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CHEVRON - FORT GOOD HOPE JOINT VENTURE
1987/88 GEOPHYSICAL REPORT

PREPARED BY: CHEVRON CANADA RESOURCES
DECEMBER 12, 1988

PROJECT ACTION SHEET

RESOURCE EVALUATION BRANCH

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COMPANY: CHEVRON CANADA RESOURCES
REPORT TITLE: FORT GOOD HOPE JOINT VENTURE
1987/88 GEOPHYSICAL REPORT

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JAN 23 1989

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REPORTS

OPERATIONS REPORT:

NUMBER 1

- OPERATION, PROCESSING AND INTERP. REPORT COMBINED

INTERPRETATION REPORT:

NUMBER

MAPS

SHOTPOINT MAPS

NUMBER 1

ENCL #1 - 1988 SEISMIC PROGRAM

INTERPRETATION

NUMBER 6

ENCL #3 - 100% SHOT PROFILES FROM TEST SITE 1
ENCL #4 - " " " " " " 2
ENCL #5 - " " " " " " 3

ENCL #7 - LINE 34X

ENCL #8 - T.S.M. ON THE KEE SCARP HORIZON

ENCL #9 - KEE SCARP TO NAHANNI TIME INTERVAL MAP

OTHER

ENCL #2 - MAGNETIC TAPE WITH DIGITAL S.P. INFO

NUMBER 1

SECTIONS

NUMBER 37

4X	32Y	59
6X	34X	60Y
8B	35	63
16X	39B	64X
16XB	44X	65
18Y	44Y	67
18YB	45	69
20X (2 LINES)	48Y	71
20XB	49	72X
22B	52Y	79Y
22BR	53	
22YB	55	
22BBR	56X	

Approved. Feb 27/89

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CHEVRON - FORT GOOD HOPE JOINT VENTURE
1987/88 GEOPHYSICAL REPORT

9 2 2 9 - C 4 - 2 E

JAN 23 1989

Prepared by:
Chevron Canada Resources
December 12, 1988

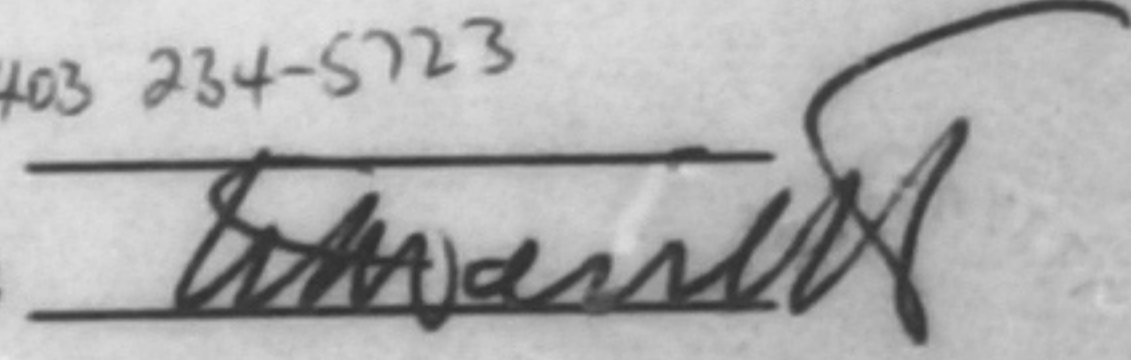
Project Geophysicist: R. G. Camp 403 234-5723
Division Geophysicist: W. E. Davitt 

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ABSTRACT

The Chevron - Fort Good Hope Joint Venture land parcel covers an area of over 1 million acres in the Mackenzie Valley 90 km northwest of Norman Wells (Figure 1). In the first year of the initial four year exploration agreement the objectives of the seismic operations were to (i) establish a comprehensive regional grid of seismic data over the entire landblock and (ii) look at various recording techniques to evaluate their effectiveness in this area.

LIST OF ENCLOSURES

- Enclosure 1 - 1:100 000 Shot Point Base Map
- Enclosure 2 - One magnetic tape with digital Shot Point information
- Enclosure 3 - 100% Shot Profiles from test site 1
- Enclosure 4 - 100% Shot Profiles from test site 2
- Enclosure 5 - 100% Shot Profiles from test site 3
- Enclosure 6 - 37 Migrated Seismic Sections
- Enclosure 7 - One copy of line 34X with interpreted horizons and velocity information
- Enclosure 8 - Time Structure Map on the Kee Scarp Horizon
(scale = 1:100 000)
- Enclosure 9 - Kee Scarp to Nahanni Time Interval Map (scale = 1:100 000)

LIST OF FIGURES

Figure 1	Landblock Location Map
Figure 2	Joint Venture Exploration Area
Figure 3	Source Testing Locations
Figure 4	Source Test Outline
Figure 5	1200% Recording Parameters
Figure 6	1000% Recording Parameters
Figure 7	3600% Line 22BR Recording Parameters
Figure 8	2000% Vibroseis Recording Parameters

PROGRAM DESCRIPTION

Program Number: 9229-C4-2E
Type of Survey: Reflection CDP Seismic
Period of Field Operation: November 29, 1987 to April 16, 1988
Locality of Work: 65 15'N to 66 10'N
128 30'W to 129 45'W
(Locality maps attached, Figures 1 and 2)
Interest Holders: Chevron Canada Resources
Community of Fort Good Hope
Program Operator: Chevron Canada Resources
Contractors: Chevron Geosciences Company (Seismic Data
Acquisition)
Western Geophysical (Seismic Data Acquisition
and Tracked Vehicles)
Carn Construction (Line Clearance Operations)
Hugh Denham Corporation (Seismic Drill Units)
Metis Development Corporation (Drill and
Recorder Camps)
Norwell Food Services (Catering)

STATISTICAL SUMMARY

Significant Dates:

<u>Date</u>	<u>Operation</u>
November 29	Start of cat work Start of drilling on test sites Surveyors on site
December 18	Shut down for Christmas break
December 30	Cats started up, camps moved out
December 31	Cat work commenced, chaining crew working
January 04	Drills and survey start up
January 05	Recording test sites
January 07	Recording production in p.m.
February 11	Cats cross the Mountain River
February 20	Drills cross the Mountain River
February 25	Recorders cross the Mountain River
April 07	Cats move east of Mountain River
April 09	Cats finish, drills cross east of Mountain River
April 10	Recorders move east of Mountain River, drills finish
April 11	Last shot fired
April 12	Demob begins
April 16	Last of recording crew moves south

Number of Personnel:

There was an average of 60 people per day employed in the field.

Production Data:

Chevron Party 6 Production	701.51 km
Chevron Party 6 Testing	42.05 km
Western Production	<u>42.82 km</u>
TOTAL	786.38 km

Average daily production for CDP recording = 7.23 km/day.

Production Notes:

There was no significant down time once production was underway. There were, however, a number of factors which had an effect on overall production:

- A thick blanket of snow prevented frost from entering the ground early in the season which prevented production shooting from starting until January 7, 1988.
- Difficult drilling east of the Mountain River led to some delays for the drill crew.
- The extreme cold led to occasional problems with the twin lead cables of the Gus Bus system. The cables became fragile and would crack, making them prone to open lines.
- Fog on the Base Camp airstrip often led to problems and delays for the aircraft support.

FIELD PROCEDURES

Surveying:

- Positioning System Control:
- GPS target surveyed using Trimble GPS meter, model #4000 SX, single frequency
 - accuracy = + 0.1 m
 - repeatability < + 0.1 m
- Seismic Survey System:
- standard EDM survey equipment
 - accuracy = + 0.5 m

Energy Source:

All shooting by Chevron Party 6 utilized a dynamite source. The four lines recorded by Western utilized a Vibroseis source.

Recording Tests:

The first series of tests was to look at various dynamite sources. These tests were undertaken on an existing line just southwest of the Base Camp as shown on Figure 3. The purpose of this testing was to examine the effect on data quality of various source arrays and hole depths. An outline of the test sequence is shown in Figure 4 with the resultant 100% profiles included as enclosures. The results of this testing showed the pattern arrays to be preferable to single hole shooting in the marginal data area of test site 1. In the good data area (test site 2) all sources were acceptable while in the very bad area (test site 3) no source type resulted in coherent reflections. (The 100% profiles enclosed represent all the test shots taken. In some cases, a complete series of tests was not possible due to drilling conditions.)

The second recording test was designed to look at fold of data. Line 22B originally recorded at 12 fold was re-shot at 36 fold later in the season as

22BR. The results showed the higher fold data to have less background noise but no significant improvement in event coherency.

The final test was to evaluate Vibroseis on the same portion of line 22B. It was felt that this 20 fold Vibroseis effort, line 22BRR, was inferior to the dynamite sources.

Recording Parameters:

The recording parameters over the season varied somewhat due to both recording tests and production considerations; however, almost all dynamite production work utilized a 3 hole shot pattern. Most dynamite data east of the Mountain River was 1200% while the regional work west of the Mountain River was predominantly 1000%. All Vibroseis data was 2000%. Parameter sheets with detailed recording information are attached as Figures 5, 6, 7 and 8.

SEISMIC DATA PROCESSING

The processing sequence used for all lines, both dynamite and Vibroseis, was essentially the same.

EDITOR

- CROOKD - for crooked line CDP calculation
- FILTER - instrument dephase filter
- GAIN - a time varying amplitude correction
- DECON - spiking deconvolution
- UPSHOT - surface statics
- AEC - a 400 msec window for amplitude equalization
- RASP - a residual automatic statics
- NMORT - moveout velocity corrections
- STACK - final stack of data
- FILTER - final bandpass filter
- BALANS - amplitude equalization
- REDATM - migration

On some lines with poor data quality and steep dips, a coherency enhancement step, COHPIC, was run before migration of the data. On the Vibroseis data, a frequency enhancement step, CALFIL, was often utilized.

Copies of all migrated sections are included with this report.

INTERPRETATION NOTES

The time structure and time interval maps enclosed with this report include both data shot by Chevron in the 1987/88 winter season and data purchased by Chevron as part of the 1984/85 Sigma participation survey. The Sigma group shoot information has been included to give a more continuous grid of coverage.

Seismic data coverage stops in the south of the landblock at the base of the Imperial Hills.

Seismic Markers

The seismic correlations used for this portion of the report are illustrated on the representative regional dip line 34X included as Enclosure 7. This is a 1000% dynamite line which runs from the Mackenzie River in the northeast, off the landblock to the southwest. The interpreted section highlights the main horizons of interest, the approximate interval velocities throughout the immediate area, and is a good example of the various data quality encountered across the block.

The Middle Cretaceous Marker (red) is simply a correlated seismic reflection which has not been tied directly to any well data. This is used primarily as a velocity change boundary for migration and depth conversion.

The Imperial Marker (yellow) is an unconformity surface which marks the base of the Cretaceous section and top of the middle Devonian Imperial Formation. This pick can in most cases be clearly seen to the west as an unconformity; however, to the east the boundary becomes much more difficult to resolve. The complications in accurately picking the Imperial are due to the generally small reflection coefficient at this level and the shallow depth to the horizon.

The Kee Scarp Marker (blue) is a strong continuous event over most of the landblock. In areas of very complicated structure, as well as where the Kee Scarp is quite shallow, picking this event accurately can be subject to errors.

The Nahanni Marker (purple) is also a strong continuous event over most of the landblock aside from the complex, poor data quality areas.

The Saline River Marker (pink) is a clear strong reflection to the east but weakens and disappears to the west. The presence or absence of a reflection at this horizon level may be related to the presence or absence of low velocity salt in the Saline River.

The Basal Cambrian Marker (green) is interpreted as an unconformity above the disturbed Proterozoic section. This reflection is quite variable in its quality over the landblock area.

Time to Depth Conversion

The interval velocities used for the time to depth conversion are:

Surface to Middle Cretaceous	3 200 m/sec
Middle Cretaceous to Imperial	3 505 m/sec
Imperial to Kee Scarp	4 265 m/sec
Kee Scarp to Nahanni	5 485 m/sec
Nahanni to Saline River	6 185 m/sec
Saline River to Basal Cambrian	4 265 m/sec
Basal Cambrian to end of section	6 400 m/sec

These interval velocities were arrived at through the averaging of available sonic log velocity data from wells in the area.

Kee Scarp Time Structure Map

The main features of interest on the time structure map of the Kee Scarp is located in the southern part of the block near the Mountain River. The map shows a large anticlinal trend, generally referred to as the Whirlpool Anticline, which runs northeast-southwest from the East Mountain outcrop, to West Mountain, and on down to the Whirlpool #1 and Hume River L-09 wells.

Northwest of the Whirlpool trend is what appears to be a separate high centered near the intersection of lines 63 and 22B. Data quality towards the eastern side of this high is poor which makes it difficult to confirm whether this is a separate closed feature or not.

Two other high features can be mapped north of the Mountain River; however, in general, the data quality between the eastern landblock boundary and the Mackenzie River is poor with a lack of coherent reflections.

Kee Scarp to Nahanni Time Interval Map

Time interval mapping is most reliable in the areas which are unaffected by large thrust structures. In the highly faulted regions or where data quality is poor, time interval mapping is subject to errors.

In the undisturbed areas over most of the landblock the Kee Scarp to Nahanni time interval shows little variation. To the east, however, towards the A-53, D-05 and O-53 wells there is a thickening of the Kee Scarp to Nahanni interval which may represent the buildup of the Kee Scarp Mountain River reef development.

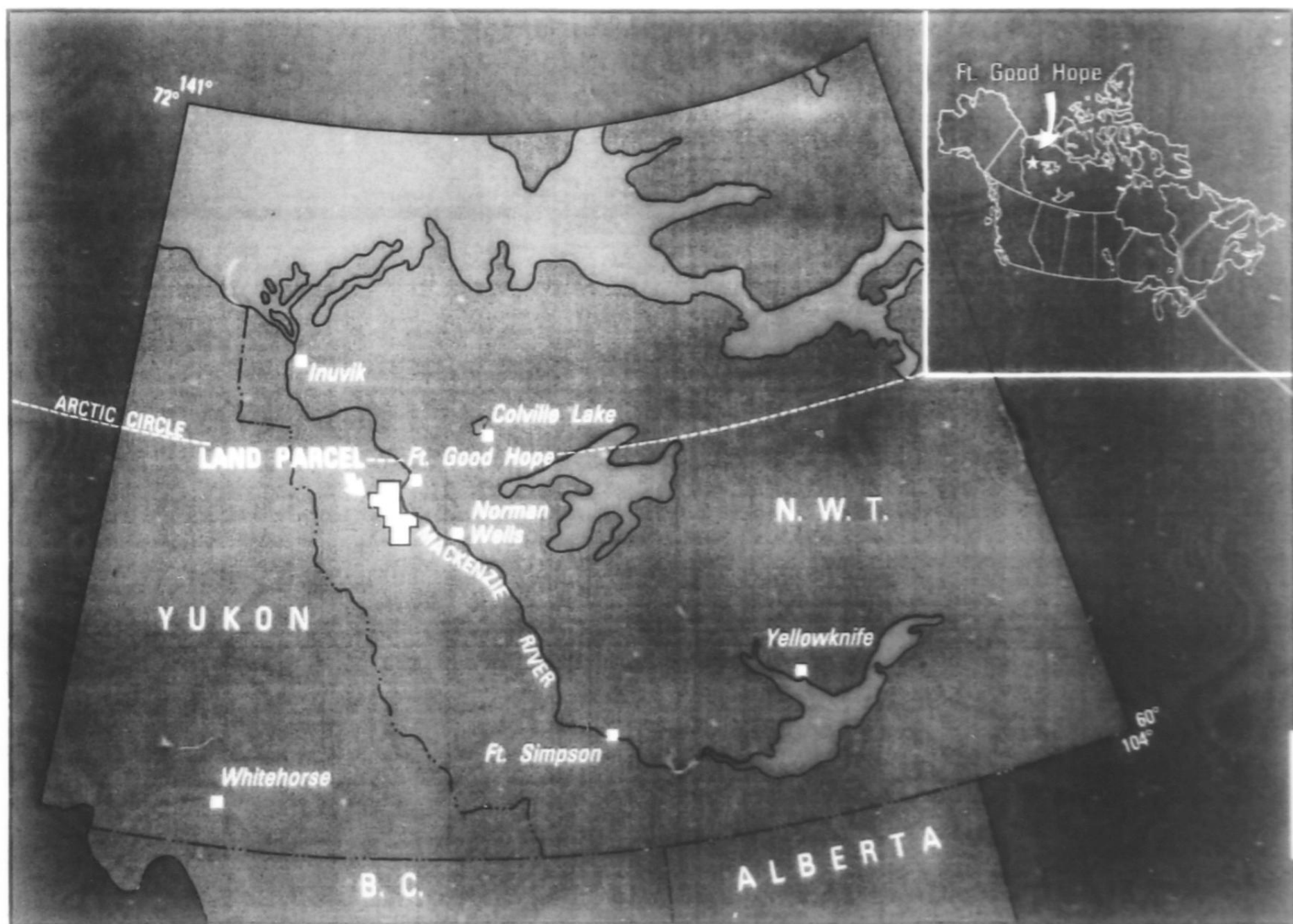
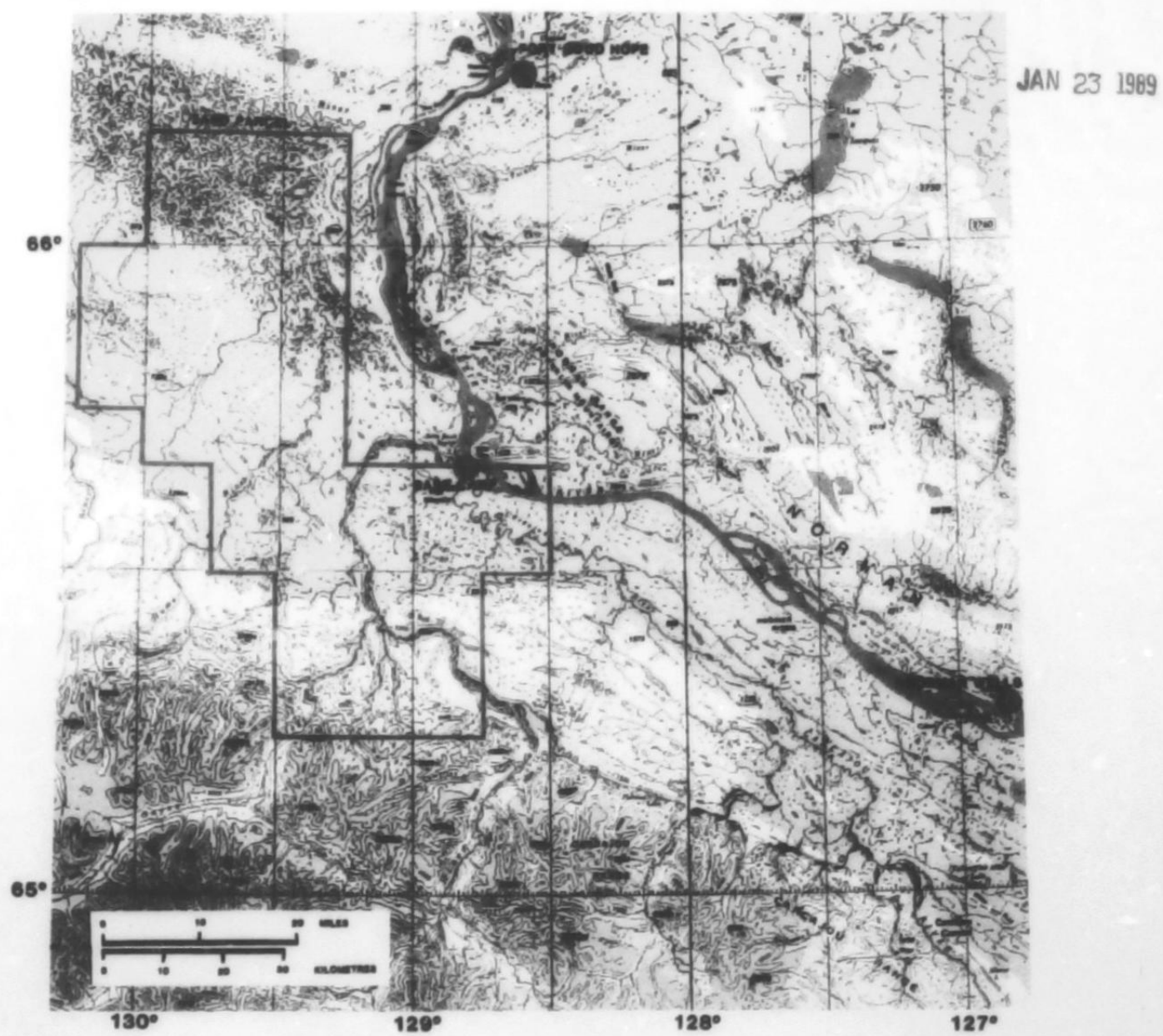


FIGURE 1

JOINT VENTURE EXPLORATION AREA

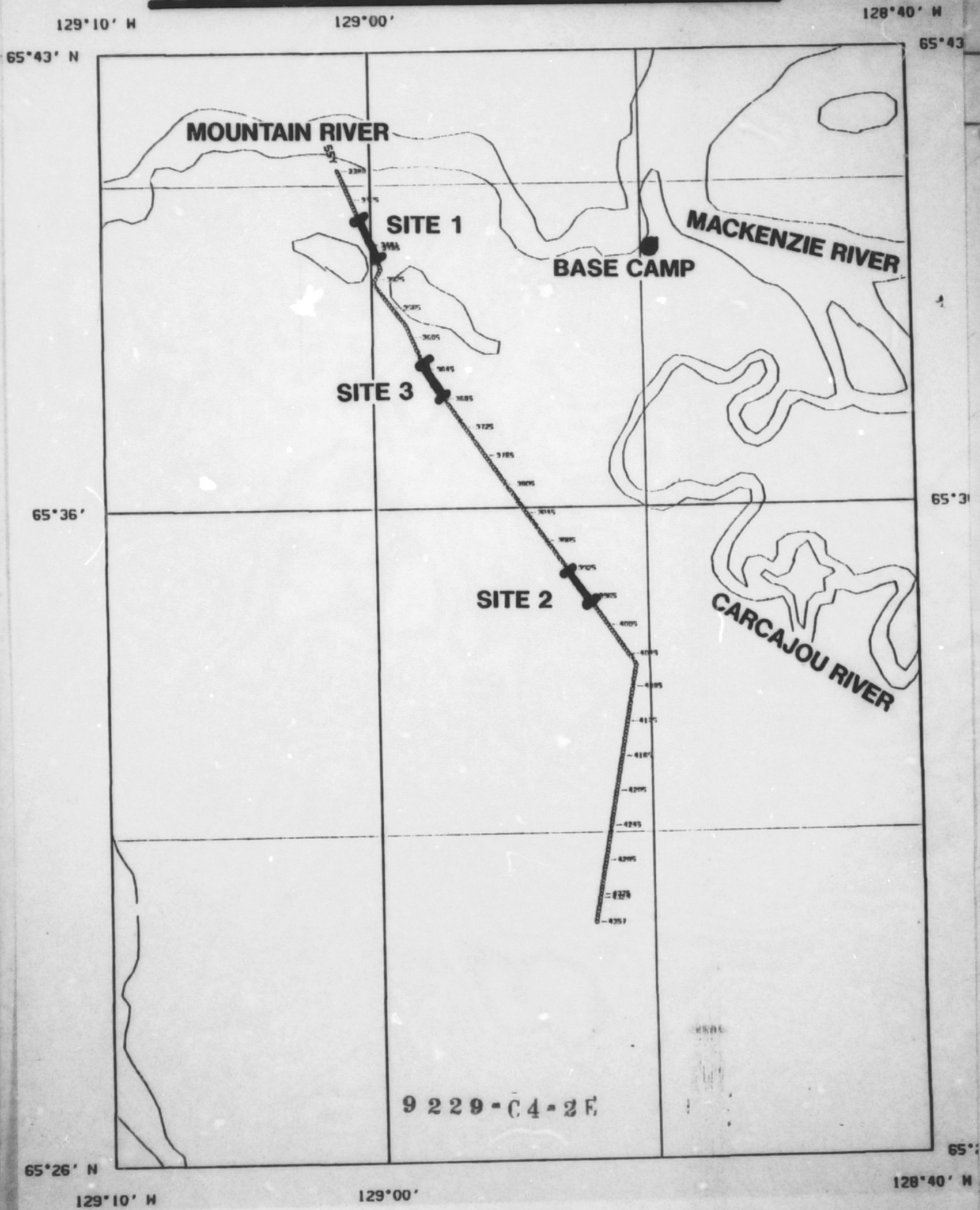


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FIGURE 2

TEST SITE LOCATION MAP

FIGURE 3

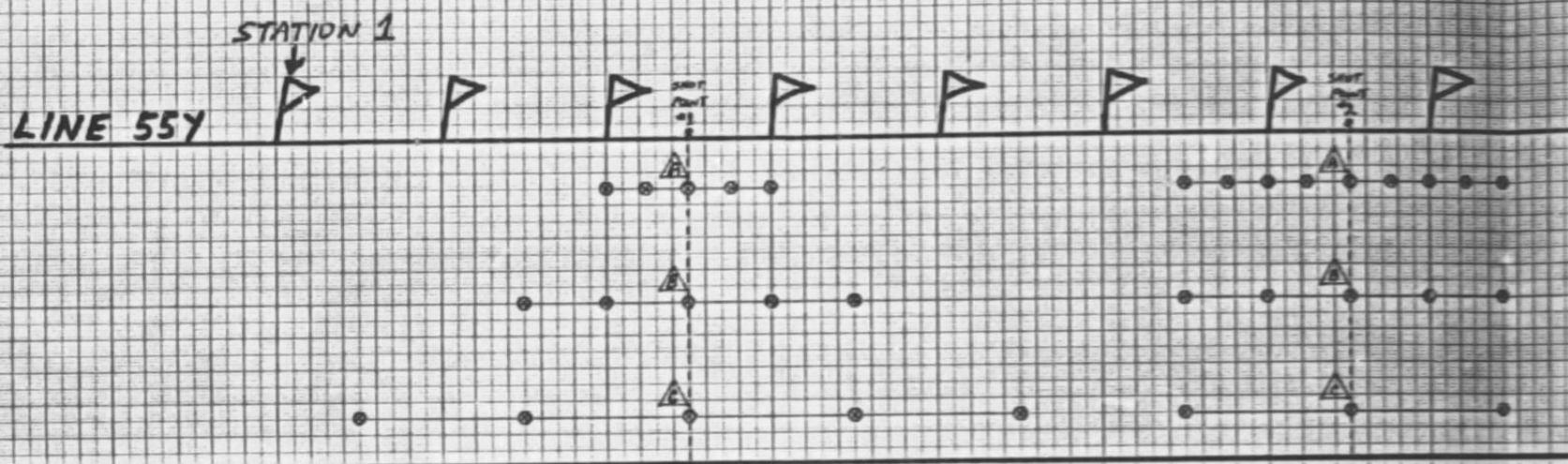


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3-H

FORT GOOD HOPE SOURCE TESTS



NOTES: (1) THE FOLLOWING SET OF TESTS IS TO BE RUN AT 3 LOCATIONS ALONG LINE 55Y.
(2) IN THE EVENT OF VERY SHALLOW DEBRIS IN THE DEEP HOLE, S.P. 9 WILL BE OMITTED AND ONLY THE ONE SET OF DEEP HOLE TEST WITH THE 2 KG. CHARGE WILL BE RUN.

SHOT POINT #1: TESTING 5 HOLE PATTERNS OF VARYING ARRAY LENGTH.

- ▲ 5 HOLES
 - HOLE SPACING = 5m
 - PATTERN LENGTH = 20m
 - HOLE DEPTH = 9m
 - CHARGE SIZE = 1 KG/HOLE
 - TOTAL CHARGE = 5 KG.
- ▲ 5 HOLES
 - HOLE SPACING = 10m
 - PATTERN LENGTH = 40m
 - HOLE DEPTH = 9m
 - CHARGE SIZE = 1 KG/HOLE
 - TOTAL CHARGE = 5 KG.
- ▲ 5 HOLES
 - HOLE SPACING = 20m
 - PATTERN LENGTH = 80m
 - HOLE DEPTH = 9m
 - CHARGE SIZE = 1 KG/HOLE
 - TOTAL CHARGE = 5 KG.

SHOT POINT #2: TESTING SAME ARRAY LENGTH WITH DIFFERING NUMBER OF HOLES.

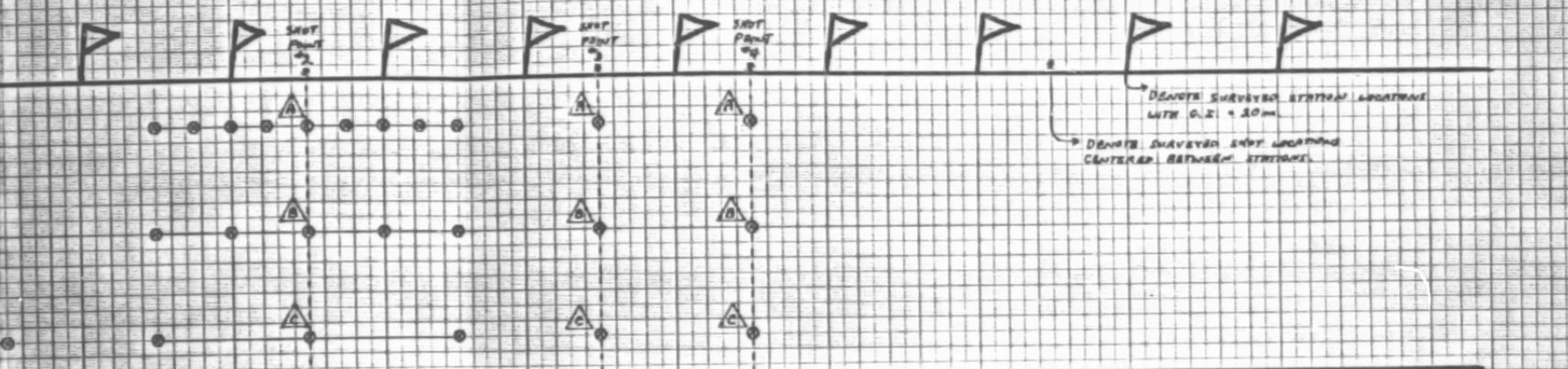
- ▲ 9 HOLES
 - HOLE SPACING = 5m
 - PATTERN LENGTH = 40m
 - HOLE DEPTH = 9m
 - CHARGE SIZE = 0.5 KG/HOLE
 - TOTAL CHARGE = 4.5 KG.
- ▲ 5 HOLES
 - HOLE SPACING = 10m
 - PATTERN LENGTH = 40m
 - HOLE DEPTH = 9m
 - CHARGE SIZE = 1 KG/HOLE
 - TOTAL CHARGE = 5 KG.
- ▲ 3 HOLES
 - HOLE SPACING = 20m
 - PATTERN LENGTH = 40m
 - HOLE DEPTH = 9m
 - CHARGE SIZE = 1.5 KG/HOLE
 - TOTAL CHARGE = 4.5 KG.

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RT GOOD HOPE SOURCE TESTS

3-H

STATION 60 →



SHOT POINT #1: TAILING SAND ARRAY LOCATED WITH DIFFERING NUMBER OF HOLES.

- 9 HOLES
- HOLE SPACING = 5m
- PATTERN LENGTH = 40m
- HOLE DEPTH = 9m
- CHARGE SIZE = 0.5 KG/HOLE
- TOTAL CHARGE = 4.5 KG
- 5 HOLES
- HOLE SPACING = 10m
- PATTERN LENGTH = 40m
- HOLE DEPTH = 9m
- CHARGE SIZE = 1 KG/HOLE
- TOTAL CHARGE = 5 KG
- 3 HOLES
- HOLE SPACING = 20m
- PATTERN LENGTH = 40m
- HOLE DEPTH = 9m
- CHARGE SIZE = 1.5 KG/HOLE
- TOTAL CHARGE = 4.5 KG

SHOT POINT #2: TAILING VARIOUS HOLE DEPTHS WITH A 2 KG CHARGE

- A - 1 HOLE
- HOLE DEPTH = 14m
- CHARGE SIZE = 2 KG
- B - 1 HOLE
- HOLE DEPTH = 30m
- CHARGE SIZE = 2 KG
- C - 1 HOLE
- HOLE DEPTH = 45m
- CHARGE SIZE = 2 KG

SHOT POINT #3: TAILING VARIOUS HOLE DEPTHS WITH A 5 KG CHARGE

- A - 1 HOLE
- HOLE DEPTH = 14m
- CHARGE SIZE = 5 KG
- B - 1 HOLE
- HOLE DEPTH = 30m
- CHARGE SIZE = 5 KG
- C - 1 HOLE
- HOLE DEPTH = 45m
- CHARGE SIZE = 5 KG

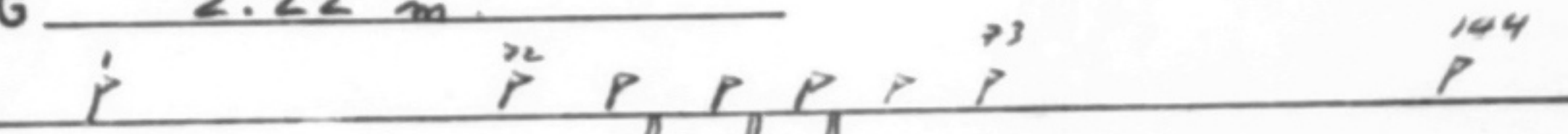
SHOOTING PARAMETERSDATE 88-12-02

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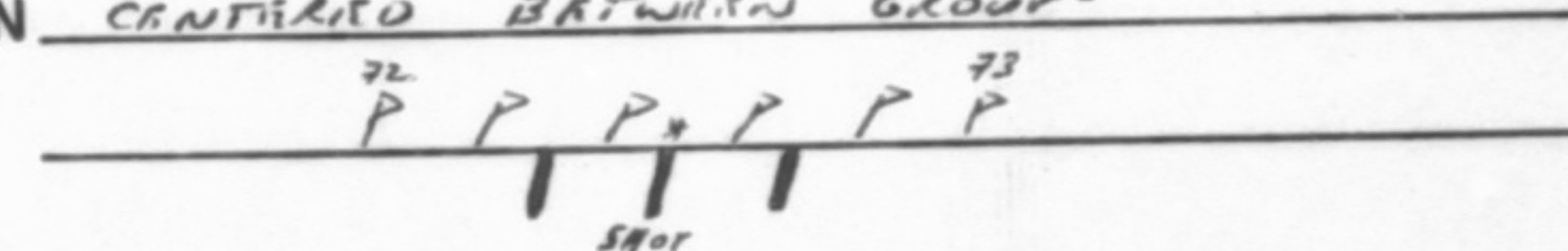
PROSPECT FORT GOOD HOPE
1200% PARAMETERS FOR LINES EAST OF
THE MTN. RIVER.COVERAGE 1200 %

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SPREAD PARAMETERS

No. OF TRACES 144
 GROUP INTERVAL 20 m
 SHOT POINT INTERVAL 120 m
 MIN. OFFSET TO CENTRE OF NEAR GROUP 50 m
 MAX. OFFSET TO CENTRE OF FAR GROUP 1470 m
 SPLIT SPREAD OR END ON SPLIT
 No. GEOPHONES/GROUP 9
 GEOPHONE SPACING 2.22 m
 SPREAD DIAGRAM 

SHOT PARAMETERS

No. OF HOLES 3
 TOTAL PATTERN LENGTH 40m
 HOLE SPACING 20m
 HOLE DEPTH 9m
 CHARGE SIZE 2 Kg / HOLE
 SHOT POINT LOCATION CENTRED BETWEEN GROUPS


RECORDING PARAMETERS

FILTERS LOW CUT 20 SLOPE 12
 FILTERS HIGH CUT 160
 SAMPLE INTERVAL 2 msec.
 RECORD LENGTH 4 seconds.

COMMENTS

FIGURE 6

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SHOOTING PARAMETERSDATE 88-02-08PROSPECT FORT GOOD HOPE1000% PARALLEL FOR LINE WEST OF
THE MTN. RIVER.COVERAGE 1000 %SPREAD PARAMETERS

9229-04-28

No. OF TRACES 120GROUP INTERVAL 24 mSHOT POINT INTERVAL 144 mMIN. OFFSET TO CENTRE OF NEAR GROUP 36 mMAX. OFFSET TO CENTRE OF FAR GROUP 1452 mSPLIT SPREAD OR END ON SPLITNo. GEOPHONES/GROUP 9

GEOPHONE SPACING

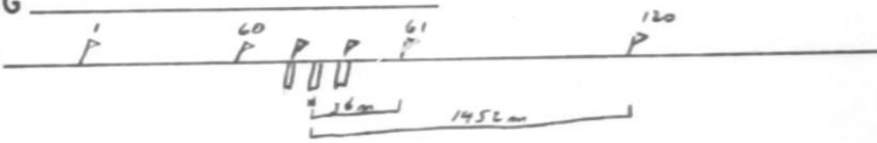
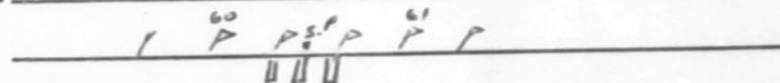
SPREAD DIAGRAM SHOT PARAMETERSNo. OF HOLES 3TOTAL PATTERN LENGTH 24 mHOLE SPACING 12 mHOLE DEPTH 9 mCHARGE SIZE 2 kg/HOLESHOT POINT LOCATION CENTERS BETWEEN GROUPSRECORDING PARAMETERSFILTERS LOW CUT 20 SLOPE 12FILTERS HIGH CUT 160SAMPLE INTERVAL 2 msec.RECORD LENGTH 4 secondsCOMMENTS

FIGURE 7

SHOOTING PARAMETERS

DATE 88-03-28

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PROSPECT FORT GOOD HOPE

*LINE 22B RE-SHOOT TO LOOK AT
HIGHER FOLD

COVERAGE 3600 %

9229-C4-2E

SPREAD PARAMETERS

No. OF TRACES 144

GROUP INTERVAL 20 m

SHOT POINT INTERVAL 40 m


MIN. OFFSET TO CENTRE OF NEAR GROUP 30 m

MAX. OFFSET TO CENTRE OF FAR GROUP 1450 m

SPLIT SPREAD OR END ON SPLIT

No. GEOPHONES/GROUP 9

GEOPHONE SPACING

SPREAD DIAGRAM 

SHOT PARAMETERS

No. OF HOLES 1

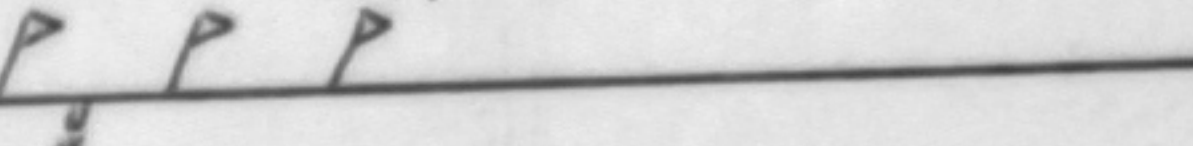
TOTAL PATTERN LENGTH N/A

HOLE SPACING N/A

HOLE DEPTH 10 m

CHARGE SIZE 2 kg.

SHOT POINT LOCATION CENTERED BETWEEN GROUPS



RECORDING PARAMETERS

FILTERS LOW CUT 20 SLOPE 12

FILTERS HIGH CUT 160

SAMPLE INTERVAL 2 msec.

RECORD LENGTH 4 sec.

COMMENTS RESHOOT OF LINE 22B TO BE CALLED 22BR. FIRST

SHOT @ S.P. 3420, LAST SHOT @ S.P. 3070. START AND

END ON A FULL SPREAD.

VIBROSEIS PARAMETERS

JAN 23 1981

DATE 8P-03-21

PROGRAM NUMBER _____
COVERAGE 2000 %PROSPECT FORT GOOD HOPE
CREW WESTERN GEO PHYSICAL

9229-C4-2E

SPREAD PARAMETERSNO. OF TRACES 120 GROUP INTERVAL 24 m
SPLIT SPREAD OR END-ON SPLIT GEOPHONES/GROUP 9
NO. OF GROUPS IN GAP 6 GEOPHONE INTERVAL 2.67 m
OFFSET TO CENTRE OF NEAR GROUP 84 m
OFFSET TO CENTRE OF FAR GROUP 1500 m
V.P. SPACING 72 m

SPREAD DIAGRAM

VIBRATOR PARAMETERSSWEEP LENGTH 16 SEC. LOW FREQ. 15 Hz
LISTEN TIME 4 SEC. HIGH FREQ. 111 Hz
TAPER LENGTH .25 SEC. UP OR DOWN SWEEP UP
NUMBER OF VIBRATORS AND SWEEPS 4 x 8
DISTANCE BETWEEN CENTRE OF EACH VIBRATOR 16 m
VIBRATOR MOVE-UP/SWEEP 3.43 m

VIBRATOR DIAGRAM

RECORDING PARAMETERSLOW CUT FILTERS 20 Hz SLOPE 12 db
HIGH CUT FILTERS 128 Hz SLOPE _____
NOTCH FILTERS IN ☐ OUT ☒ SAMPLE RATE 2 msec.
TYPE OF STACK VERTICAL ☐ DIVERSITY ☐ EDITED ☐COMMENTS GROUND FORCE CONTROL.

