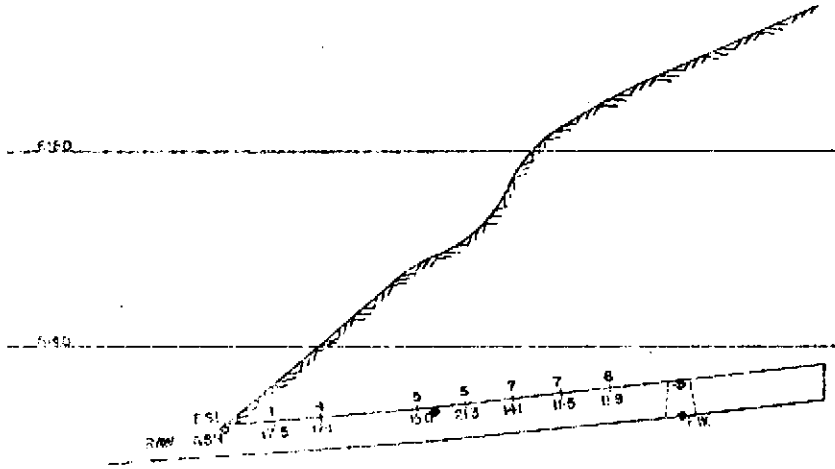
ADIT H-3

HOSMER AREA

SCALE: 1"=20'

U9 SEAM-30'





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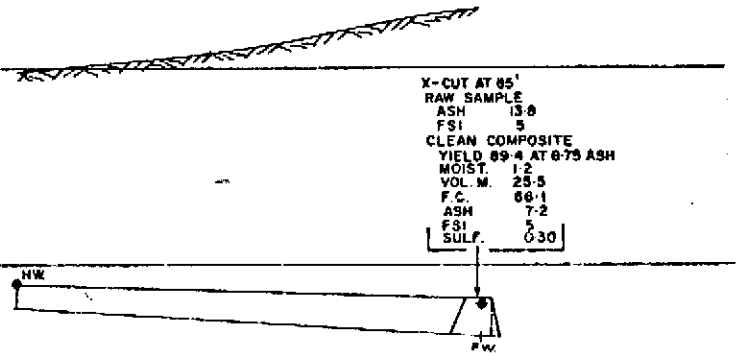
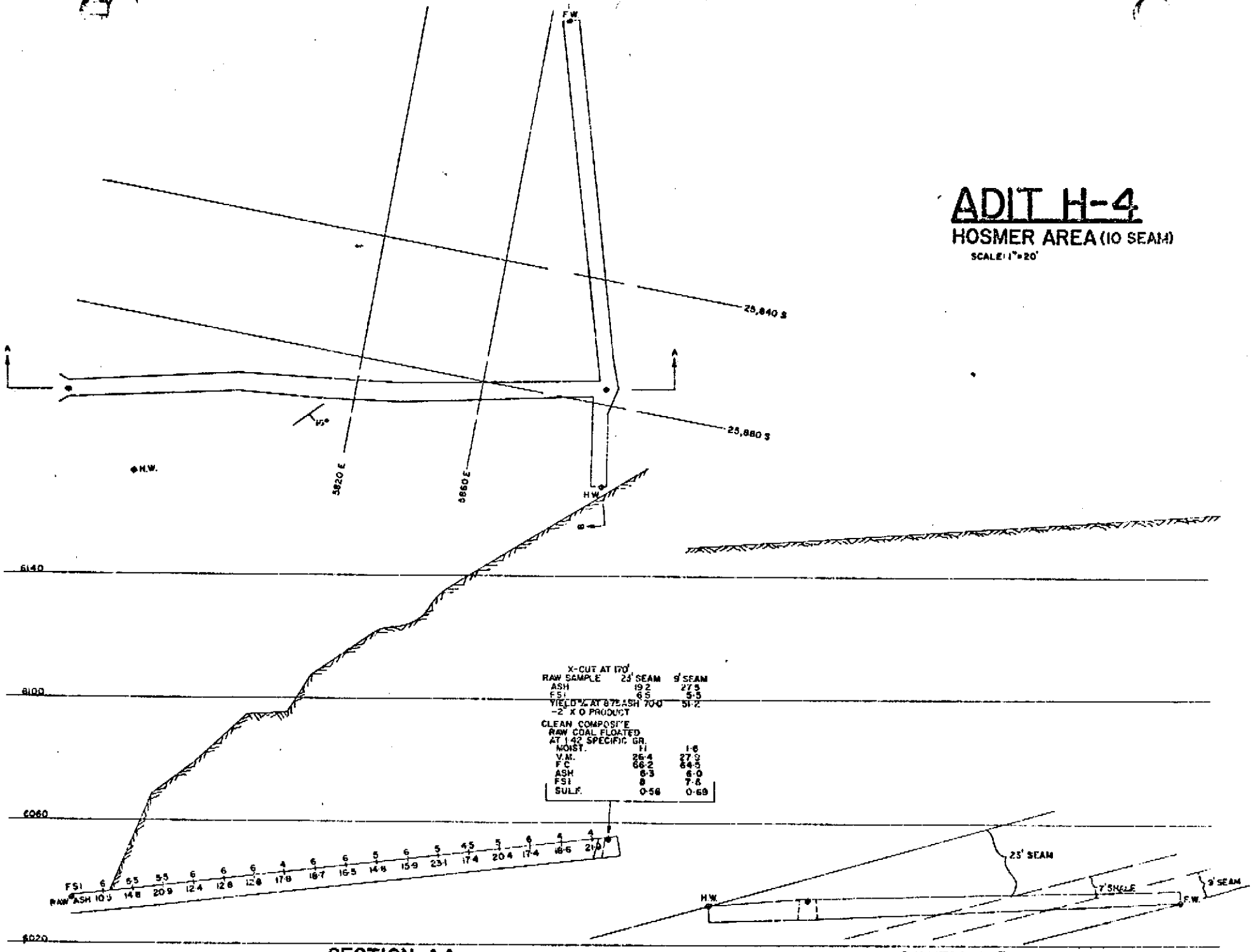


SECTION BB

ADIT H-4

HOSMER AREA (10 SEAM)

SCALE: 1"=20'

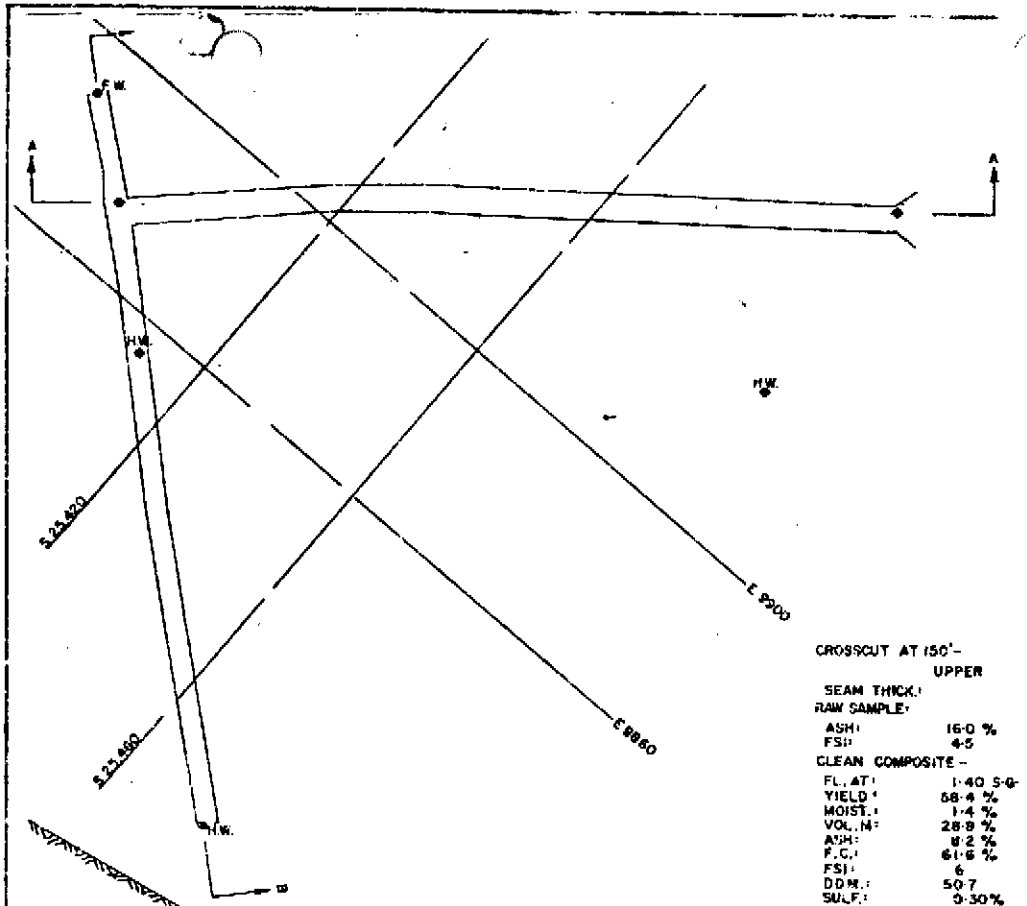


SECTION AA

SECTION BB

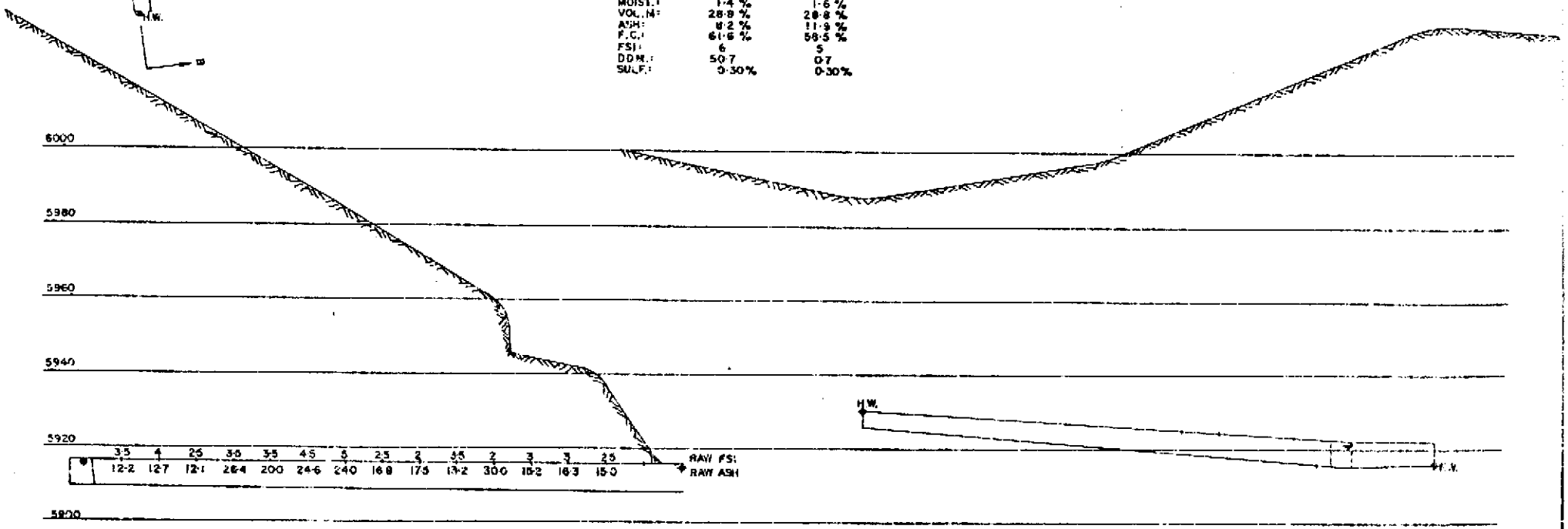
ADIT H-5

HOSMER AREA
9 SEAM



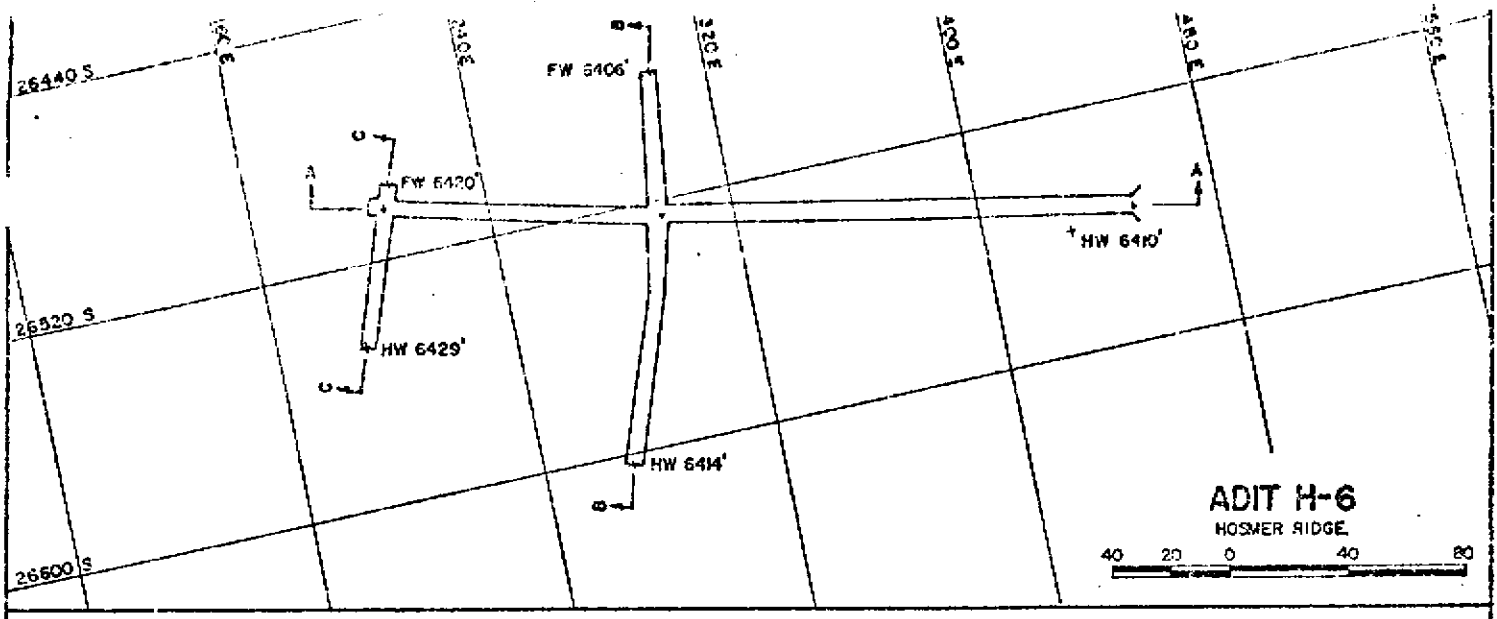
CROSSCUT AT 150'–

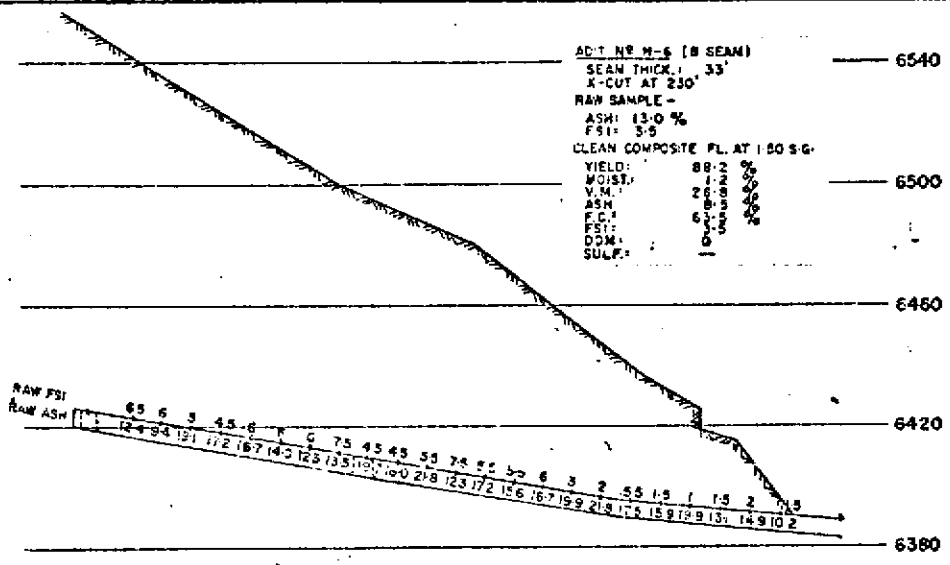
	UPPER	LOWER
SEAM THICK.:		
RAW SAMPLE–		
ASH:	16·0 %	24·5 %
FSI:	4·5	3·5
CLEAN COMPOSITE –		
FL.,AT:	1·40 S·G·	1·60 S·G
YIELD:	58·4 %	71·4 %
MOIST.:	1·4 %	1·6 %
VOL.M:	28·8 %	28·8 %
ASH:	8·2 %	11·9 %
F.C.:	61·6 %	58·5 %
FSI:	6	5
DDM.:	50·7	0·7
SULF.:	0·30%	0·30%



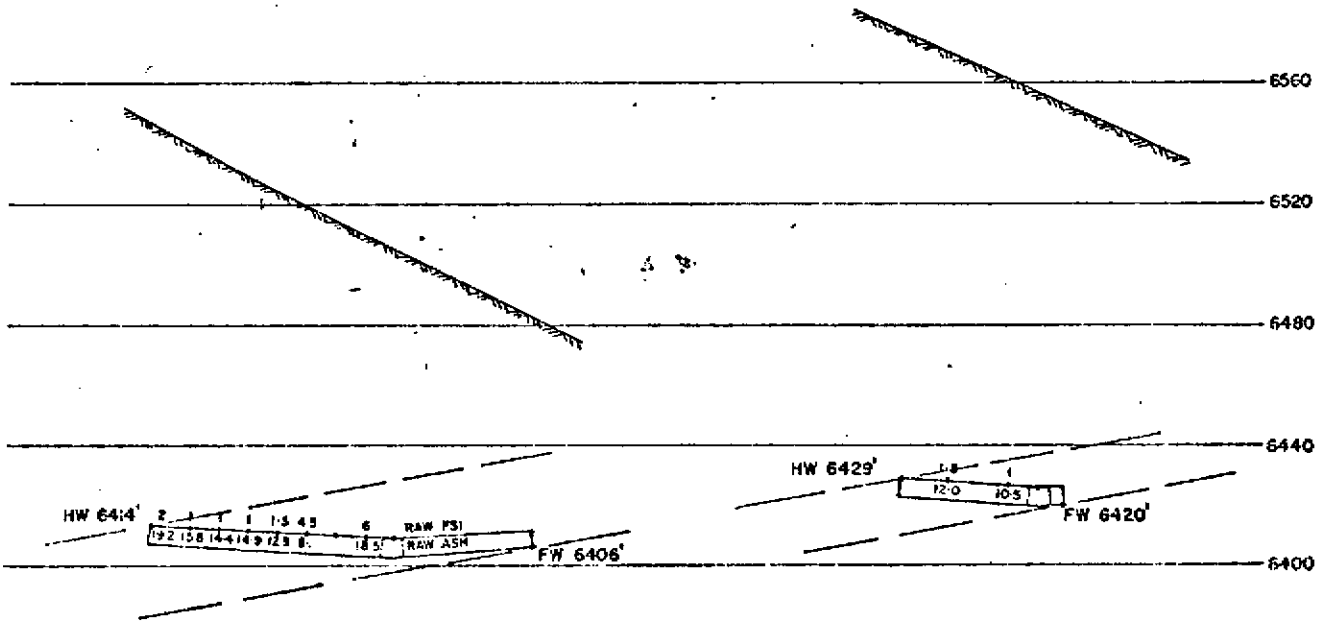
SECTION AA

SECTION BB





SECTION A-A



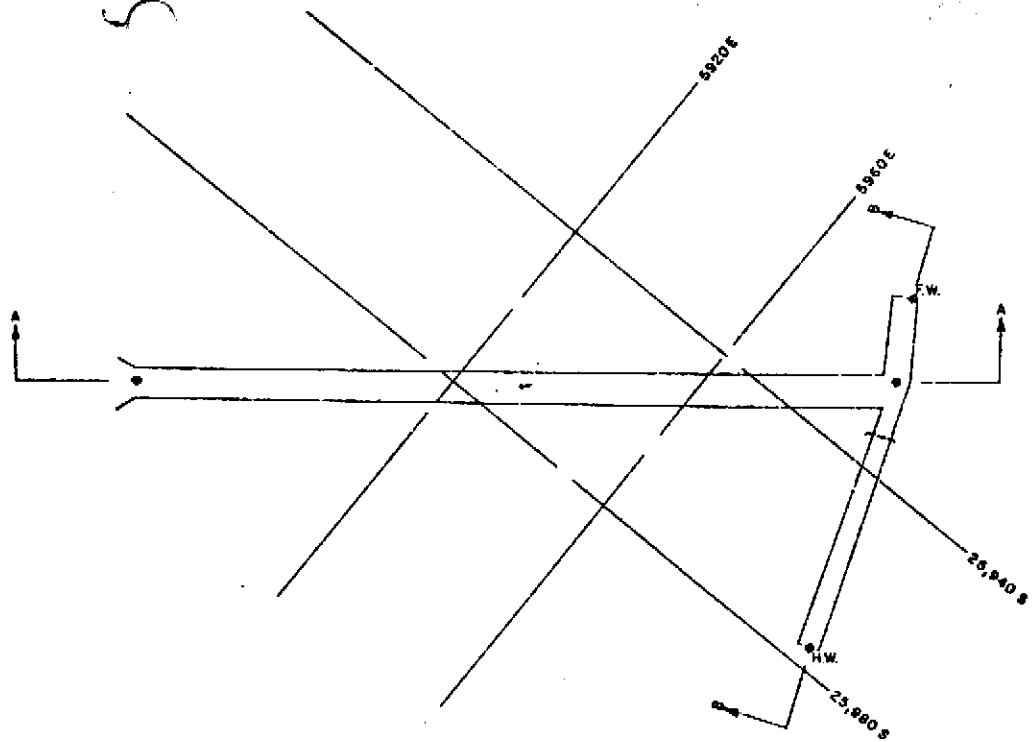
SECTION B-B

SECTION C-C

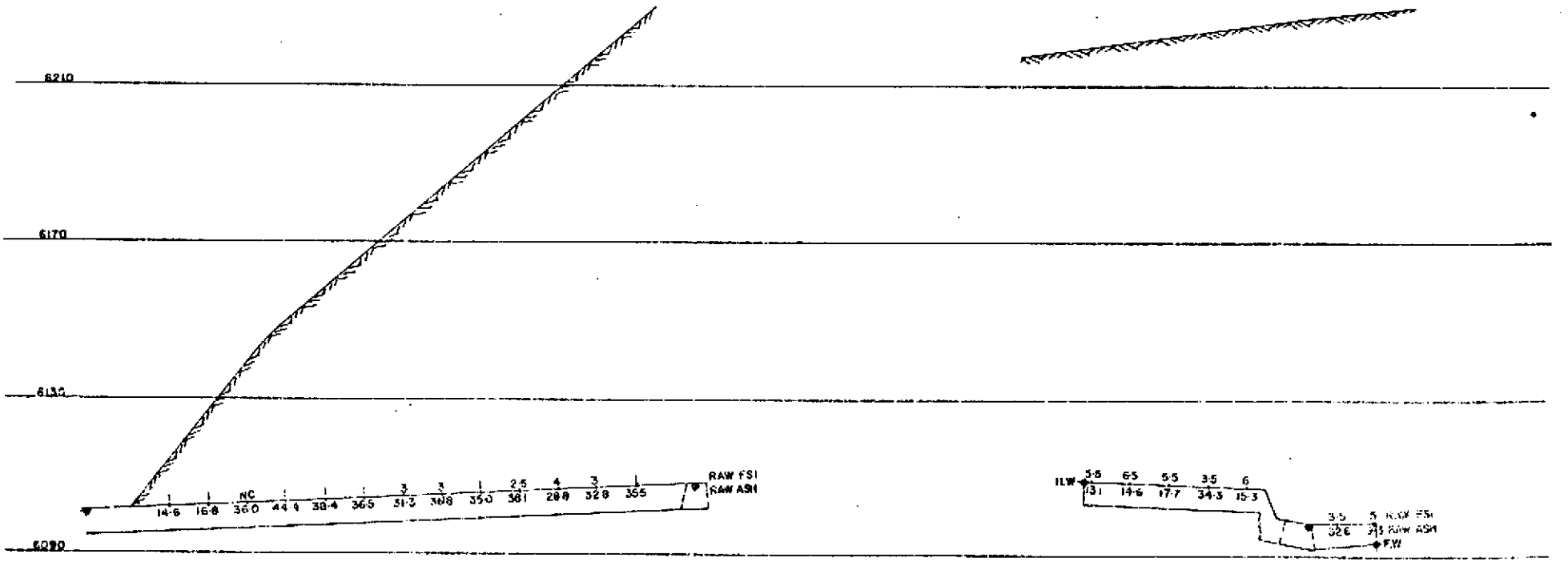
ADIT H-7

HOSMER AREA

SCALE: 1" = 20'

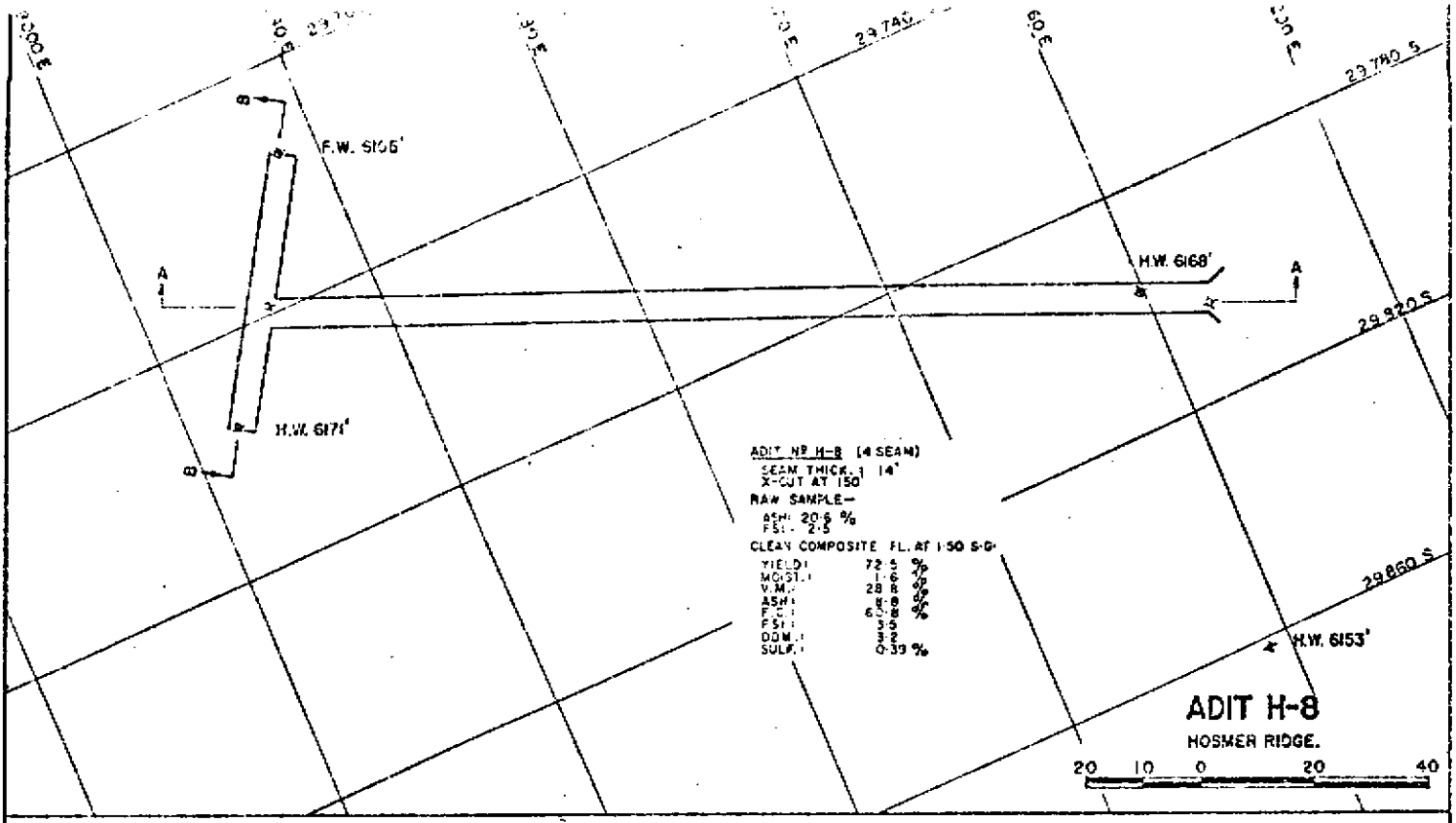


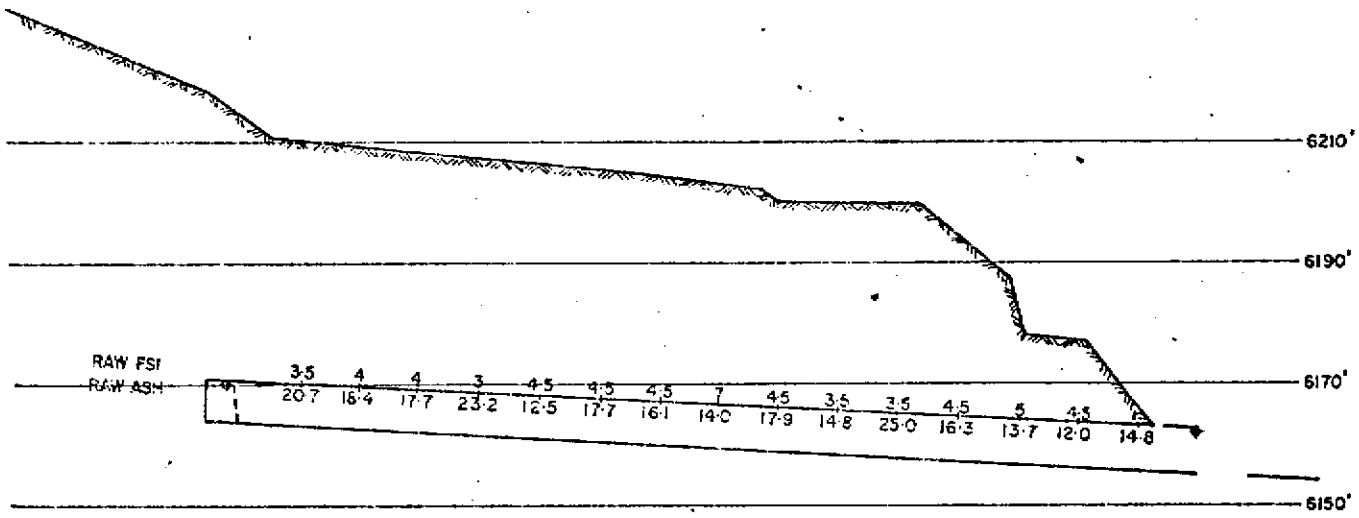
CROSSCUT AT 150' – SEAM ' THICK.
RAW SAMPLE–
ASH: 22·4 %
FSI: 6
CLEAN COMPOSITE FL. AT 1·45
YIELD: 68·7 %
MOIST.: 1·1 %
VOL. M.: 27·1 %
ASH: 7·7 %
F.C.: 64·1 %
FSI: 6
DDM.: 391
SULF.: 0·39 %



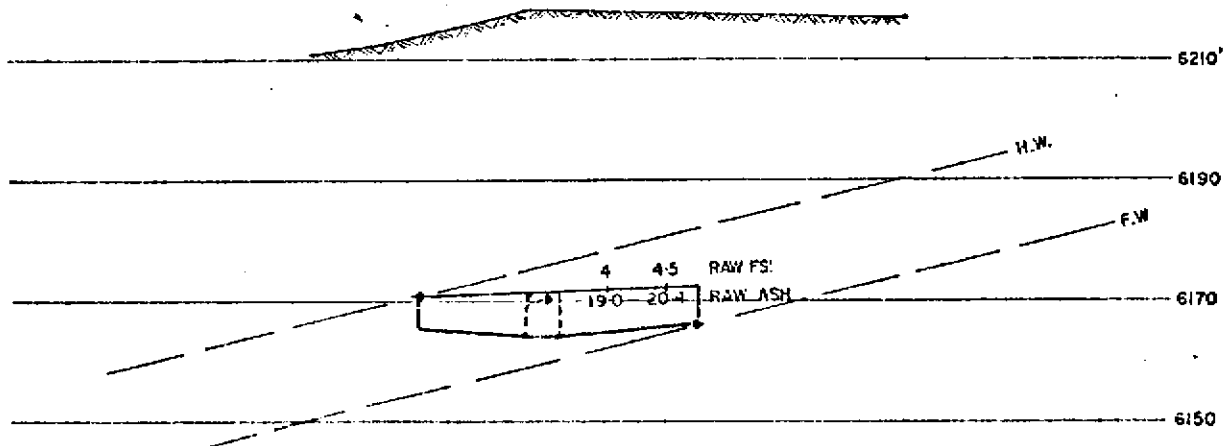
SECTION AA

SECTION BB

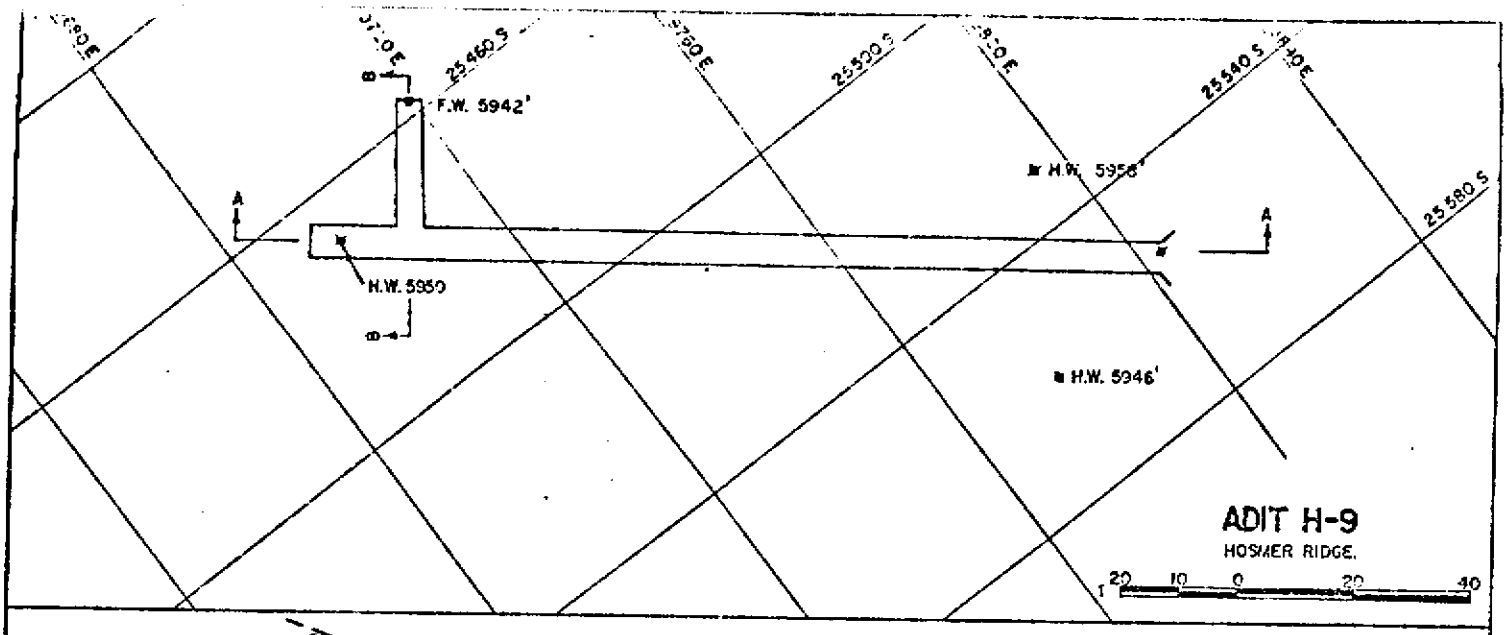


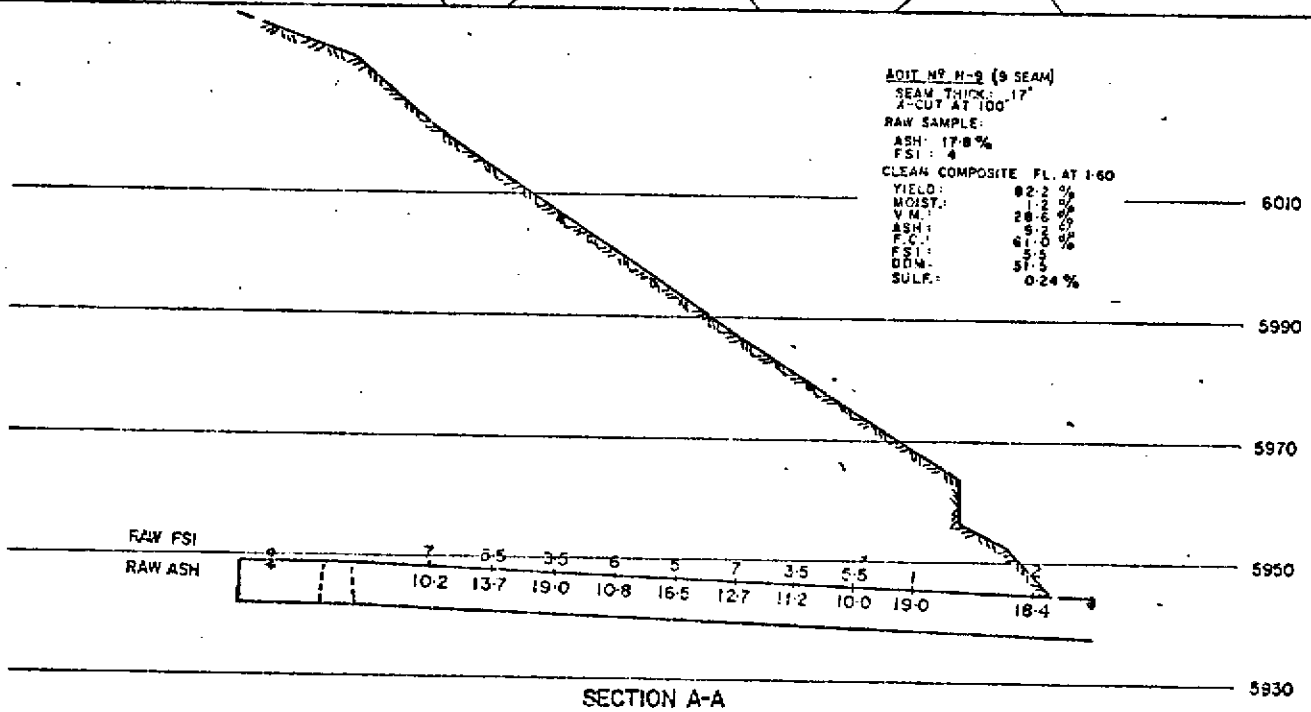


SECTION A-A

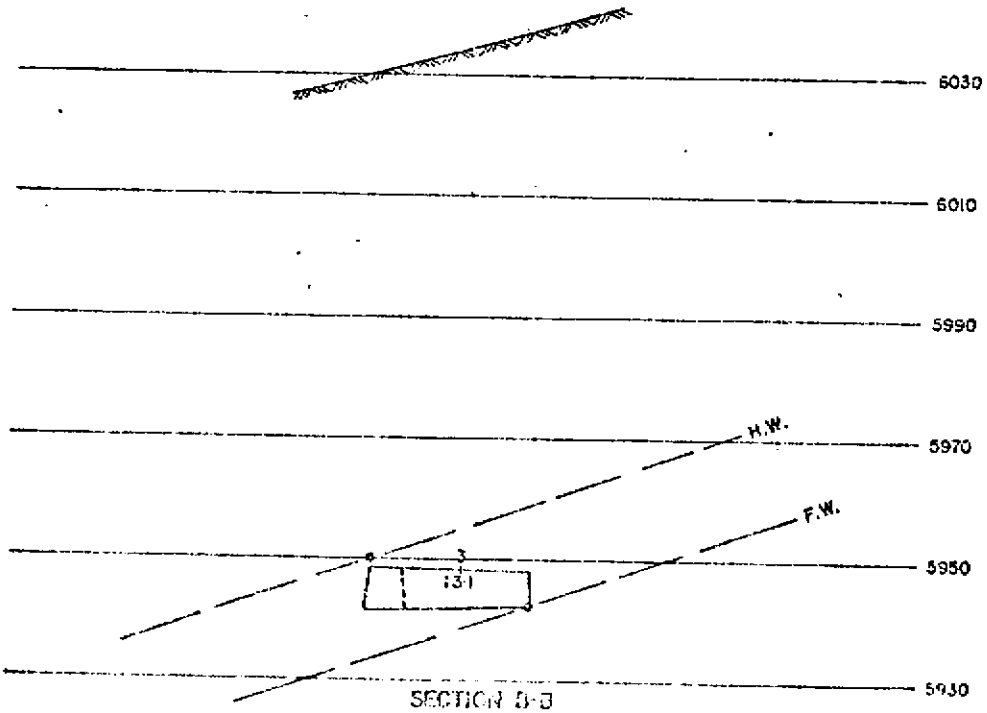


SECTION B-B





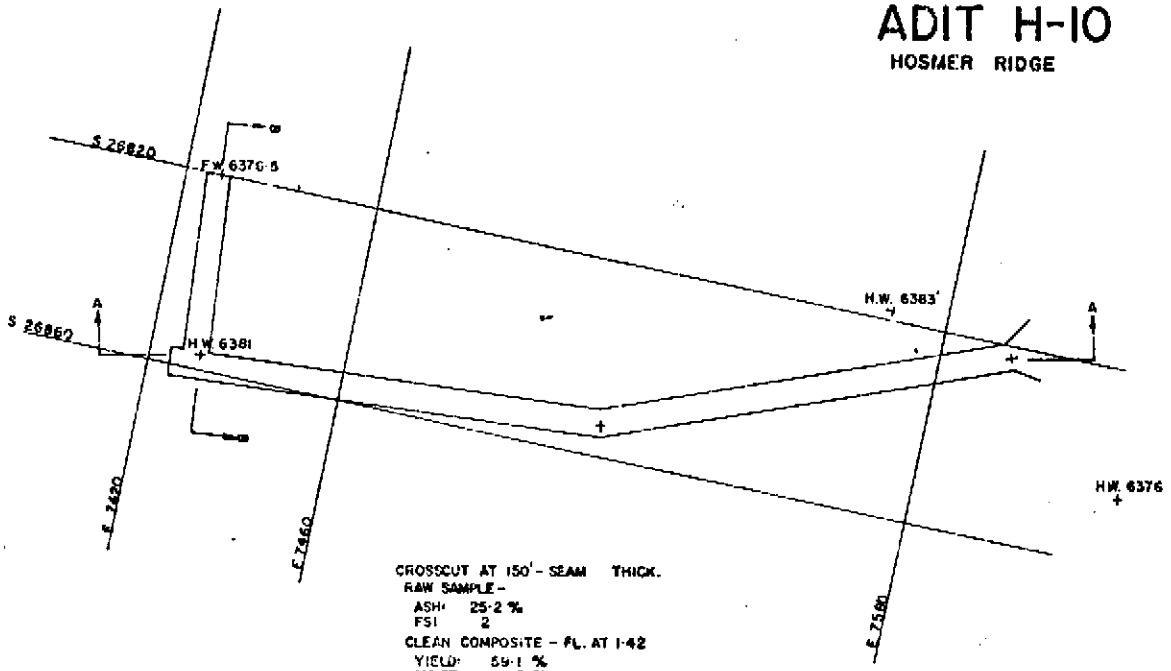
SECTION A-A



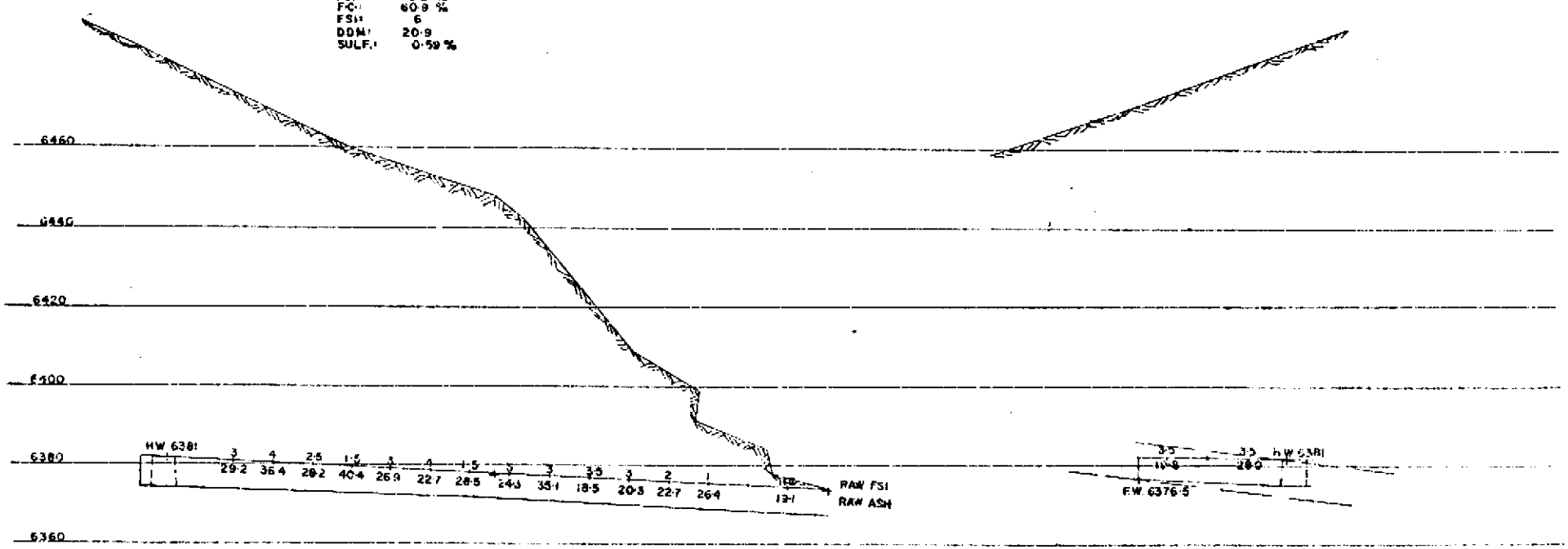
SECTION B-B

ADIT H-10

HOSMER RIDGE

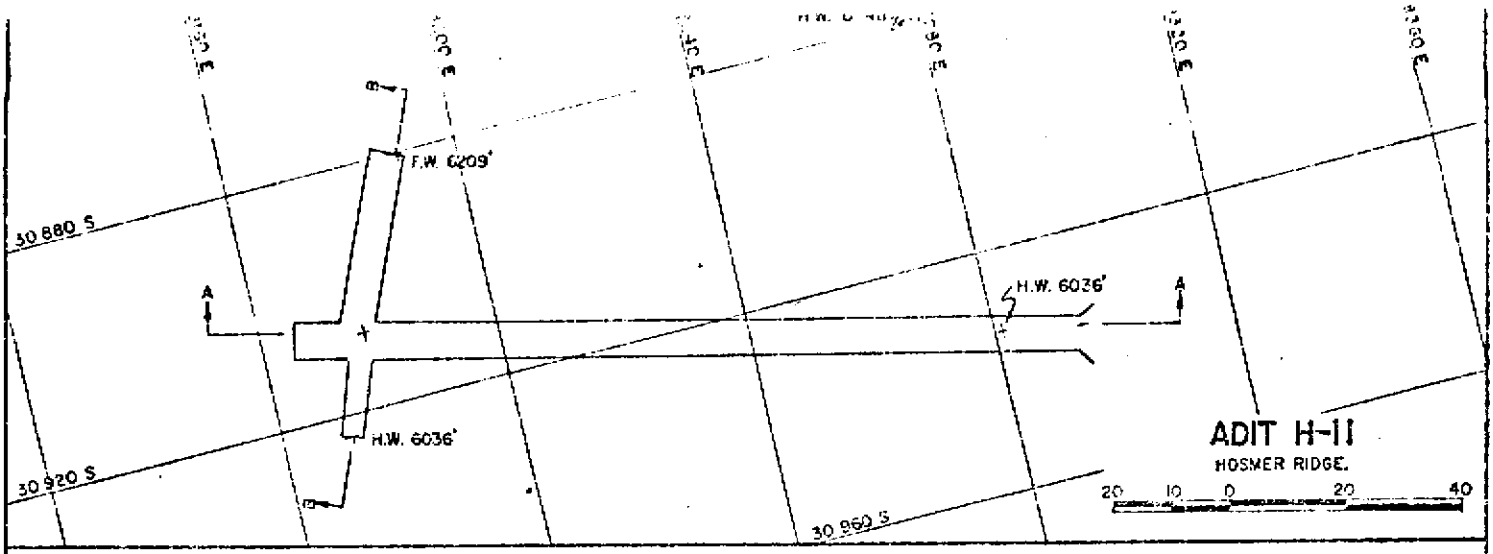


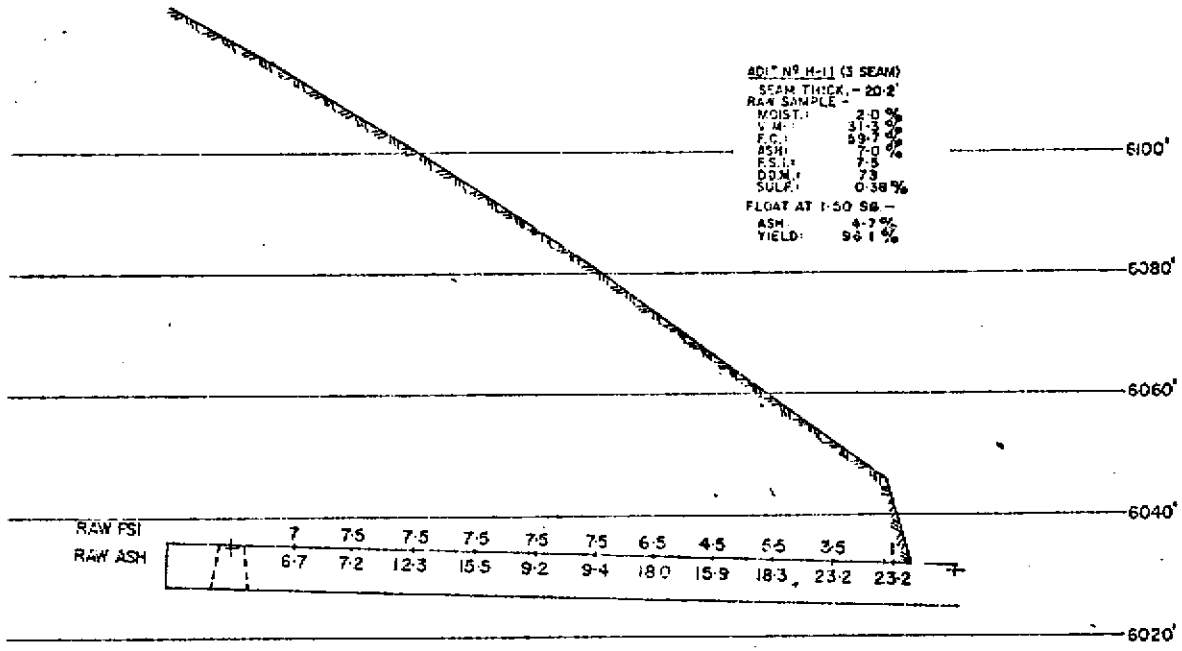
CROSSCUT AT 150' - SEAM THICK.
RAW SAMPLE -
ASH: 25·2 %
FSI: 2
CLEAN COMPOSITE - FL. AT 1·42
YIELD: 59·1 %
MOIST.: 1·8 %
VOL.M.: 29·1 %
ASH: 8·2 %
F.C.: 60·9 %
FSI: 6
DDM: 20·9
SULF.: 0·59 %



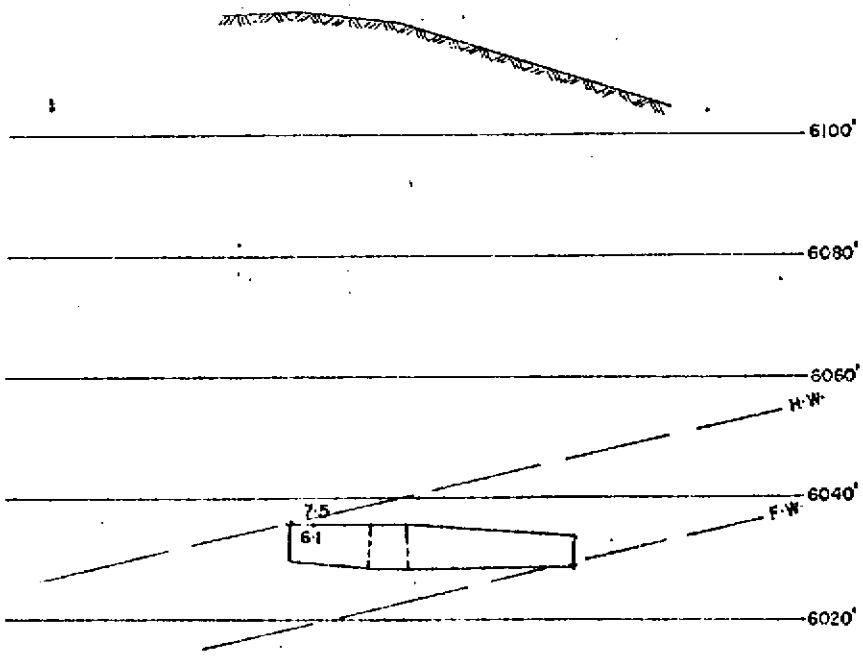
SECTION A-A

SECTION B-B





SECTION A-A



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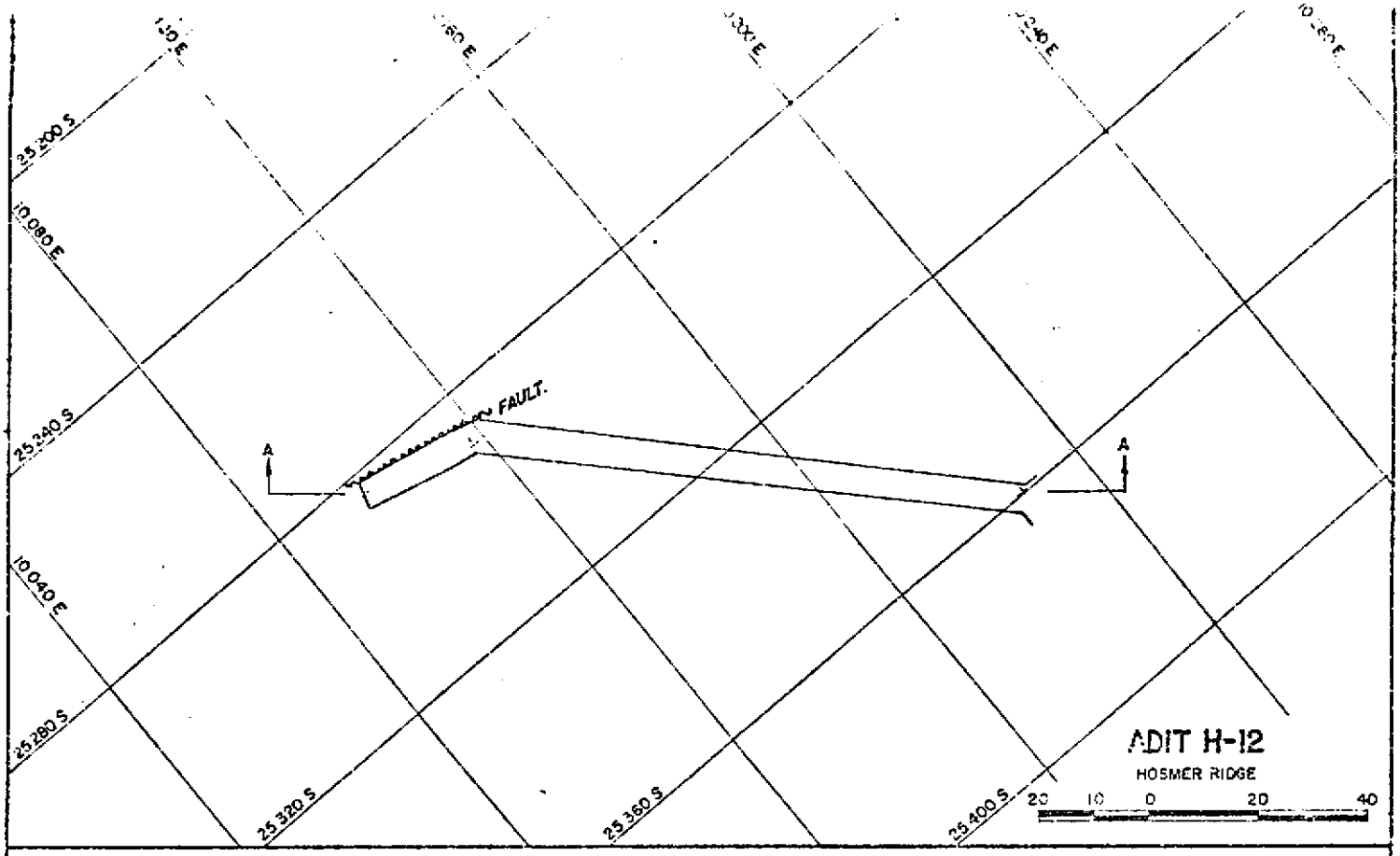
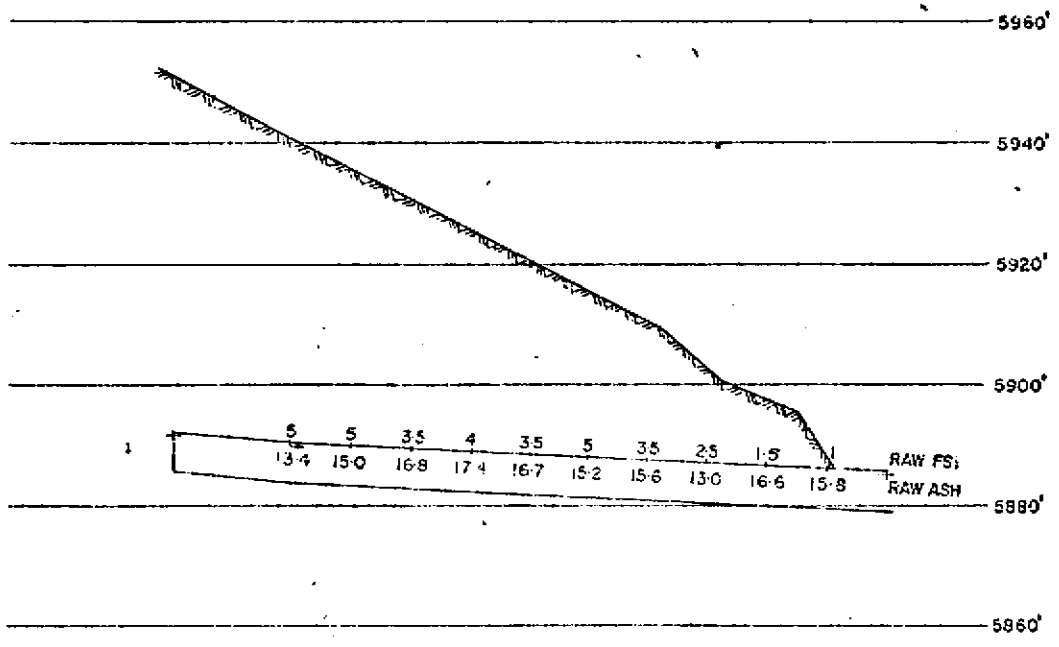
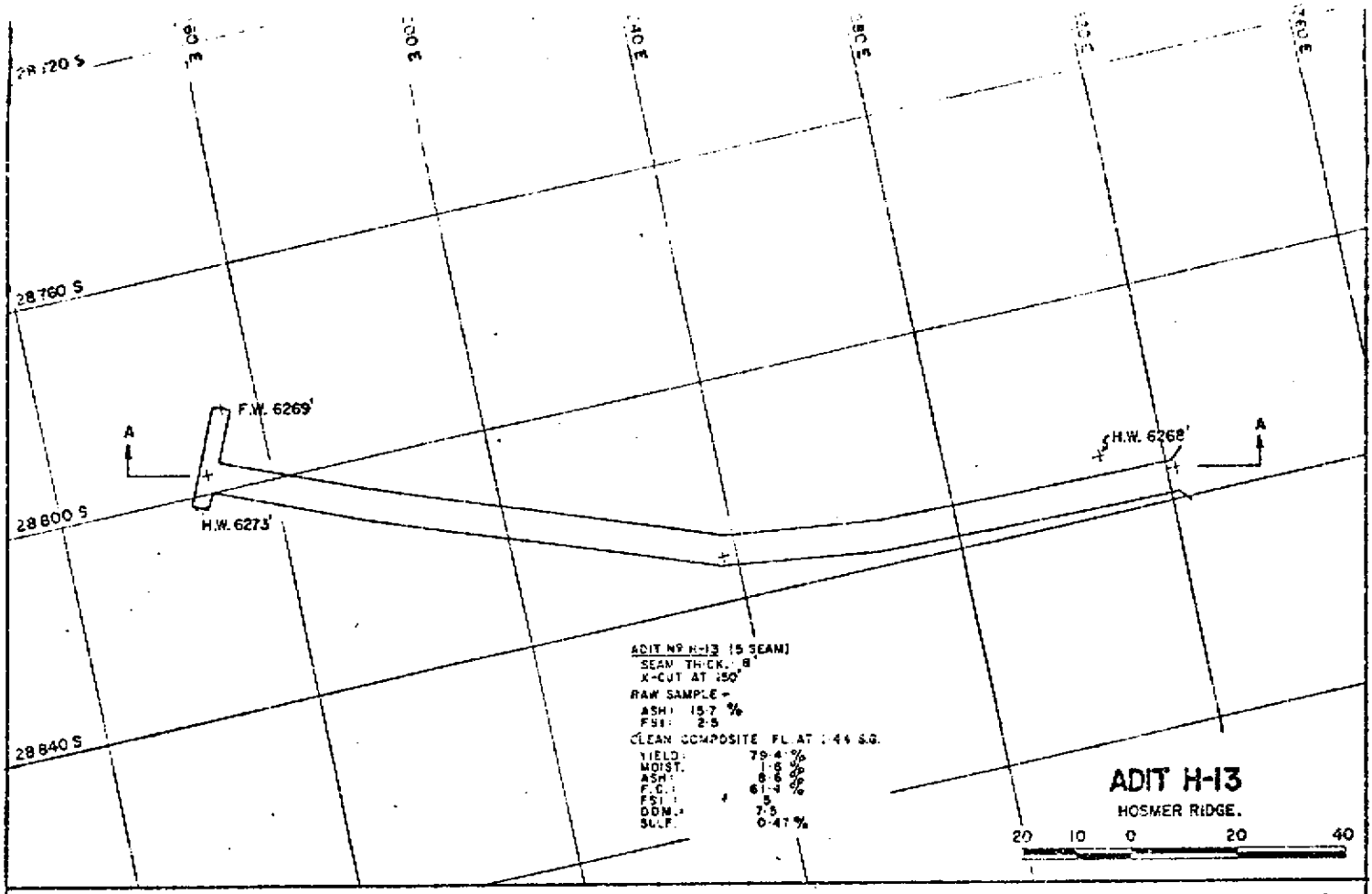
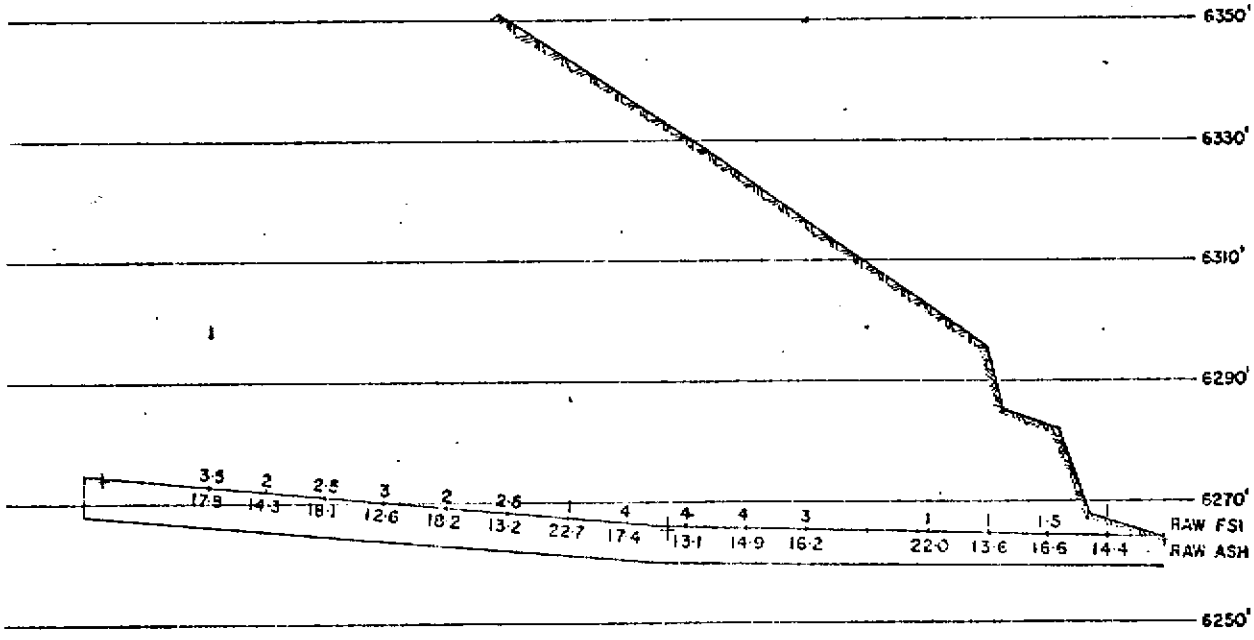




SECTION A-A

N·B· : ENTRY DRIVEN TO 120',
DEFERRED BECAUSE OF SPRING BREAKUP.

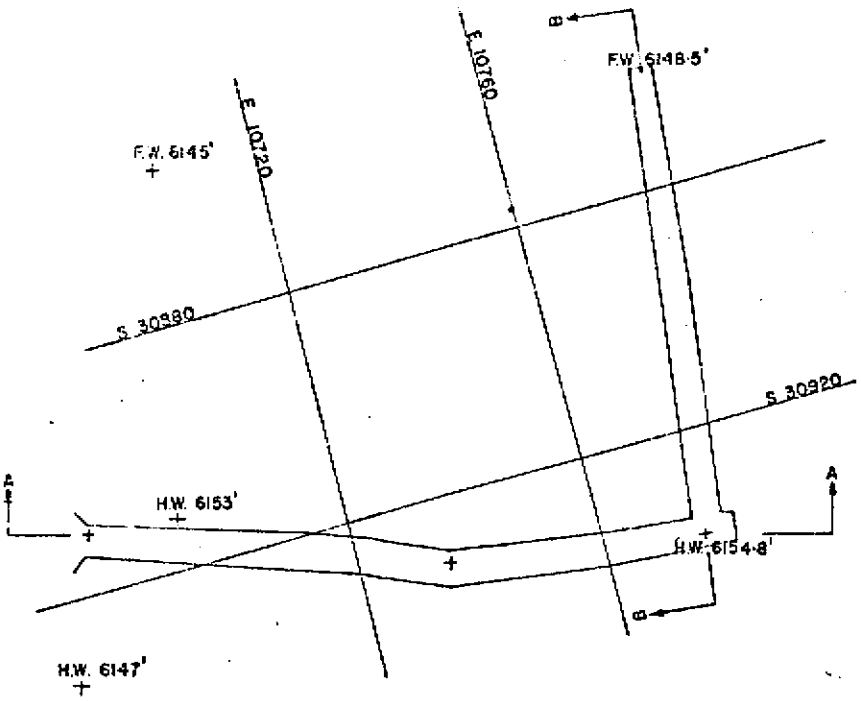

28 720 S
28 760 S
28 800 S
28 840 S
F.W. 6269'
H.W. 6273'
H.W. 6268'
A
A
ADIT Nº H-13 (5 SEAM)
SEAM THICK. 8'
X-CUT AT 150'
RAW SAMPLE -
ASH: 15·7 %
FSI: 2·5
CLEAN COMPOSITE FL AT 1·44 S.G.
YIELD: 79·4 %
MOIST. 1·6 %
ASH: 8·6 %
F.C.: 61·4 %
FSI: 5
DDM.: 7·5
SULF. 0·47 %
ADIT H-13
HOSMER RIDGE.
20 10 0 20 40


6350'
6330'
6310'
6290'
6270'
6250'
3·5 2 2·5 3 2 2·6 1 4 4 4 3 1 1 1·5
17·9 14·3 18·1 12·6 18·2 13·2 22·7 17·4 13·1 14·9 16·2 22·0 13·6 16·6 14·4
RAW FSI
RAW ASH

SECTION A-A

ADIT H-14

HOSMER RIDGE



ADIT N° H-14 (3 SEAM - LOWER)

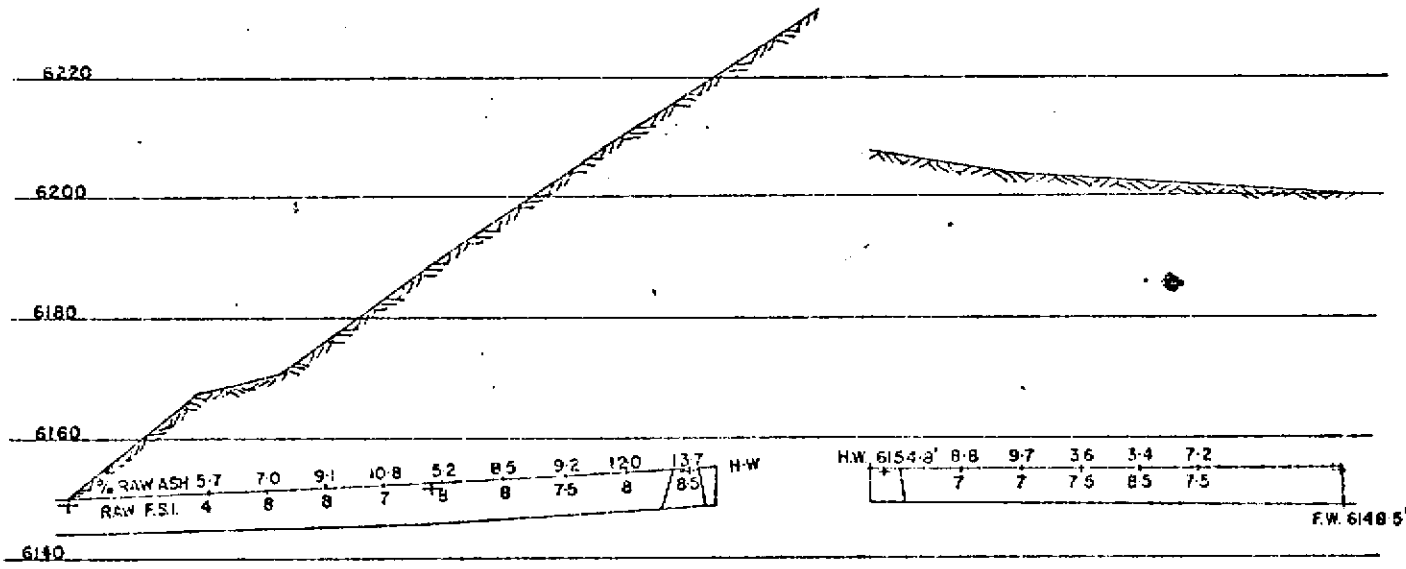
SEAM THICK.- 27·2'

RAW SAMPLE -

MOIST.	1·9 %
V.M.	32·4 %
F.C.	57·3 %
ASH	8·4 %
F.S.I.	7·5
O.J.M.	390
SULF.	0·44%

FLOAT AT 1·50 S.G. -

ASH	4·3 %
YIELD	93·7 %

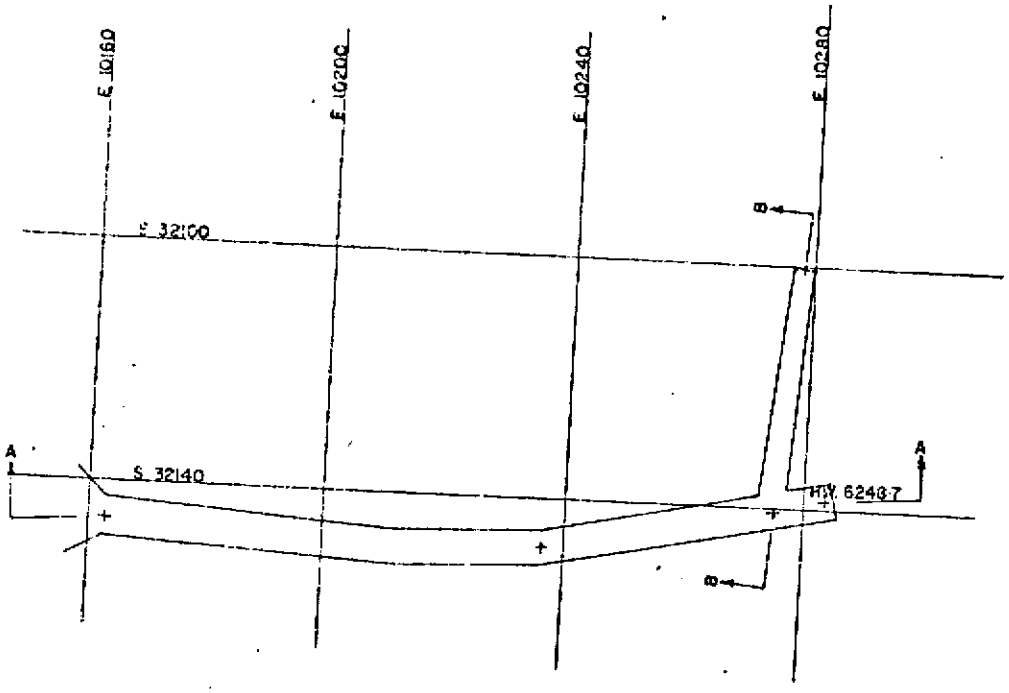


SECTION A-A

SECTION B-B

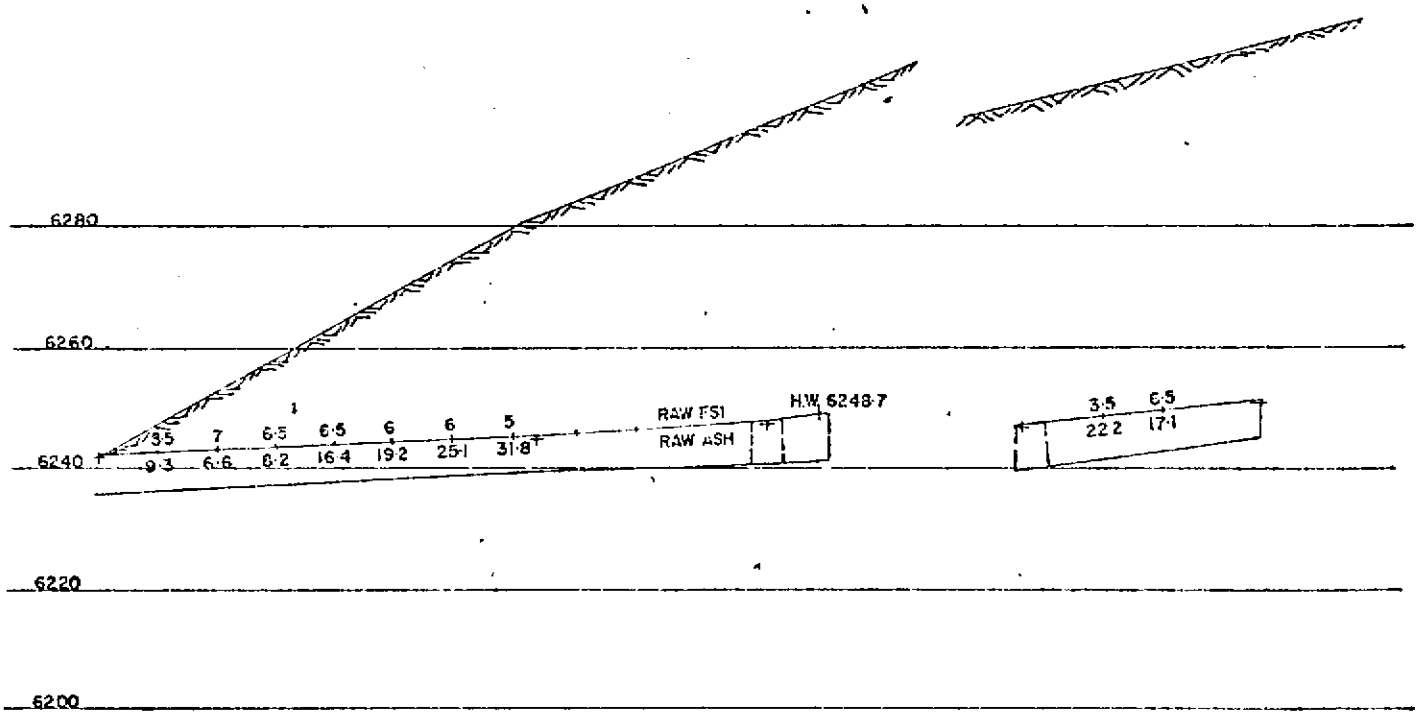
ADIT H-15

HOSMER RIDGE



ADIT No H-15 (2 SEAM)
SEAM THICK.: 19'
H-CUT AT 90°
RAW SAMPLE –
ASH: 33·8 %
FSI.: 3
CLEAN COMPOSITE FL. AT 1·57 S.G.

YIELD:	56·3 %
MOIST.:	3·6 %
ASH:	7·6 %
F.C.:	87·4 %
FSI:	6·5
DDM:	189
SULF.:	0·58 %

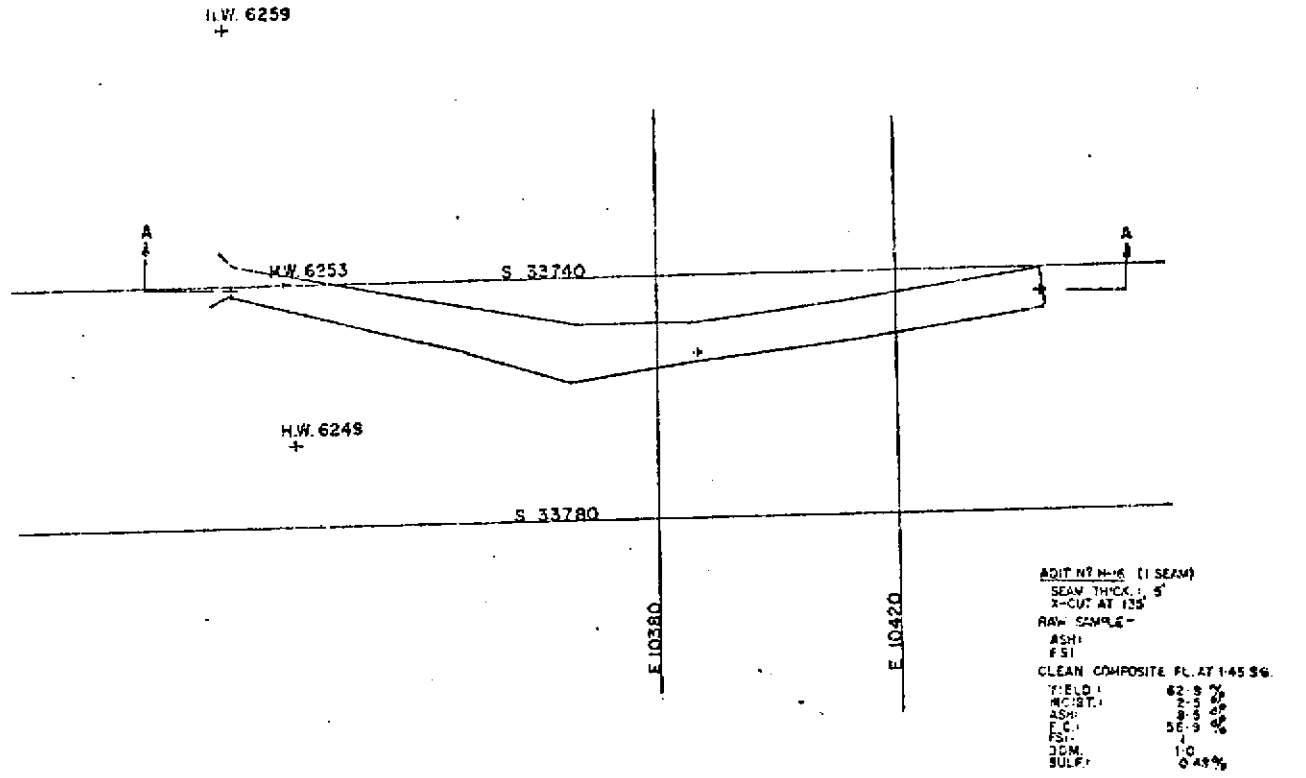


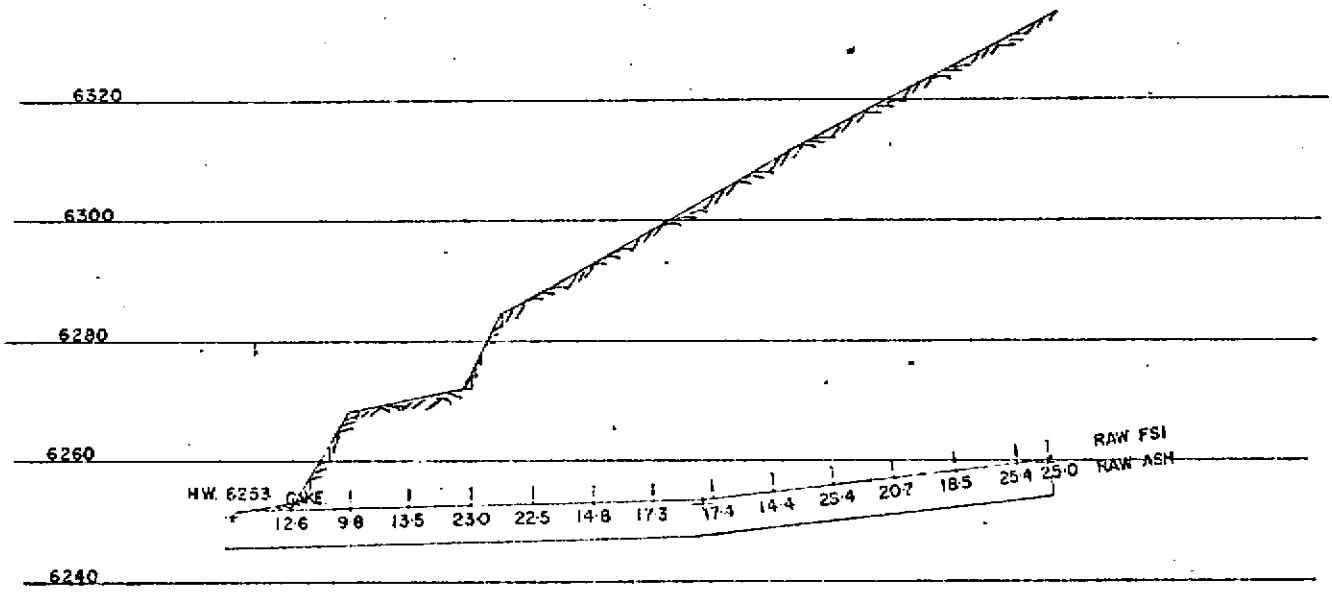
SECTION A-A

SECTION B-B

ADIT H-16

ROSMER RIDGE

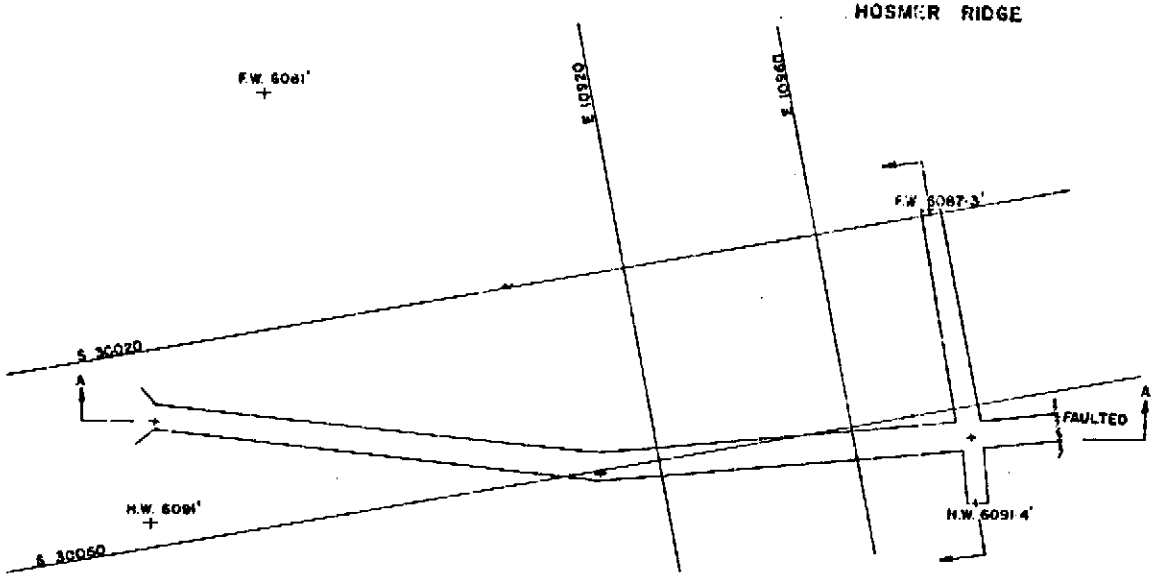




SECTION A-A

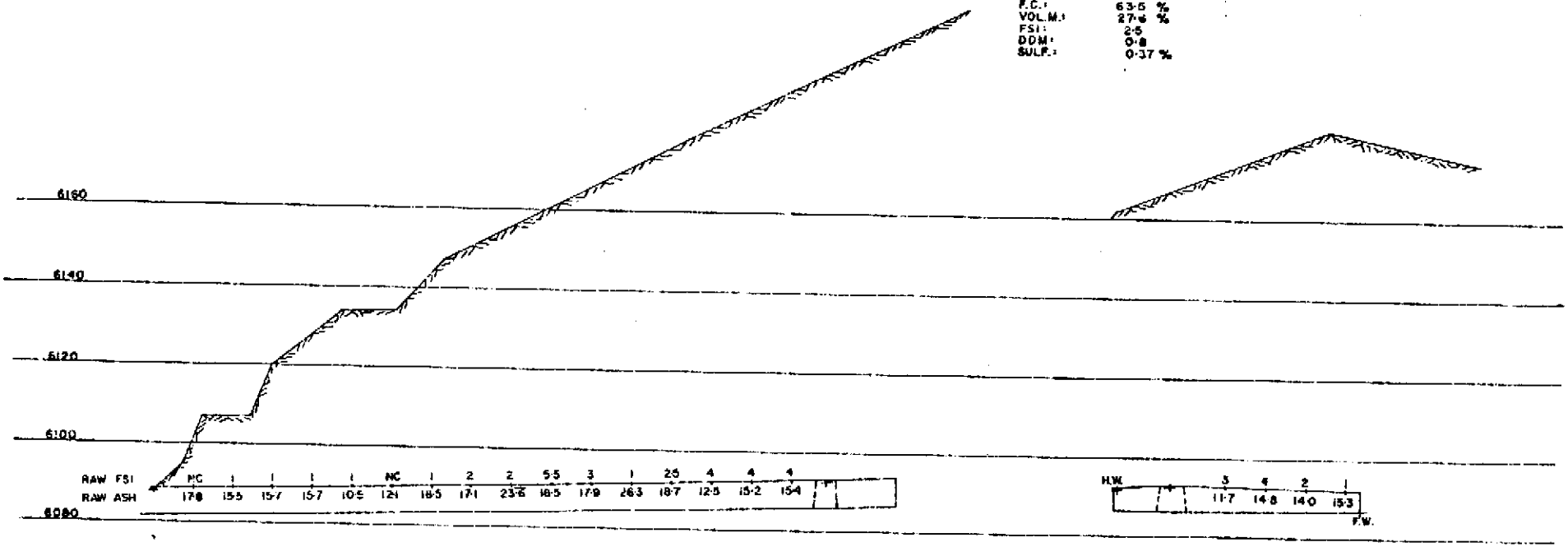
ADIT H-17

HOSMER RIDGE



CROSSCUT AT 170' - SEAM '' THICK.
RAW SAMPLE –
ASH: 22·0 %
FSI: 1·0
CLEAN COMPOSITE FL. AT 1·45 8·9

YIELD :	66·5 %
MOIST. :	1·7 %
ASH :	7·2 %
F.C. :	63·5 %
VOL.M. :	27·6 %
FSI :	2·5
DDM :	0·8
SULP. :	0·37 %

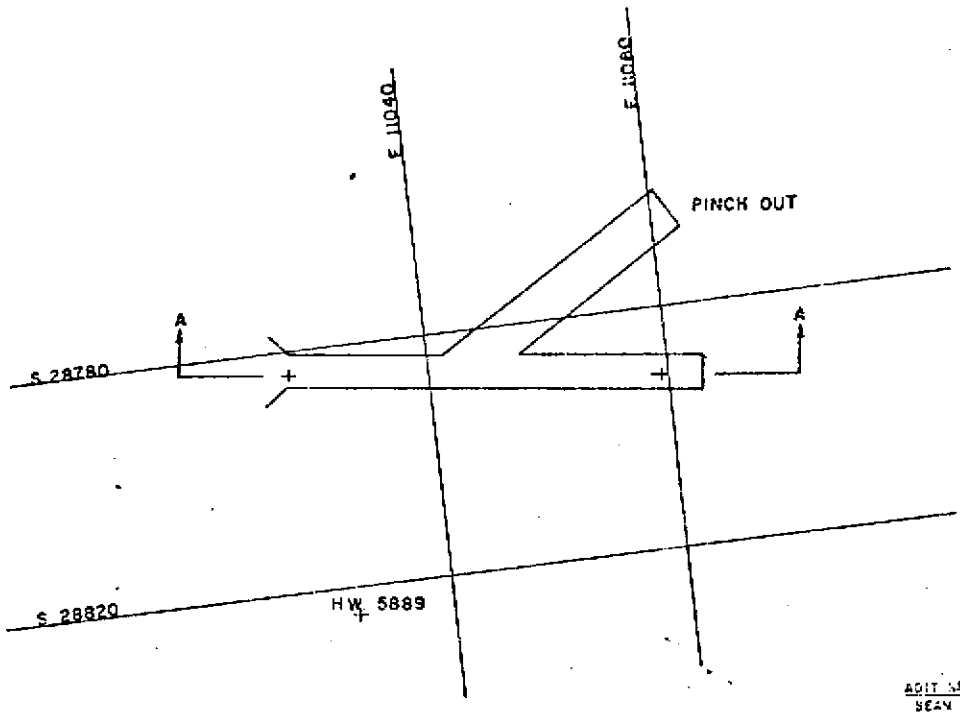


SECTION A-A

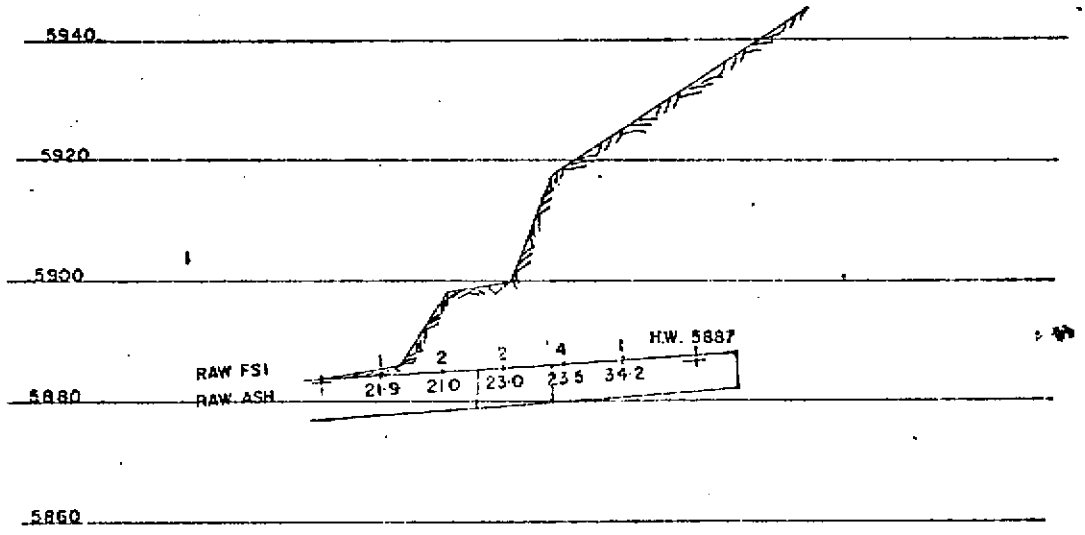
SECTION B-B

ADIT H-18

HOSMER RIDGE



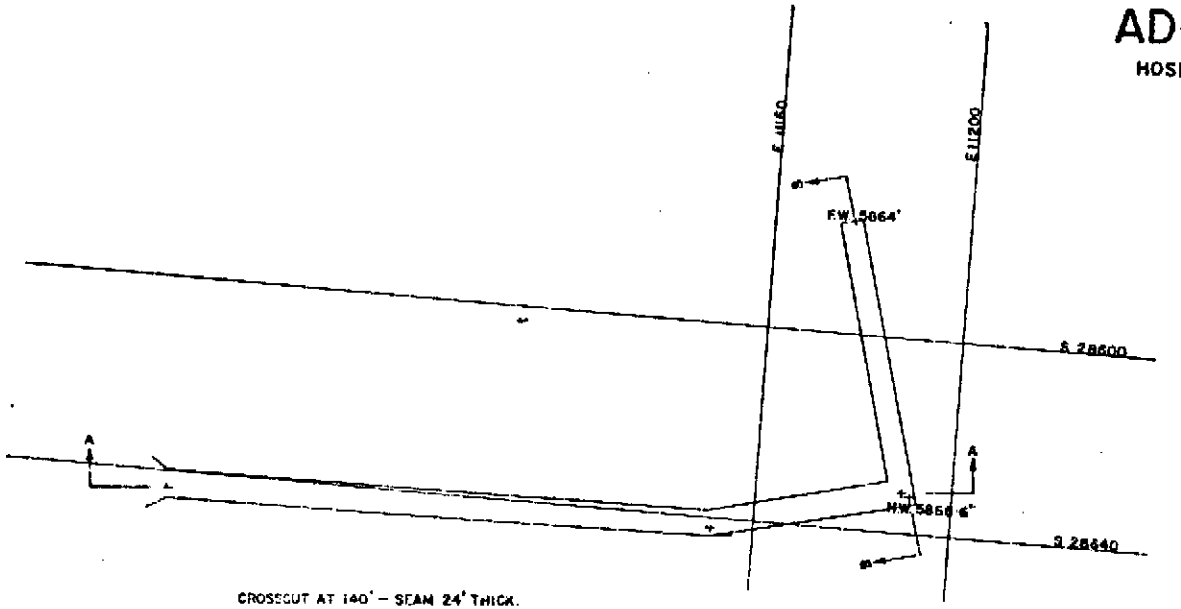
ADIT NO H-18 (7 SEAM)
SEAM THICK. 11'
ENTRY DRIVEN TO 70',
SEAM PINCHED OUT TO 5'.
ADIT ABANDONED.



SECTION A-A

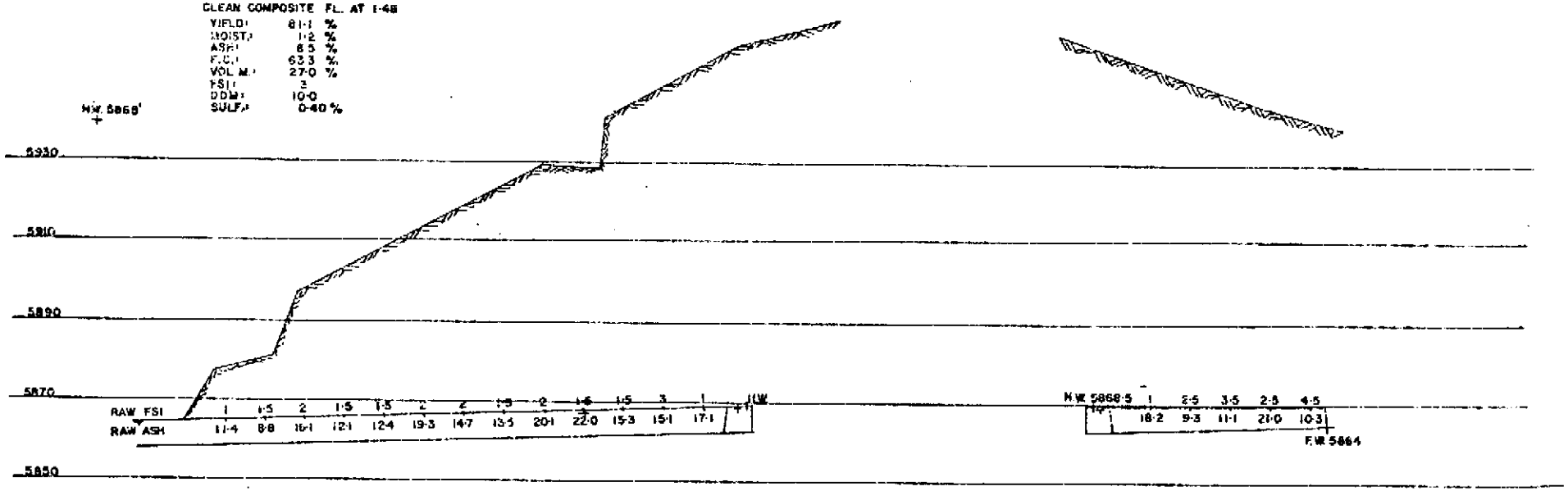
ADIT H-19

HOSMER RIDGE



CROSSCUT AT 140' – SEAM 24' THICK.
RAW SAMPLE –
ASH: 14·5 %
FSI: 2
CLEAN COMPOSITE FL. AT 1·48

YIELD:	81·1 %
MOIST.:	1·2 %
ASH:	8·5 %
F.C.:	63·3 %
VOL. M.:	27·0 %
FSI:	3
DDM:	10·0
SULF.:	0·40 %

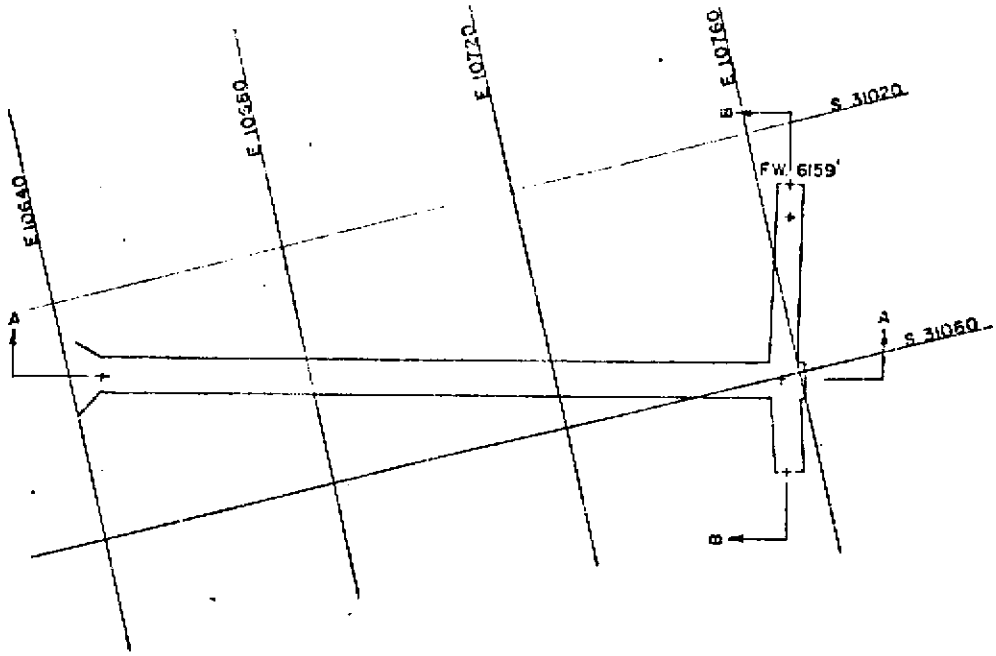


SECTION A-A

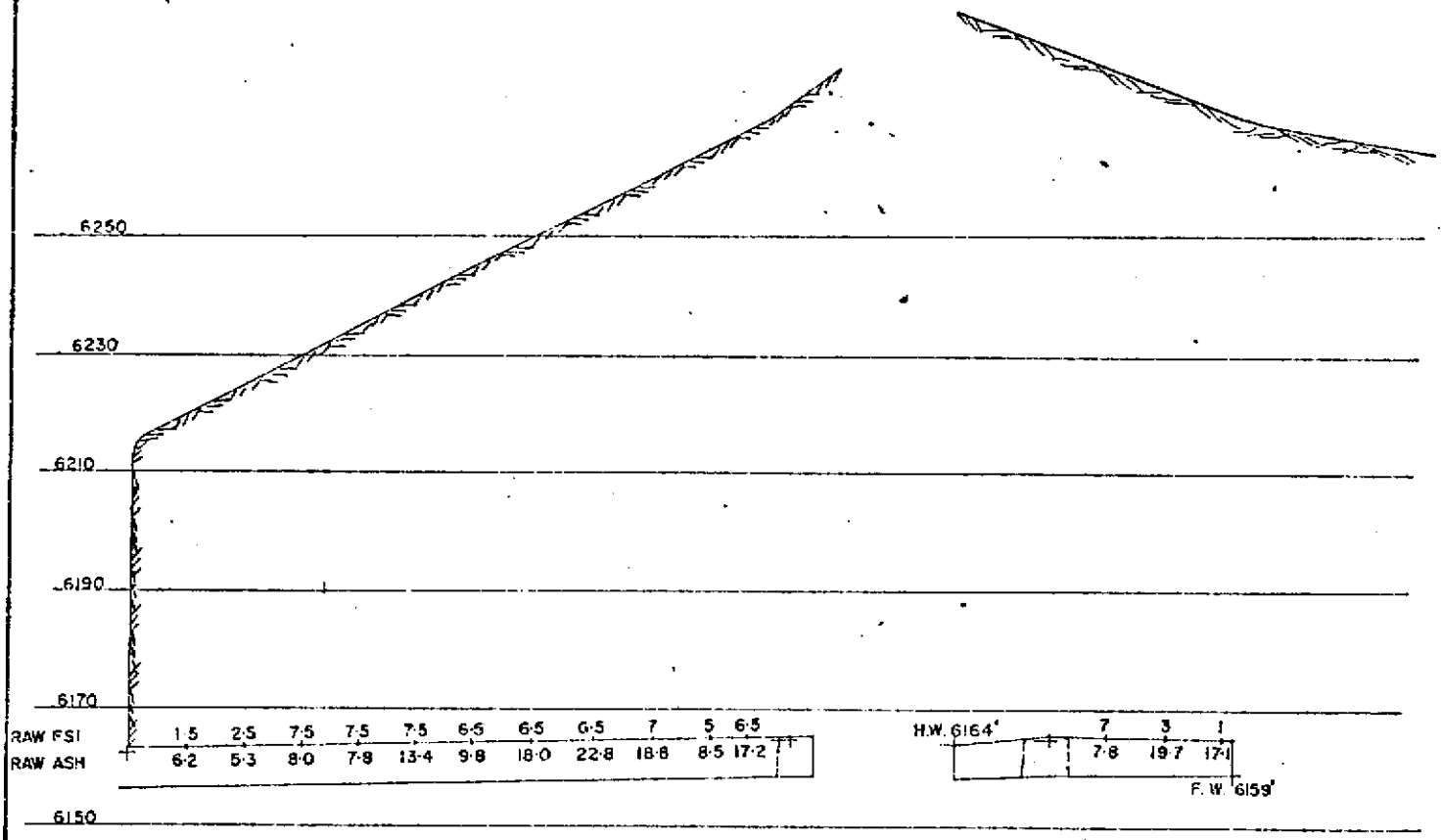
SECTION B-B

ADIT H-20

NOSMER RIDGE



ADIT N? H-20 (5 SEAM-UPPER)
SEAM THICK.- 15'
RAW SAMPLE—
MOIST.: 2.5 %
V.M.: 32.0 %
F.C.: 59.5 %
ASH: 6.0 %
F.S.I.: 5
D.D.M.: 55
SULF.: 0.66 %
FLOAT AT 1.50 S.G.—
ASH: 4.6 %
YIELD: 78.6 %

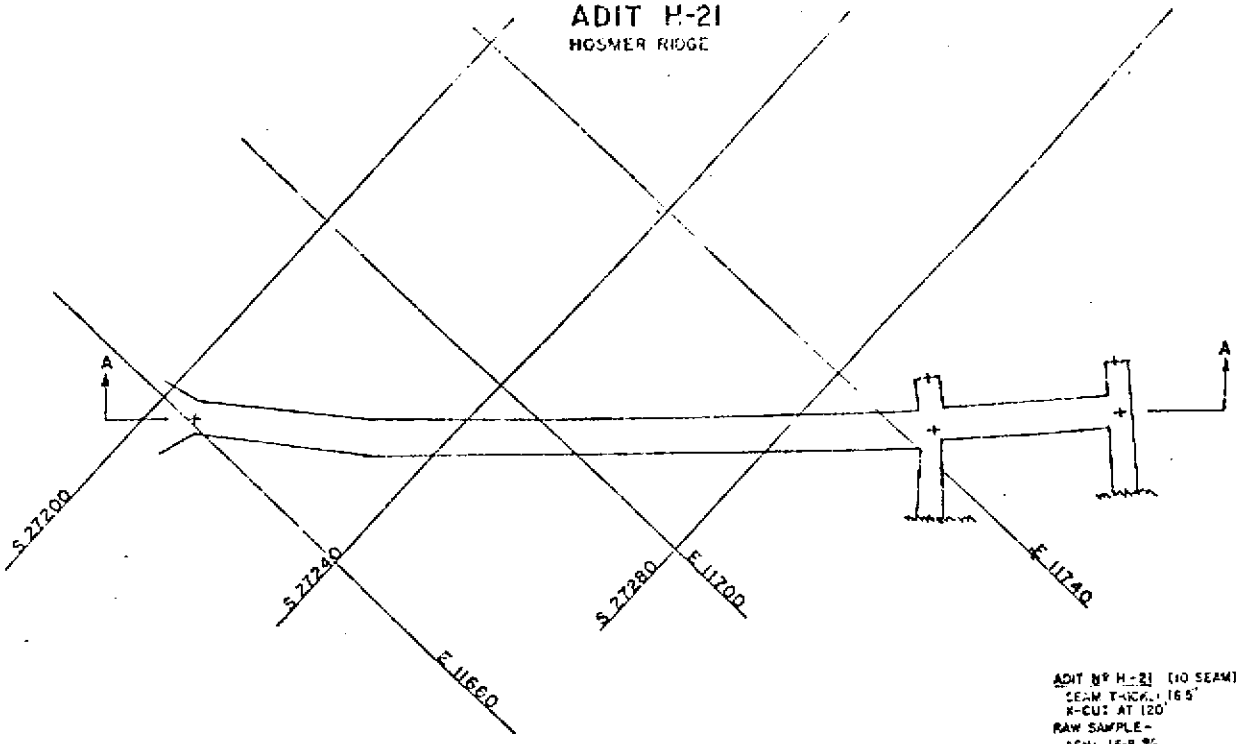


SECTION A-A

SECTION B-B

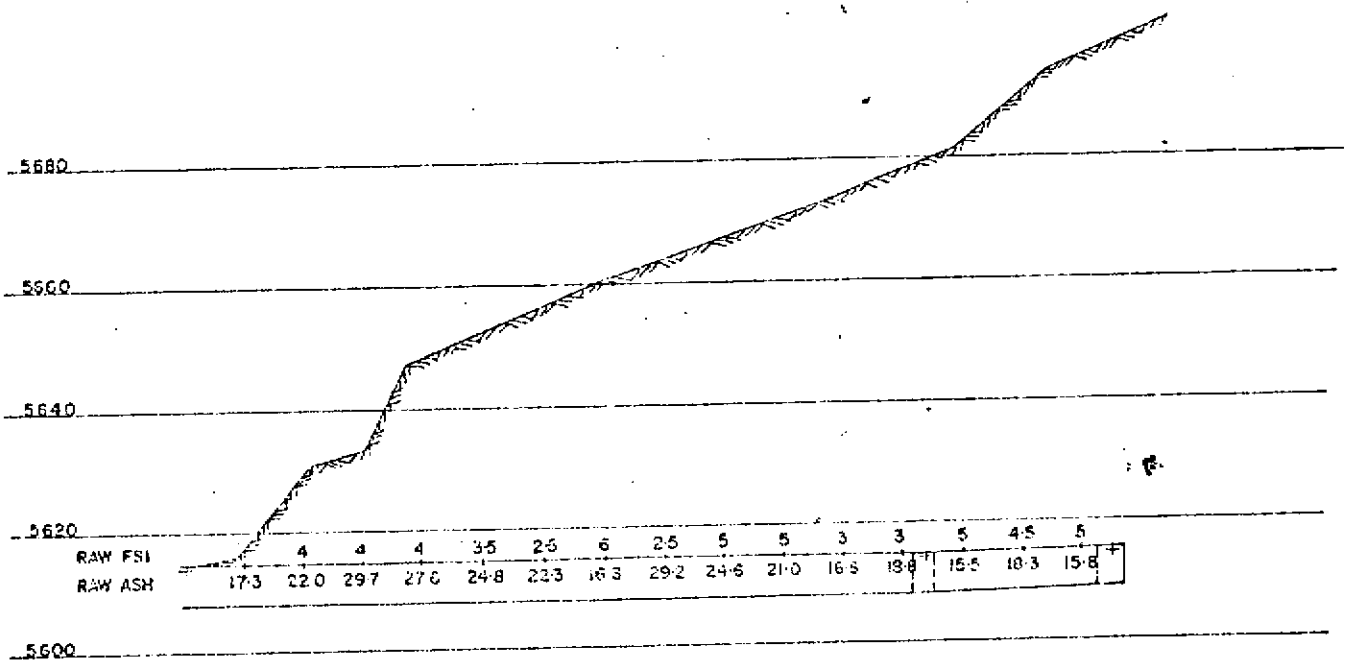
ADIT H-21

HOSMER RIDGE



ADIT № H-21 (10 SEAM)
SEAM THICK.: 16'5"
K-CUT AT 120'
RAW SAMPLE -
ASH: 15·8 %
FSI: 2·5
CLEAN COMPOSITE FL. AT 1·42 SG:

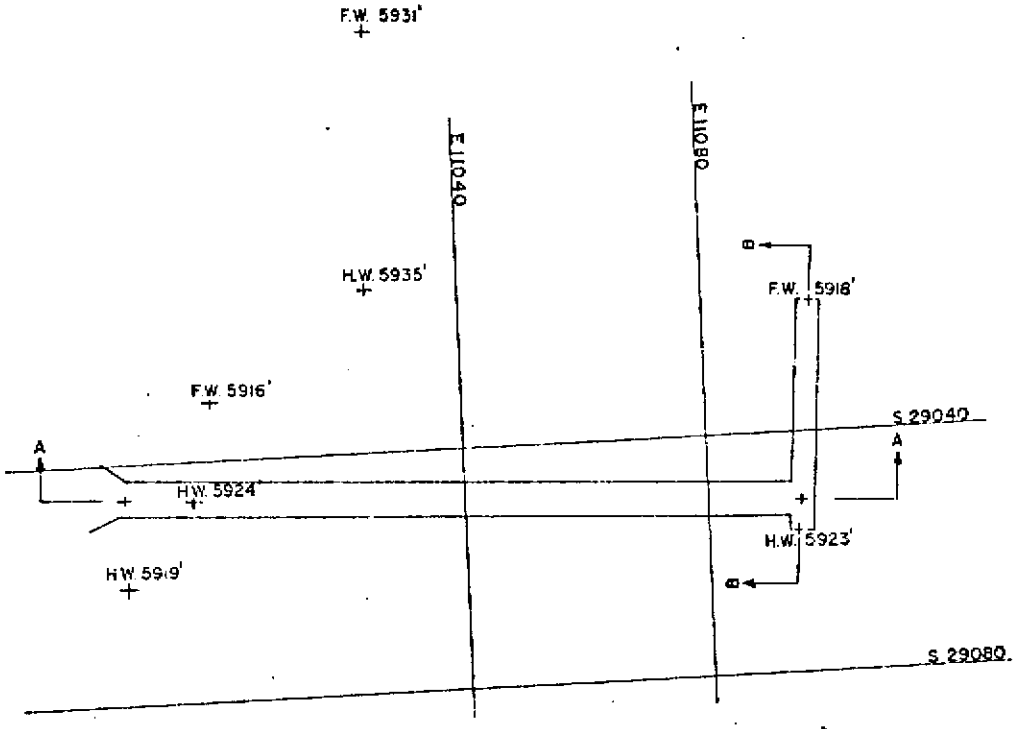
YIELD	68·7 %
MOIST.	1·2 %
ASH:	7·0 %
F.C.:	52·4 %
V.M.:	29·4 %
FSI:	2
DDM.	48
SULF.	0·32 %



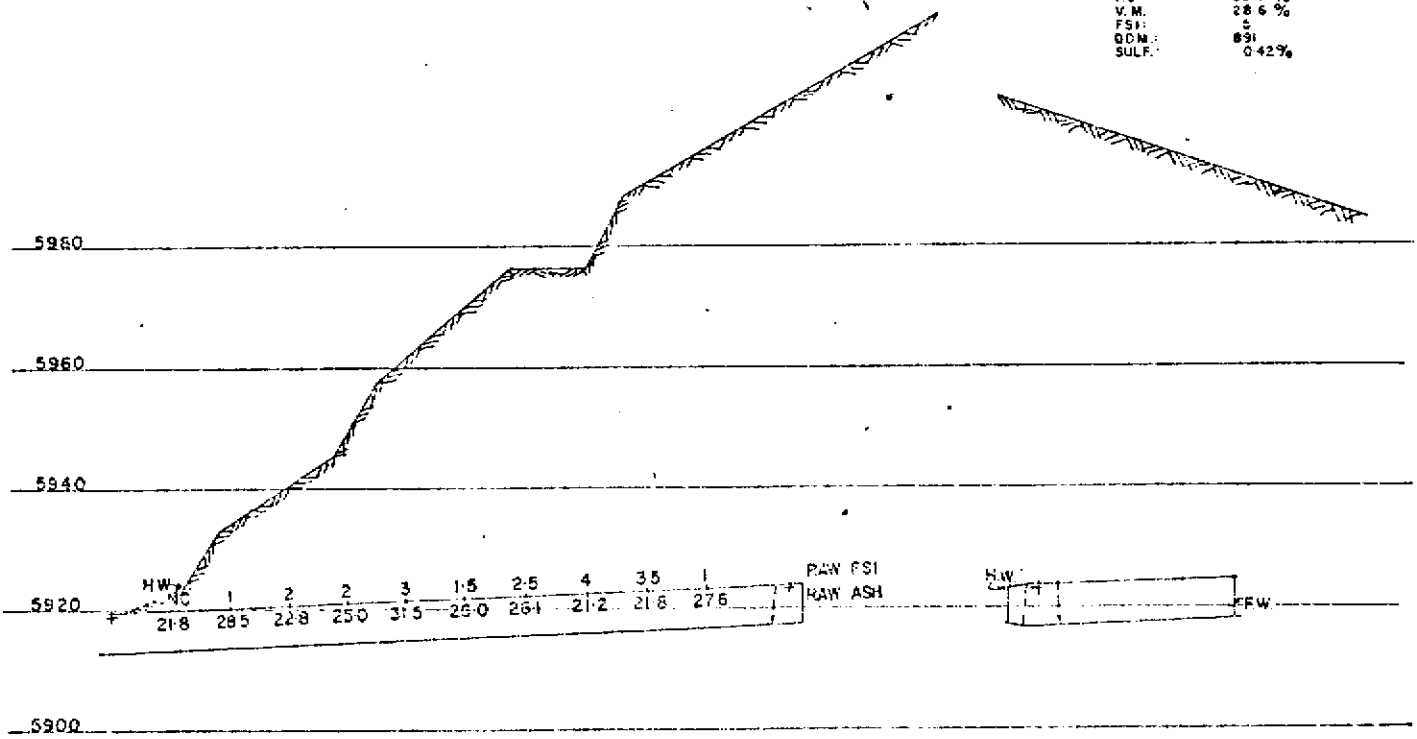
SECTION A-A

ADIT H-22

HOSMER RIDGE



ADIT No H-22 (7 SEAM)
SEAM THICK 14.4'
X-CUT AT 110'
RAW SAMPLE —
ASH: 31.8 %
FSI: 2.5
CLEAN COMPOSITE FL AT 1.46 S.G.
YIELD: 45.4 %
MOIST.: 1.5 %
ASH: 10.2 %
F.C. 59.7 %
V.M. 28.6 %
FSI: 6
BTU: 891
SULF.: 0.42%

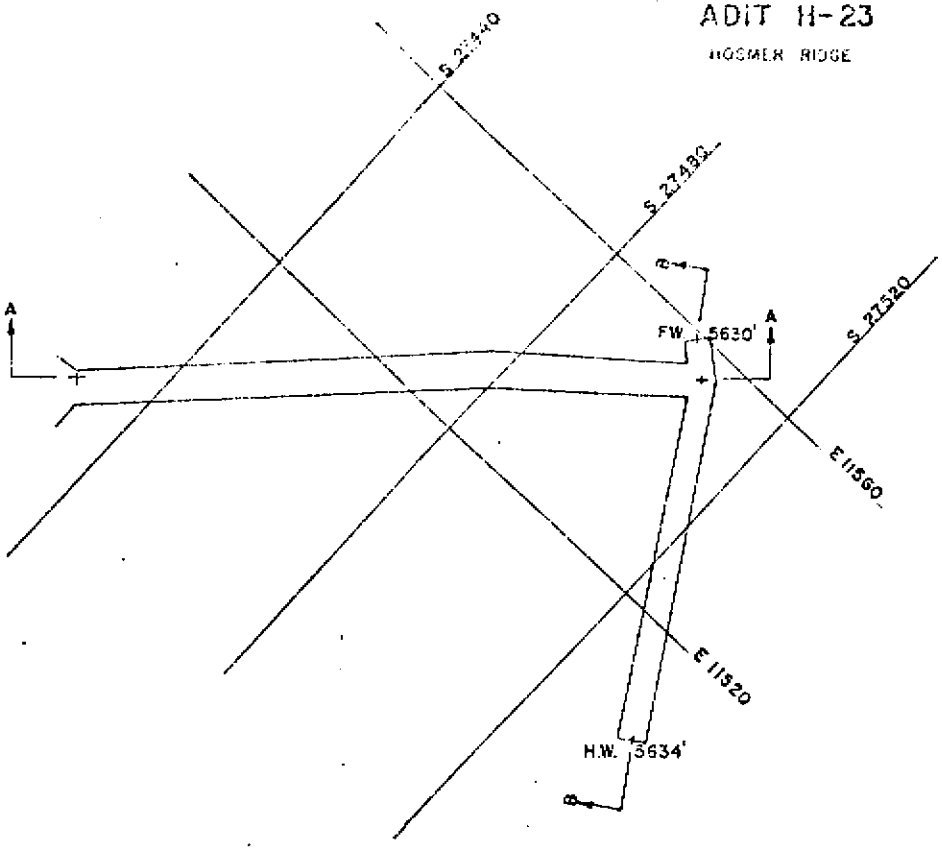


SECTION A-A

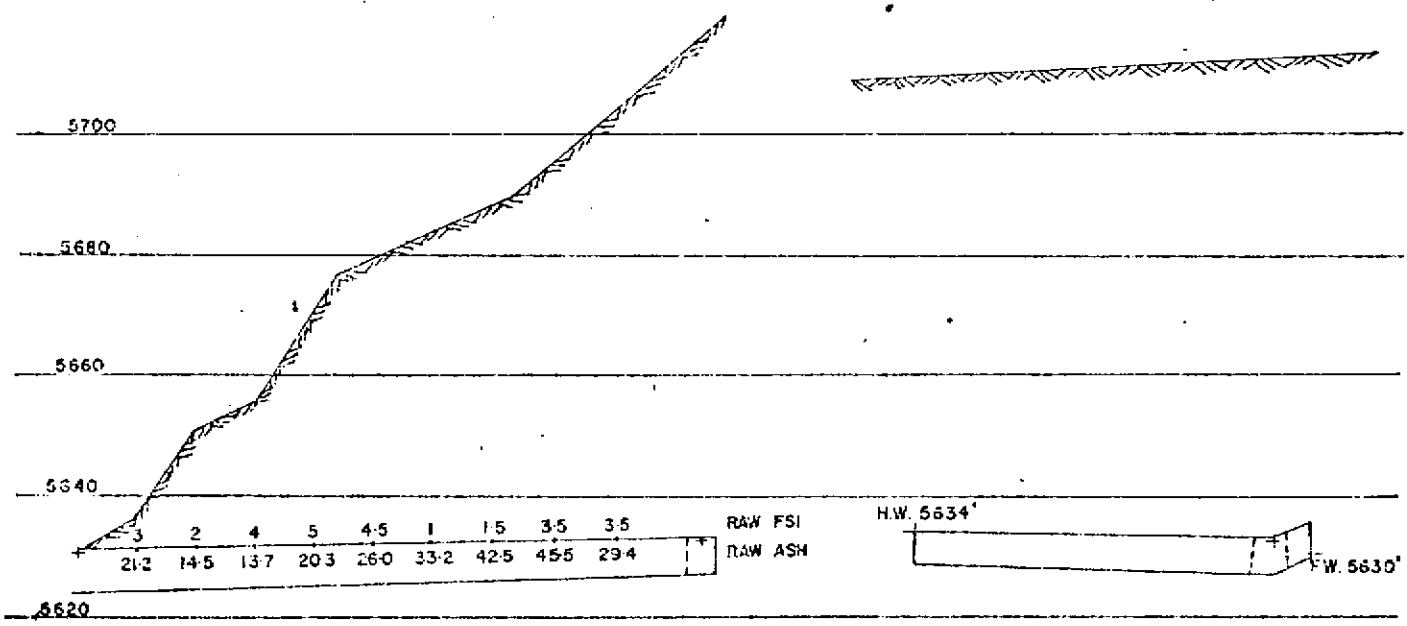
SECTION B-B

ADIT H-23

HOSMER RIDGE



ADIT Nº H-23 (B SEAM)	UPPER BENCH	LOWER BENCH
SEAM THICK	21·7'	19·4'
X-CUT AT	90'	90'
RAW SAMPLE –		
ASH:	23·6 %	18·7 %
FSI:	4·5	5·5
CLEAN COMPOSITE –		
FLOAT AT	1·52 S.G.	1·60 S.G.
YIELD:	67·4 %	81·1 %
MOIST:	1·0 %	1·3 %
ASH:	10·2 %	8·4 %
F.C.:	59·3 %	60·6 %
V.M.	29·5 %	29·2 %
FSI:	6·5	6
G.I.M.:	244	30
SULF:	0·44 %	0·41 %

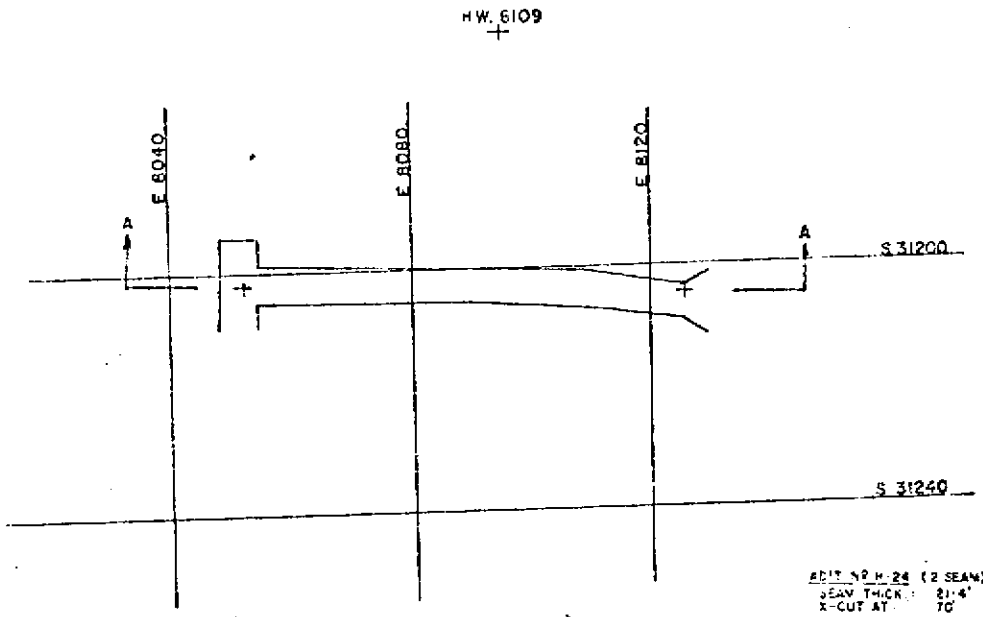


SECTION A-A

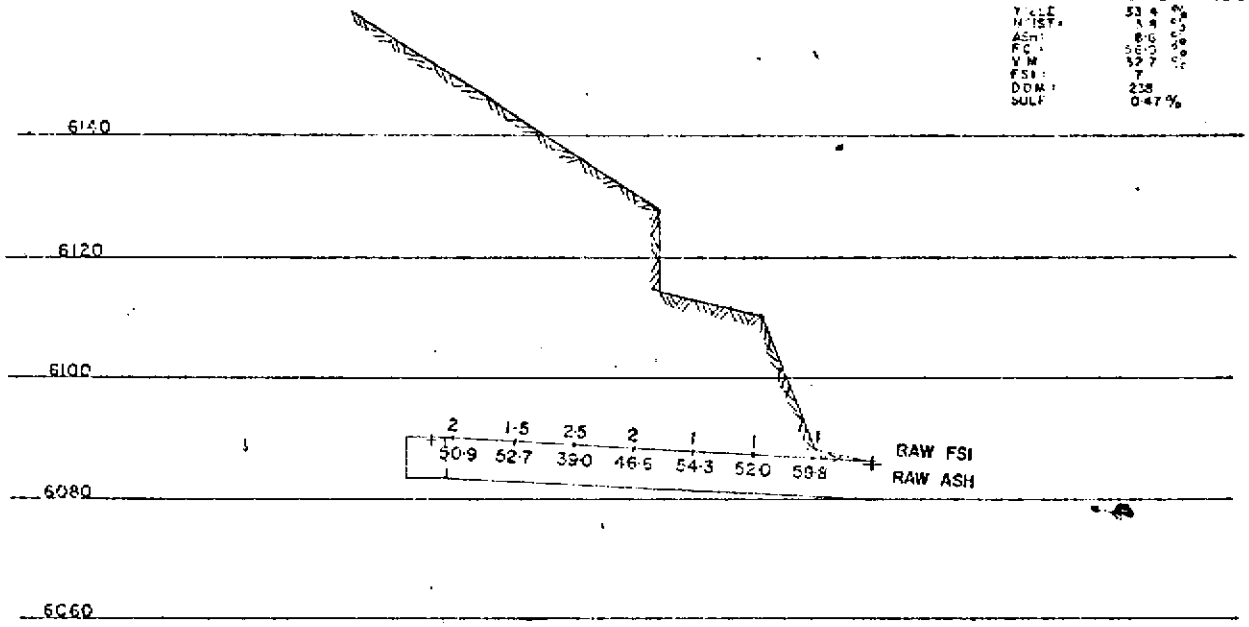
SECTION B-B

ADIT H-24

HOSMER RIDGE



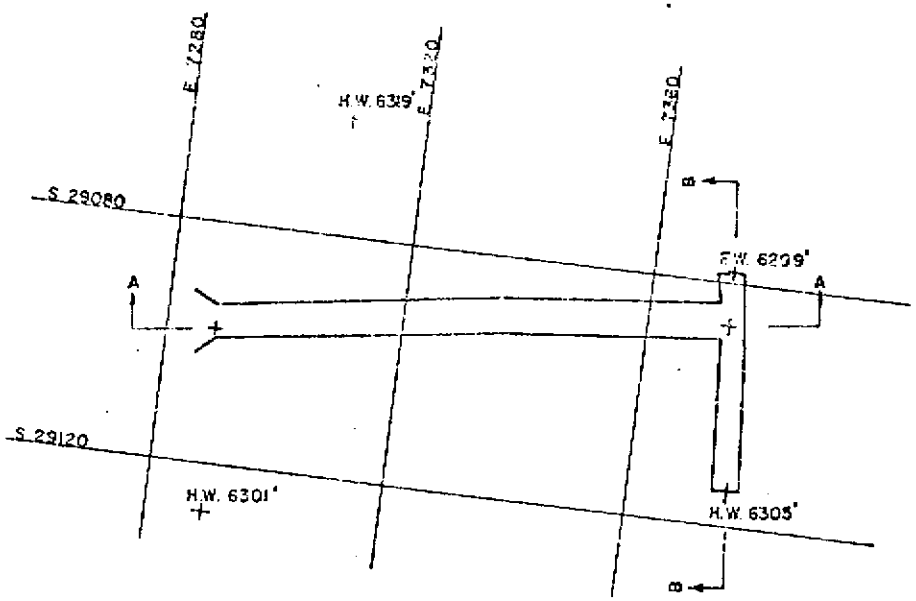
ADIT NO H-24 (2 SEAM)
SEAM THICK : 21'4"
X-CUT AT : 70'
RAW SAMPLE -
ASH : 53.6 %
FSI : 1.5
CLEAN COMPOSITE F. AT # 48 SE
YIELD : 53.6 %
MOIST. : 1.8 %
ASH : 8.6 %
FC : 56.0 %
V.M. : 32.7 %
FSI : 7
DOM : 23S
SULF : 0.47 %



SECTION A-A

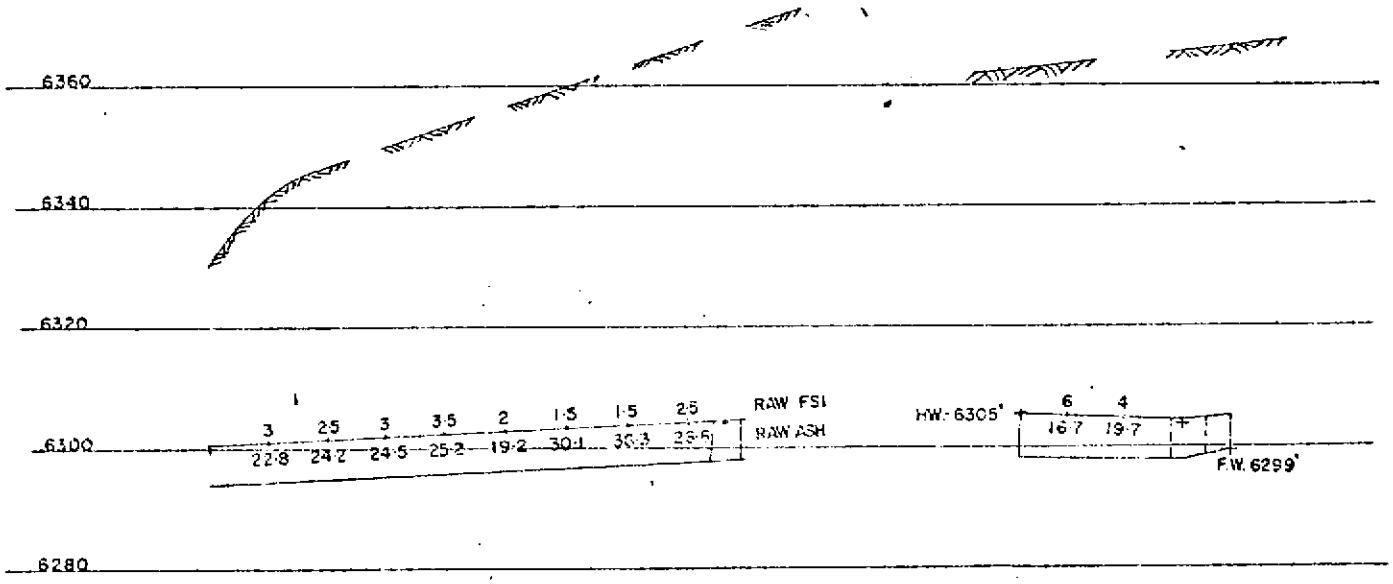
ADIT H-25

WHEELER RIDGE.



ADIT NO H-25 14 SEAM
SEAM THICK. 13.2'
X-CUT AT 90°
RAW SAMPLE—
ASH 23.4%
FSI 2.5
CLEAN COMPOSITE FL AT 1.50 SG.

YIELD:	72.4 %
MOIST.:	1.9 %
ASH:	8.4 %
F.C.:	61.0 %
V.M.	29.7 %
FSI	5.5
DSM	5
SULF.:	0.43 %

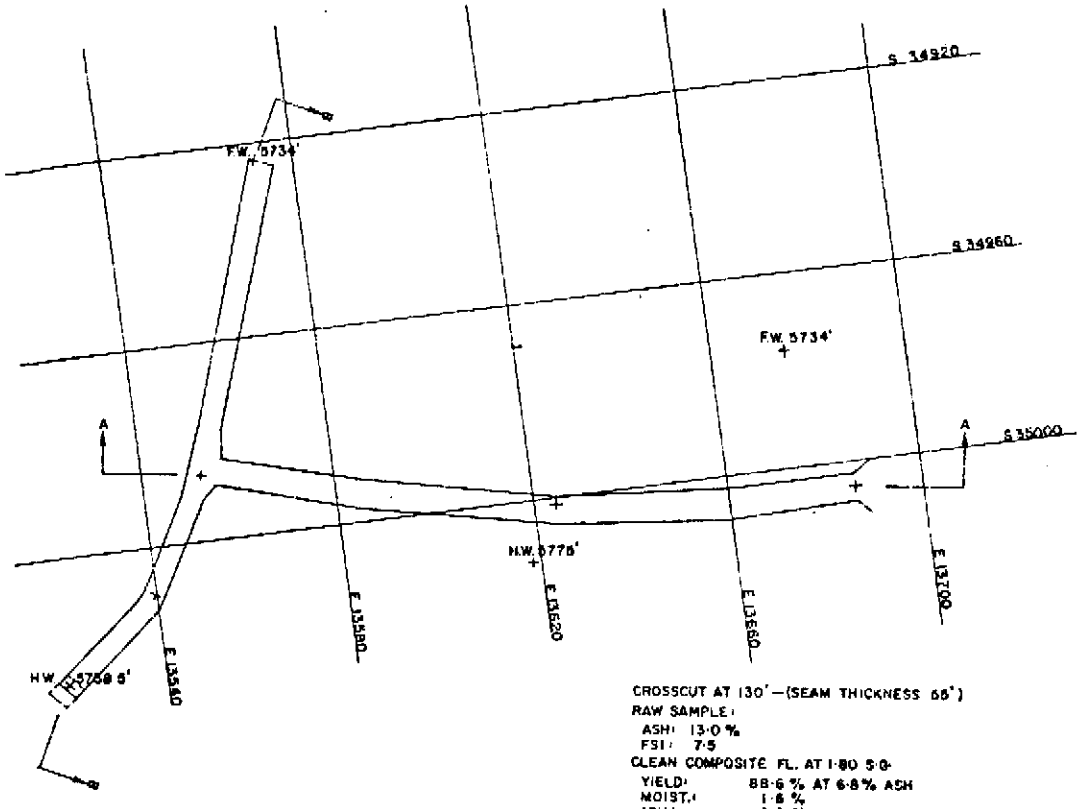


SECTION A-A

SECTION B-B

ADIT H-26

HOSMER RIDGE



CROSSCUT AT 130'—(SEAM THICKNESS 68')

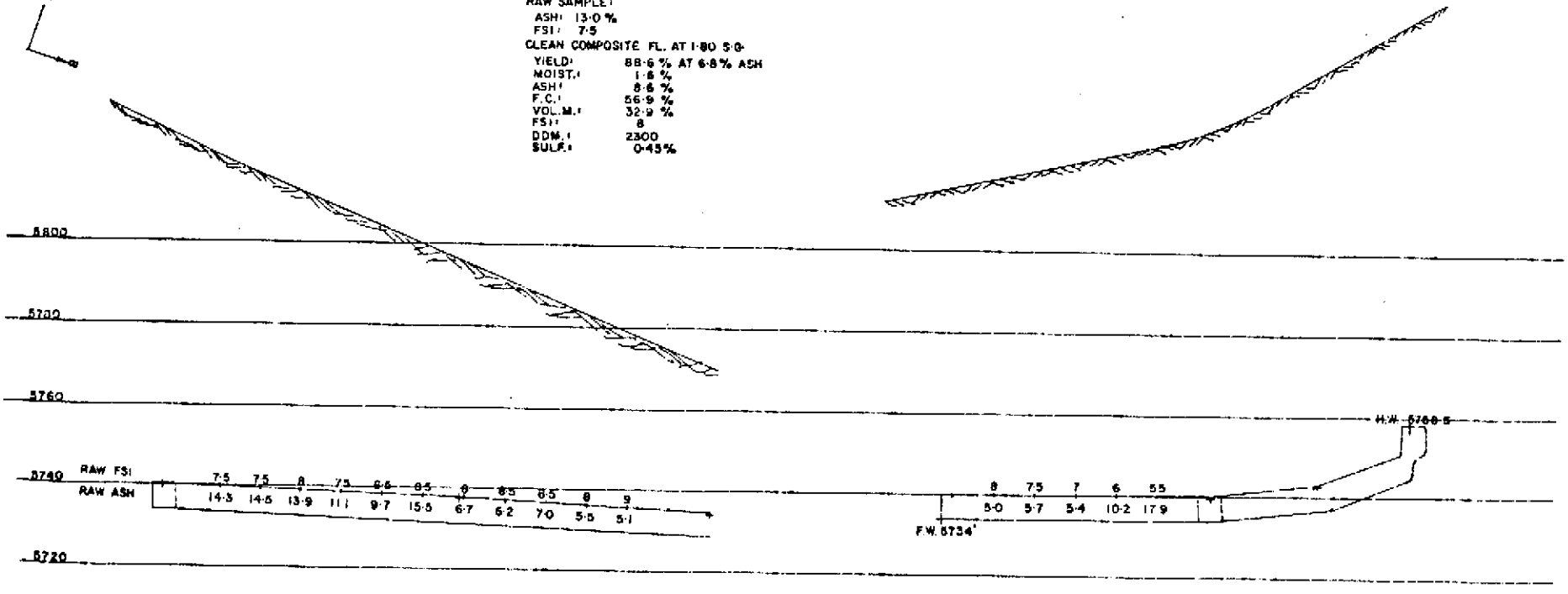
RAW SAMPLE:

ASH: 13·0 %

FSI: 7·5

CLEAN COMPOSITE FL. AT 1·80 S·G·

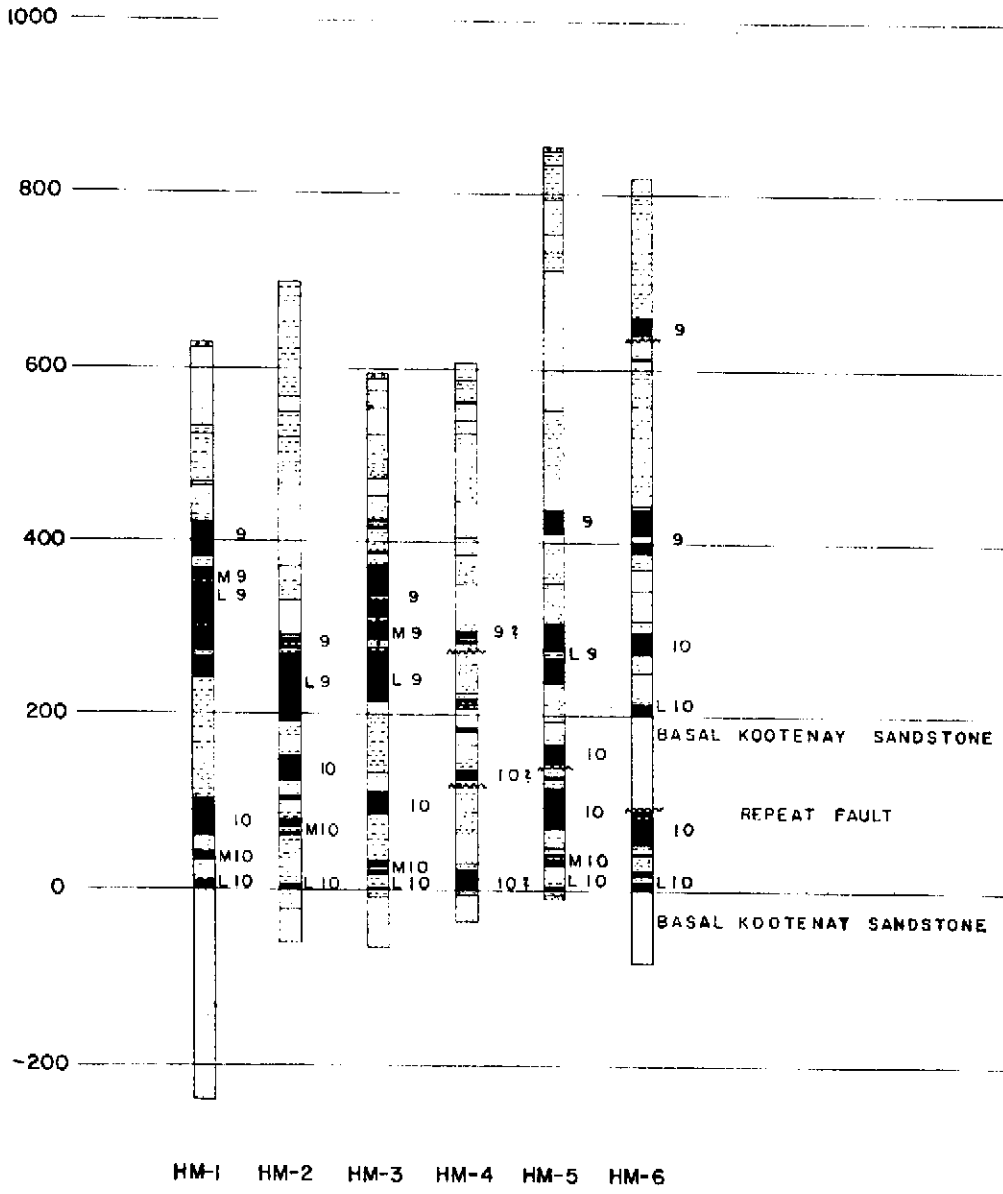
YIELD:	88·6 % AT 6·8 % ASH
MOIST.:	1·6 %
ASH:	8·6 %
F.C.:	56·9 %
VOL.M.:	32·9 %
FSI:	8
DDM.:	2300
SULF.:	0·45%



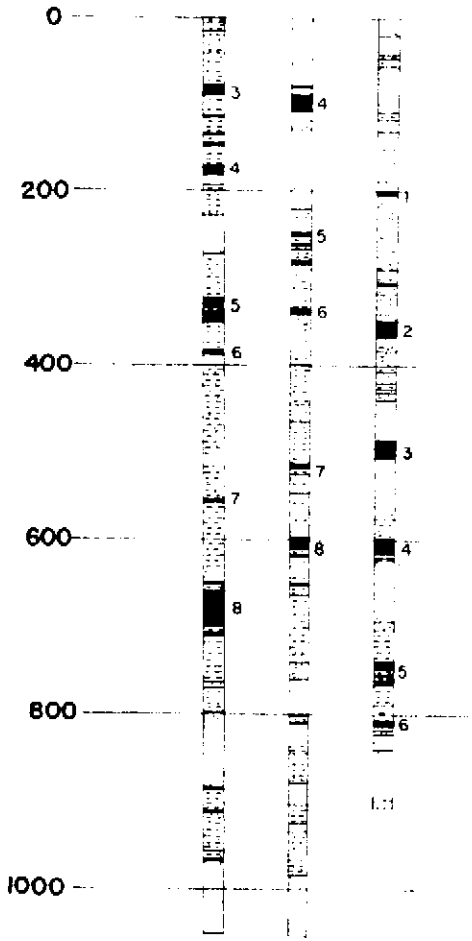
SECTION A-A

SECTION B-B

DRILL HOLE LOGS-20



DRILL HOLE LOGS—20 A



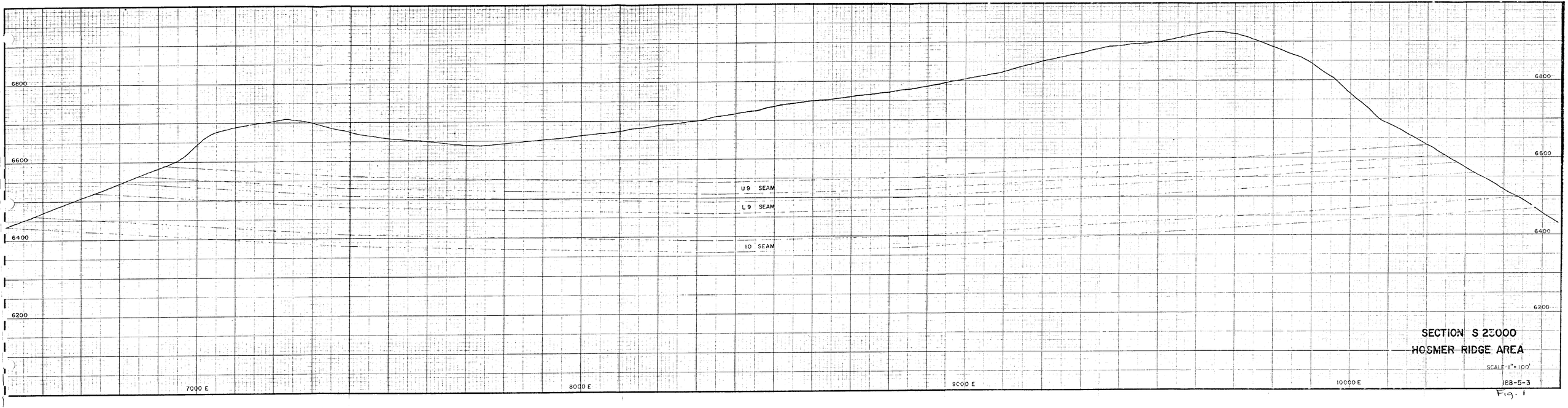

6800
6600
6400
6200
U 9 SEAM
L 9 SEAM
10 SEAM
7000 E
8000 E
9000 E
10000 E
6800
6600
6400
6200
SECTION S 23000
HOSMER RIDGE AREA
SCALE 1"=100'
188-5-3

Fig. 1

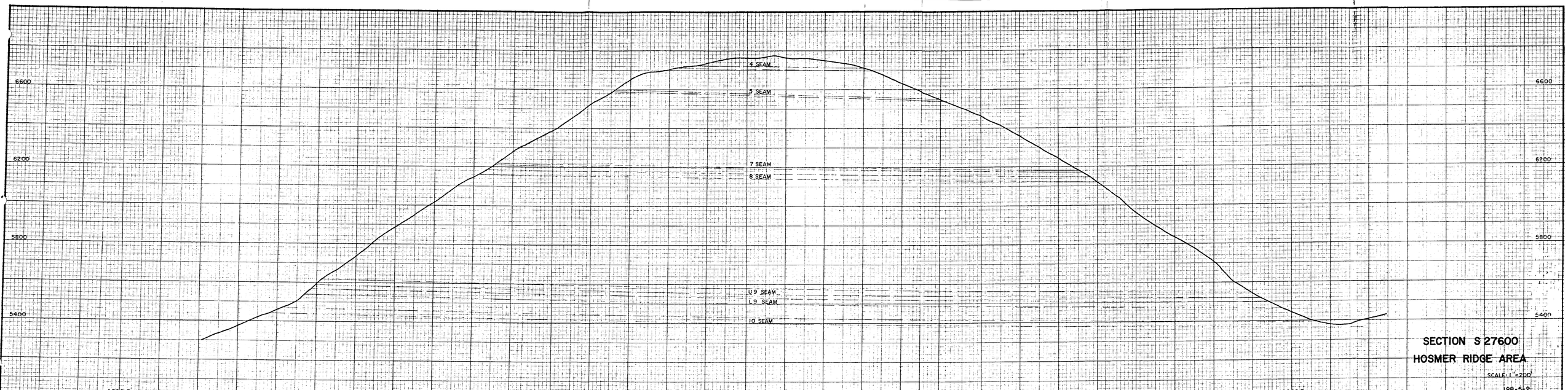

6600
6200
5800
5400
4 SEAM
5 SEAM
7 SEAM
8 SEAM
U 9 SEAM
L 9 SEAM
10 SEAM
4000 E
5000 E
6000 E
7000 E
8000 E
9000 E
10000 E
SECTION S 27600
HOSMER RIDGE AREA
SCALE: 1"=200'
88-5-2

Fig 2

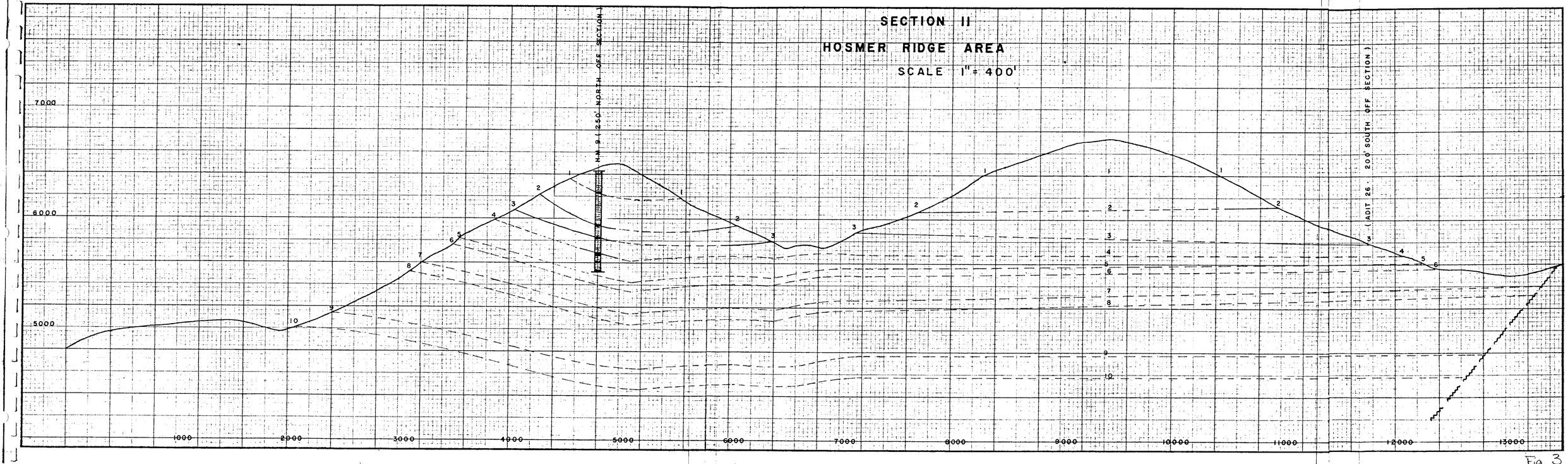
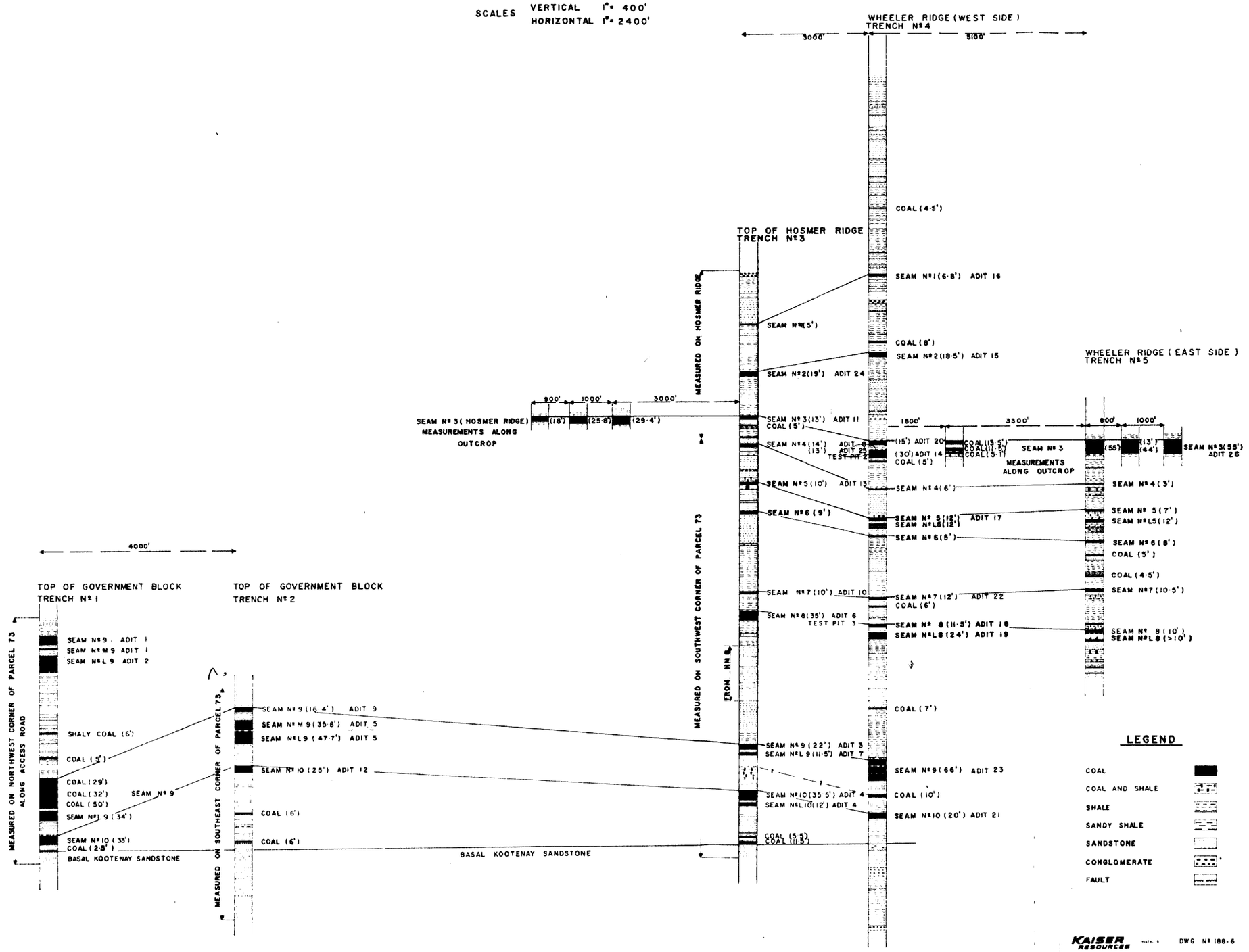

SECTION II
HOSMER RIDGE AREA
SCALE 1" = 400'
7000
6000
5000
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
HM 9 (250' NORTH OFF SECTION)
(ADIT 26 - 200' SOUTH OFF SECTION)

Fig. 3

CORRELATION CHART (HOSMER RIDGE AREA)

SCALES VERTICAL 1"= 400'
HORIZONTAL 1"= 2400'



KAISER RESOURCES DWG Nº 188-6

MINING METHODS

Methods Applicable

Reserves in the southwest portion of the Dominion Block including 4, 5, 7, 8, 9 and 10 seams have strip potential and could be mined by conventional shovel and truck mining methods. Maximum dip within the Parcel 73 block is 18 degrees.

On Hosmer and Wheeler Ridge the dips vary between 5 and 15 degrees so that either the conventional mining longwall method or the room and pillar method using continuous mining machines could be employed.

The hydraulic mining method for seams pitching more than 10 degrees is presently being employed in the Michel mining area on a demonstration basis in the #10 seam, and to date appears to have excellent potential for dips between 10 degrees and 40 degrees.

SECTION 27600 S

SECTION A

ADIT NO H-16 (I SEAM)
SEAM THICK.: 5'
X-CUT AT 135'
RAW SAMPLE —
ASH:
FSI
CLEAN COMPOSITE FL. AT 1·45 S.G.

YIELD:	62·8 %
MOIST.:	2·5 %
ASH:	8·5 %
F.C.:	56·9 %
FSI:	1
DDM.	1·0
SULF.:	0·48%

SHALE
5' COAL
SHALE

HM 8

HM 7

HM 6

8500

6000

5500

5000

4500

336

H-W 70(5)A

KAISER RESOURCES NATAL, B.C.

pt. 1/5

COAL RESERVES
Nº 1 SEAM
PARCEL 73, HOSMER RIDGE, & WHEELER RIDGE AREAS.

DESIGNED	SCALES
DRAWN W·P· & K·P·	HOR. 1"=1000'
CHECKED	VERT.
APPROVED	DWG. NO. 146-3-(1) REV.
DATE JANUARY, 1971	

SECTION 27600'S

SECTION 11

ADIT Nº H-15 (2 SEAM)
SEAM THICK.: 19'
X-CUT AT 90'

SHALE
19' COAL
SHALE

RAW SAMPLE -
ASH: 33·5 %
FSI.: 3

CLEAN COMPOSITE FL. AT 1·57 S.G.

YIELD:	56·3 %
MOIST.:	2·6 %
ASH:	7·6 %
F.C.:	57·4 %
FSI:	6·5
D.D.M.:	189
SULF.:	0·28 %

ADIT Nº H-24 (2 SEAM)
SEAM THICK.: 21·4'
X-CUT AT: 70'

SHALE
21·4 COAL & SH. BANDS
SHALE

RAW SAMPLE -
ASH: 53·6 %
FSI: 1·5

CLEAN COMPOSITE FL. AT 1·48 S.G.

YIELD:	33·4 %
MOIST.:	3·8 %
ASH:	8·6 %
F.C.:	56·0 %
V.M.:	32·7 %
FSI.:	7
D.D.M.:	238
SULF.	0·47 %

6000

5500

5000

4500

2500' COVER

HM 7

HM 8

HW 70(5)A

336

KAISER RESOURCES NATAL, B.C.

pt 1/5

COAL RESERVES
Nº 2 SEAM
PARCEL 73, HOSMER RIDGE, & WHEELER RIDGE AREAS.

DESIGNED	
DRAWN	W·P· & K·P·
CHECKED	
APPROVED	
DATE	JANUARY, 1971

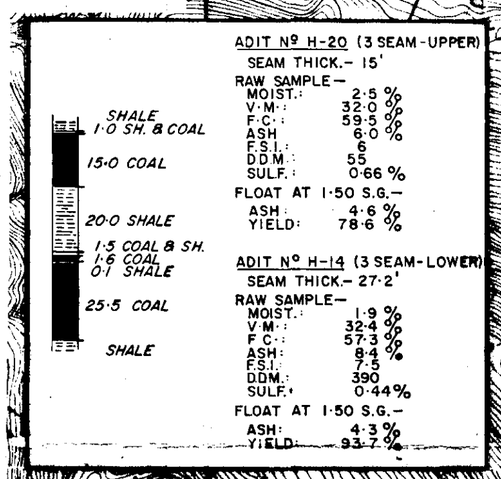
SCALES
HOR. 1" = 1000'
VERT.

DWG. NO. 146-3-(2)

REV.

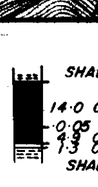
SECTION 27600 S

SECTION 11



ADIT Nº H-20 (3 SEAM-UPPER)
SEAM THICK.- 15'
RAW SAMPLE—
MOIST.: 2·5 %
V·M·: 32·0 %
F·C·: 59·5 %
ASH 6·0 %
F.S.I.: 6
D.D.M.: 55
SULF.: 0·66 %
FLOAT AT 1·50 S.G.—
ASH: 4·6 %
YIELD: 78·6 %

ADIT Nº H-14 (3 SEAM-LOWER)
SEAM THICK.- 27·2'
RAW SAMPLE—
MOIST.: 1·9 %
V·M·: 32·4 %
F·C·: 57·3 %
ASH: 8·4 %
F.S.I.: 7·5
D.D.M.: 390
SULF.: 0·44 %
FLOAT AT 1·50 S.G.—
ASH: 4·3 %
YIELD: 93·7 %



ADIT Nº H-11 (3 SEAM)
SEAM THICK.- 20·2'
RAW SAMPLE—
MOIST.: 2·0 %
V·M·: 31·3 %
F.C.: 59·7 %
ASH: 7·0 %
F.S.I.: 7·5
D.D.M.: 73
SULF.: 0·38 %
FLOAT AT 1·50 SG.—
ASH: 4·7 %
YIELD: 96·1 %

ADIT Nº H-26 (3 SEAM)
SEAM THICK. 55'
X-CUT AT 130'
RAW SAMPLE-
ASH 13·0 %
FSI 7·5
CLEAN COMPOSITE FL. AT 1·80 S·G·
YIELD: 88·6 % AT 6·8 % ASH
MOIST.: 1·0 %
ASH: 8·6 %
F.C.: 59·9 %
V.M.: 32·0 %
FSI: 8
DDM.: 2300
SULF.: 0·45 %

HM 7

HM 8

5000

5500

6000

2500 COVER

4500

336 H-W 70(5)A

KAISER RESOURCES NATAL, B.C.

pt. 1/5

COAL RESERVES
Nº 3 SEAM
PARCEL 73, HOSMER RIDGE, & WHEELER RIDGE AREAS.

DESIGNED	SCALES
DRAWN W·P· & K·P·	HOR. 1"=1000'
CHECKED	VERT.
APPROVED	DWG. NO. 146-3-3 / REV.
DATE JANUARY, 1971	

SECTION 27600 S

SECTION 11

ADIT Nº H-8 (4 SEAM)
SEAM THICK. 14'
X-CUT AT 150'
RAW SAMPLE—
ASH: 20·6 %
FSI. 2·5

SHALE
14' COAL
SHALE

CLEAN COMPOSITE FL. AT 1·50 S.S.

YIELD:	72·5 %
MOIST.:	1·6 %
V.M.:	28·8 %
ASH:	8·8 %
F.C.:	60·8 %
FSI:	3·5
DDM.:	3·2
SULF.:	0·39 %

ADIT Nº H-25 (4 SEAM)
SEAM THICK. 13·2'
X-CUT AT 90'
RAW SAMPLE—
ASH: 23·4 %
FSI: 2·5

SHALE
13·2 COAL
SHALE

CLEAN COMPOSITE FL. AT 1·50 S.S.

YIELD:	72·4 %
MOIST.:	1·9 %
ASH:	8·4 %
F.C.:	61·0 %
V.M.:	28·7 %
FSI:	5·5
DDM:	5
SULF.:	0·45 %

6000

5500

5000

4500

2500' COVER

HWY 3

336 H-W 70(5)A

KAISER RESOURCES NATAL, B.C. pt 1/5

COAL RESERVES
Nº 4 SEAM
PARCEL 73, HOSMER RIDGE, & WHEELER RIDGE AREAS.

DESIGNED	
DRAWN	W·P· & K·P·
CHECKED	
APPROVED	
DATE	JANUARY, 1971.

SCALES
HOR. 1" = 1000'
VERT.

DWG. NO. 146-3-4

REV.

SECTION 27600'S

SECTION 11

ADIT Nº H-17 (5 SEAM)
SEAM THICK.: 23'
X-CUT AT 160'

SHALE
23' COAL (INCL. 2'-3' SH. & COAL ZONE)
SHALE

RAW SAMPLE –
ASH: 22·0 %
FSI: 1·5

CLEAN COMPOSITE FL. AT 1·45 S.G.

YIELD:	66·5 %
MOIST.:	1·7 %
ASH:	7·2 %
F.C.:	63·5 %
FSI	8·5
DDM.:	0·8
SULF.	0·37 %

ADIT Nº H-13 (5 SEAM)
SEAM THICK.: 8'
X-CUT AT 150'

SHALE
8' COAL
SHALE

RAW SAMPLE –
ASH: 15·7 %
FSI: 2·5

CLEAN COMPOSITE FL. AT 1·44 S.G.

YIELD:	79·4 %
MOIST.	1·6 %
ASH:	8·6 %
F.C.:	61·4 %
FSI.:	5
DDM.:	7·5
SULF.	0·47 %

6000

5500

5000

4500

2500' COVER

336 H-W 70(5)A

KAISER RESOURCES NATAL, B.C. pt 1/5

COAL RESERVES
Nº 5 SEAM
PARCEL 73, HOSMER RIDGE, & WHEELER RIDGE AREAS.

DESIGNED	SCALES
DRAWN W·P· & K·P·	HOR. 1"=1000'
CHECKED	VERT.
APPROVED	DWG. NO. 146-3-5 / REV.
DATE JANUARY, 1971	

SECTION 27600 S

SECTION 11

ADIT Nº H-22 (7 SEAM)
SEAM THICK. 14·4'
X-CUT AT 110'
RAW SAMPLE—
ASH: 31·8 %
FSI: 2·5
CLEAN COMPOSITE FL. AT 1·46 S·G·
YIELD: 46·4 %
MOIST.: 1·5 %
ASH: 10·2 %
F.C.: 59·7 %
V.M.: 28·6 %
FSI: 5
DDM.: 891
SULF.: 0·42 %

SHALE
14·4 COAL
SHALE

ADIT Nº H-19 (8 SEAM)
SEAM THICK.: 24'
X-CUT AT 140'
RAW SAMPLE—
ASH: 14·5 %
FSI: 2
CLEAN COMPOSITE FL. AT 1·48 S·G·
YIELD: 81·1 %
MOIST.: 1·2 %
ASH: 8·5 %
F.C.: 63·3 %
V.M.: 27·0 %
FSI: 3
DDM.: 10·0
SULF. 0·40 %

SHALE
24' COAL
SHALE

ADIT Nº H-18 (7 SEAM)
SEAM THICK.: 11'
ENTRY DRIVEN TO 70',
SEAM PINCHED OUT TO 3'.
ADIT ABANDONED.

6000

5500

6000

4500

4000

2500' COVER

HM 8

HM 7

336

H-W 70(5)A

KAISER RESOURCES NATAL, B.C.

pt 1/5

COAL RESERVES
Nº 8 SEAM
PARCEL 73, HOSMER RIDGE, & WHEELER RIDGE AREAS.

DESIGNED	SCALES
DRAWN W·P· & K·P·	HOR. 1"=1000'
CHECKED	VERT.
APPROVED	DWG. NO. 146-3-6
DATE JANUARY, 1971	REV.

SECTION 27600 S

SECTION N

ADIT Nº H-23 (9 SEAM)

	UPPER BENCH	LOWER BENCH
SEAM THICK.	21·7'	19·4'
X-CUT AT	90'	90'
RAW SAMPLE –		
ASH:	23·6 %	18·7 %
FSI:	4·5	5·5
CLEAN COMPOSITE –		
FLOAT AT:	1·52 S·G·	1·60 S·G·
YIELD:	67·4 %	81·1 %
MOIST.:	1·0 %	1·8 %
ASH:	10·2 %	8·4 %
F.C.:	59·3 %	60·6 %
V.M.	29·5 %	29·2 %
FSI:	6·5	6
D.D.M.:	244	30
SULF.:	0·44 %	0·41 %

SHALE

21·7 COAL (UPPER BENCH) SAMPLE A

9·1 SHALE

19·4 COAL (LOWER BENCH)

5500

5000

4000

2500' COVER

HM 8

HM 7

HM 6

336 H·W·70(5)A

KAISER RESOURCES NATAL, B.C. pt. 1/5

COAL RESERVES Nº 9 SEAM

PARCEL 73, HOSMER RIDGE, & WHEELER RIDGE AREAS.

DESIGNED

DRAWN W·P· & K·P·

CHECKED

APPROVED

DATE JANUARY, 1971

SCALES

HOR. 1"=1000'

VERT.

DWG. NO. 146-3-7

REV.

SHALE

16·5 COAL

SHALE

ADIT Nº H-21 (10 SEAM)
SEAM THICK.: 16·5'
X-CUT AT 120'
RAW SAMPLE-
ASH: 15·8 %
FSI: 2·5
CLEAN COMPOSITE FL. AT 1·42 SG

YIELD:	68·7 %
MOIST.:	1·2 %
ASH:	7·0 %
F.C.:	62·4 %
V.M.:	29·4 %
FSI.:	7
DDM.	45
SULF.:	0·32 %

SECTION 27000 S

SECTION N

8500

4500

4000

2500' COVER

HM 15
4600 - #3

HM 21

HM 7

HM 8

336 H-W 70(5)A

KAISER RESOURCES ← NATAL, B.C.
pt 1/5

COAL RESERVES
Nº 10 SEAM
PARCEL 73, HOSMER RIDGE, & WHEELER RIDGE AREAS.

DESIGNED
DRAWN W·P· & K·P·
CHECKED
APPROVED
DATE JANUARY, 1971

SCALES
HOR. 1" = 1000'
VERT.

DWG. NO. 146-3-8

REV.