Discovery Energy

Processing Report Lake Hope 3D 12-21-12

Submitted by:



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1. Activities Schedule

The project was bid based on a time table of four weeks from the time we received all the data depending on the amount of testing desired by the client. Processing of data began on June 25,2012 and the PSTM received by the client on August 9,2012. The project took about 2 weeks longer than anticipated due to the fact the only acquisition information was in paper form and the data headers had no information available. All geometry information had to be entered by hand and verified for all 9511 records. There were 894 spread definitions which had to be described as well for the survey. Once all the information was put in by hand the geometry for all records were visually inspected for accuracy and any corrections made. A header populated dataset was given to the client in the event any future processing of this dataset was desired the additional cost would not be incurred again.

2. Responsible for the re-processing:

Shelby Barley - has served as Senior Executive Vice President since 1993. Mr. Barley has been with the company since it's inception in 1991. Mr. Barley served an intricate role in solving the statics and velocity challenges in numerous Yemen and Delaware Basin datasets. His expertise is employed throughout domestic projects in California, Montana, Wyoming, Michigan, Appalachians, Gulf Coast and in volcanics of Washington. His international projects include: Colombia, Dubai, Oman, Algeria, Mozambique, the Sakhalin shelf and throughout South America. Mr. Barley received his B. A. in Business from Tarleton State University and began processing for PGI in 1982

3. Hardware & Software used

Hardin uses PROMAX software for interactive processing, and also utilize third party software for refraction statics (Renegade's Seismic Studio and Hampson Russell's GLI), Prestack Time and Depth Migration (Tsunami, Bluestreak, and ADS). Our depth velocity modeling is performed with Paradigm's Geo-Depth. We also have SDI software for plotting and generating cgm files. This all runs on Linux Clusters with 200 + dual core CPU's and 40+ terabytes of disk space.

4. Acquisition Parameters

See associated acquisition files included **Folder name** = Acquisition PDF files

5. Pre-processing test

The processing parameters were initially based on basic parameters and evaluated throughout the processing. The initial gain curve application as well as the decon and spectral whitening parameters were tested during the processing.

6. Processing Sequence

- 1. SEGY Input
- 2. Geometry Header Load
- 3. Trace Edit
- 4. True Amplitude Recovery
- 5. Surface Consistent Amplitude Corrections
- 6. Surface Consistent Deconvolution
- 7. Refraction Statics
- 8. Velocity Analysis
- 9. NMO
- 10. Trace Mute
- 11. Bandpass Filter / Spectral Whitening
- 12. Trace Equalization
- 13. Surface Consistent Statics
- 14. Velocity Analysis
- 15. Surface Consistent Statics
- 16. CDP Residual Statics
- 17. PSTM Curved Ray Migration
- 18. Velocity Analysis
- 19. Stack
- 20. Time Variant Filter
- 21. Trace Equalization
- 22. SEGY Output

7. Parameters used in processing 1. SEGY Input

2. Geometry Header Load

This dataset was shot using a vibroseis source . The survey was shot to yield a 35 m x 17.5 m cdp bin spacing. The survey was shot yielding a fold up to 34 for parts of the survey. The Lake Hope survey covers 128.09 square kilometers (9511 recorded files). The near offset is approximately 39 m and the far offset is approximately 2150 m. There was a total of 5.023.312 traces in this project at a 4ms sample rate and a four second trace length.

3. Trace Edit

4. True Amplitude Recovery

Time power constant 1.1 to 3.0 seconds

5. Surface Consistent Amplitude Corrections

Shot, Rcvr, Offset, CDP, Chan components were used in decomposition but only the shot and receiver components were applied to the data

6. Surface Consistent Deconvolution – Spike / 160 ms. Operator

7. Refraction Statics Datum=0 m. V(E)=1950 V(0)=1650 V(1)=1950 m./sec.

8. Velocity Analysis – 1 km interval

9. NMO

10. Trace Mute

TIME	AOFFSET	CDP
 10.1	38.9	26000.0
261.5	508.2	26000.0
631.0	888.5	26000.0
737.0	1065.2	26000.0
879.4	1197.4	26000.0
1476.0	2151.7	26000.0

- **11. Bandpass Filter** 2-6-210-220 hz. or **Spectral Whitening** 4-8-75-80 hz.
- 12. Trace Equalization 1000 ms. AGC
- 13. Surface Consistent Statics 4 iterations
- **13.Velocity Analysis** ¹/₂ km interval
- **13. Surface Consistent Statics** 4 iterations
- 16. CDP Residual Statics 6 ms. Max static
- 17. PSTM Curved Ray Migration Tsunami software
- **18. Velocity Analysis** ¹/₂ km interval

19. Stack

- 20. Time Variant Filter 6-10-75-80 hz...,....0-700 ms. 6-10-65-70 hz....1000-1800 ms. 6-10-50-60 hz....2000-4000 ms.
- 21. Trace Equalization 1000 ms. AGC

The processing flow produced two final datasets. One with and without Spectral Whitening for the PSTM processing.

8. Fold Map



9. Swath Map of processed lines

Display of receiver lines



Display of Shot lines





Display of Offset distribution

Display of CDP coverage



10. Stack & Migration examples Brute Inline 1175



Refraction Statics Inline 1175





First Pass Surface Consistent Statics Inline 1175



Second pass of Surface Consistent Statics Inline 1175

CDP Residual Statics Inline 1175





PSTM Curved Ray Migration Inline 1175



PSTM Curved Ray Migration Inline 1175 with Spectral Whitening

11. Ratios of CDP Inline / X-line

3D Data Loading Worksheet

Client: Discovery Energy

Survey: Lake Hope 3D

Area: Australia

Date: 7/30/2012

AGD 84 AHD UTM projection AMG Zone 54 SM=141

Upper	· Left Corner		Upper	· Right (Corner
Line#:	: 1330		Line #	±:1330	
Trace	# 1001		Trace	#:1880	
CDP	289521		CDP	290400	
X:	357147.2		X:	372374.3	
Y:	6888903		Y:	689108	3.5
Lower	· Left Corner		Lower	r Right (Corner
Line#: 1001			Line #:1001		
Trace #:1001			Trace #:1880		
CDP	1		CDP	880	
X:	358779.6		X:	374006	.8
Y:	6877504.5		Y:	687968	5
Line (Bin) Spacing:		35m		
Trace	(Bin) Spacing	•	17.5m		
Form	at- SEGY 32 B	it Floating Poi	nt		
Heade	er Information				
Line N	Number Starts	in Byte:			21-24
Trace	Number Start		25-28		
CDP X Coordinate Starts in Byte:					73-76
CDP Y	Y Coordinate S	Starts in Byte:			77-80
Samp	le Rate: 4 ms	Record Lengt	th:	4 sec	
Datun	n: 0	Datum Veloc	city	1828m	
CDD	//T 1º // 10/	1) + 000) + X/	• //	1000	

CDP=((Inline # - 1001) * 880) + X-line# - 1000

12. Velocity Fields

See included file (**stk.vel**) for final RMS stacking velocities ASCII

See included file (**ip2pstm.vel**) for PSTM model RMS velocities ASCII

See included file (**pstmstk.vel**) for final PSTM stacking velocities

Folder Name = Velocity Information ascii



Velocity Grid ¹/₂ km by ¹/₂ km

13. Velocity models used

Final Stacking Velocity profile



14. Values of all statics

See associated files a db for complete shot and rcvr static listings

All statics included – refraction, 2 passes of surface consistent statics

Folder name = Shot Rcvr Statics

15. Conclusions & Recommendations

The Lake Hope 3D survey was shot to yield a 35m x 12.7m cdp bin spacing. The processing flow works very well for this data. There is ample signal in the data for quality velocity and static resolution. The frequency content appears to have a considerable amount of higher frequency and continuity of the data appears well. Statics and velocities behaved very well during the processing. Further development of this area will yield more information from the interpretation as well as the processing end. The final datasets in this project were produced with and without spectral whitening applied.



March 2013

Lake Hope 3D Reprocessing Report

ABSTRACT

Bell & Murphy and Associates on behalf Discovery Energy Corp supervised the reprocessing of the Lake Hope 3D totaling 138.4 square kilometers acquired by Santos Ltd in 1922. The reprocessing was assigned to Hardin International Processing, Inc.. Digital field data was delivered June 25, 2012 and final processing that included both post and pre stack migration were transferred to Bell & Murphy August 9, 2012.

INTRODUCTION

Discovery Energy Corp was granted Petroleum Exploration License PEL 512 October 26, 2012 and the Lake Hope 3D is on the Northeast corner on PEL 512 and overlaps onto several oil fields. Sturt, Sturt East, Tantanna, Malgoona and Taloola. Additional interesting wells within the Lake Hope 3D include the deep Murumaba Lake Hope #1 well drilled in 1971 to a total depth of 2500 meters. Discovery's intent was to reprocess the Lake Hope 3D with current state of industry geophysical processing techniques.

OBJECTIVE VERVIEW

Discovery Energy after mapping both the existing 2D seismic data and the original processing of the Lake Hope 3D wanted to focus on the stratigraphic component of the above producing reservoirs by reprocessing the 1992 Lake Hope 3D with updated state of the industry processing techniques. A second objective was to help determine acquisition parameters changes for acquiring future 3D's on PEL 512

Field Acquisition and Processing "1992"

Halliburton Geophysical Services acquired and processed the Lake Hope 3D. Energy Source was Vibroseis with a sweep frequency of 8-84 Hz, and a sample rate of 4 ms. Final processing deliveries were stack and final Post Stack Migration at 4ms with time variant filters on a 17.5 X 17.5 CDP bin size grid.

Reprocessing "2012"

While the Lake Hope 3D was acquired with the excelled field recording equipment in 1992 none of the field support data was input in to the record tape headers. Harden had to define the field geometry for each of the 9511 field records. This included hand entering all individual shots and receiver surveyed location with elevations and each individual field record. This delayed the final delivery by two weeks.

The survey geometry constructed by Harden resulted a change in the CDP bin spacing of 35 m by 17.5 as compared to 17.5 X 17.5 in 1992. In addition to changing the CDP bin spacing Harden applied refractions statics, Surface Consistent statics and Pre Stack Time Migration. These changes in processing produced several final data sets:

1) Stack,

6) Migration (Post Stack Time Migration)

8) Migration SP (balancing/broadening improve resolution)

- 7) Migration FX (noise attenuation, deconvolution)
- Stack FX
 Stack SP
- 9) Migration FX SP
- 4) Stack FX SP
 5) Stack TVF
- 10) PSTM (Pre Stack Time Migration)
 - 11) PSTM SP

DISCOVERY ENERGY MAPPING

Discovery has started a detail structural and stratigraphic mapping of multiple key horizons including: Cadna Owie, Murta, Namur Westbourne, Adori, Birkhead Hutton Poolowanna, Patchawarra and Merrimella.

FUTURE FIELD ACAQUISTION PARAMETERS

Bell & Murphy and Associates on future 3D acquisitions will recommend that changes in recording processing parameters.

- 1) Open recording filters,
- 2) Sample Rate of 1 ms for field acquisition and final processing
- 3) Test for using only 1 vibrator sweep with sweep frequencies in excess of 124 Hz
- 4) Pod 6 geophones instead of laying the 12 geophones inline along the receiver line

Respectfully BELL & MURPHY AND ASSOCIATES, LLC Au James A. Carroll, P.G. Managing Director