Talisman Energy Inc.

Geophvsical Interpretation Report

Portland/Bellburns Program West Newfoundland

Acquisition Date: 9604
Report Date: 9704
Author: Mark Godlewski

Introduction

This report summarizes the interpretation of a geophysical data set comprising 156 km of onshore seismic and gravity data acquired by Talisman in January to April of 1996. The interpretation includes other data available to Talisman at this time. The report is being submitted to the Newfoundland and Labrador Department of Mines and Energy in accordance with the regulations.

Seismic Data Quality And Processing

The overall data quality is fair to good. The two biggest factors effecting data quality are near surface weathering and structural Complexity.

The principle problem with the weathering are areas of thick glacial fill which tend to absorb and scatter the seismic energy. An effort was made with the dynamite acquisition to place the charges into bedrock. Unfortunately this was not always possible due to the thickness of the drift and the difficulties in drilling. Shot holes bottoming in bedrockand geophone locations with thin drift had the best signal to noise characteristics. This included locations in solid granite up on the top of the Long Range Mountain.

Structural complexity is a major factor in this area. As explained below there are a number of episodes of significant structural movement. The sense of movement is different for each of these episodes resulting in a complex 3D 'structural picture with variable strike and dip. Often preexisting faults have been partially or completely reactivated over a portion of their length. The structural complexity has three effects on the seismic processing and interpretation. The first is to complicate the sense of true strike and dip for the structures so that every line contains a significant amount of off-'line energy that cannot be migrated properly in a 2D sense. The second effect is that the complex shallow velocity variations lead to confused and degraded images at deeper levels. The third problem is that the structural interpretation itself becomes ambiguous due to the line misties and the difficulty in applying structural restoration tools.

Data quality tends to worsen towards the Long Range Mountain front. This is probably a combination of the increased structural complexity and an area of thicker glacial drift.

Seismic Correlations

The events used in the mapping were chosen primarily based on strength and continuity with only a general understanding of their geologic significance. Their identification is based on regional correlations to other parts of the basin and on ties to surface geology. There are no deep wells or sonic logs in the area.

The major markers used in the seismic mapping are listed below in order from shallow to deep:

Cow Head Group
These reflections can be clearly seen on many of the seismic lines particularly those located in the vicinity of Parson's Pond. Some of the deepest reflections are quite strong and probably correspond to tuned interbeds of tight limestone and organic rich shale. These thrust slices are believed to be the distal equivalents of the Petit Jardin, St. George, and Table Point platform carbonates which have been transported long distances inland by the Taconic Orogeny. The deep water carbonate equivalents are overlain stratigraphically by the clastics of the Lower Head Formation. Due to the structural and
stratigraphic complexity and the apparent lack of regional reservoir we made no attempt to develop consistent correlations for these units.

Table Point Marker
This marker has been tied into the surface geology north of Portland Creek Pond. It appears to correlate with the top of the Ordovician Carbonate Platform. This marker should lie from 50 m to 150 m above the top of a porous dolomite unit. Petit Jardin Marker This is an excellent marker in the area and is generally conformable with the Table Point above and the Labrador below. Based on ties to surface geology north of Portland Creek Pond the marker is believed to represent the first major shale interval towards the base of the carbonate platform. This marker may correlate to the Big Cove marker on the Port au Port pennisula.

Labrador Marker
This is the lowest consistent marker in the platform succession. In some places this marker seems to be close to Precambrian granite basement but in other areas there appears to be significant thicknesses of sedimentary (Proterozoic?) rocks beneath the marker.

Structural Features

The structures in the Portland/Bellburns area are the result of at least four tectonic episodes. The major elements are listed below from oldest to youngest:

Cambro-Ordovician Extension
A number of seismic lines show evidence of down to the basin extension faults which cut the older parts but not the top of the carbonate platform. A good example occurs on line 9670 at SP 389. Here one of these early extension faults causes thickening in the lower platform.

Taconic Extension

These faults are the source of the famous Cape Cormorant submarine debris. They appear to occur in response to loading on the platform in front of the Taconic Allochthon. These fault zones are often quite difficult to interpret as they are frequently inverted and subjected to some strikeslip movement later in the Taconic and Acadian. Some evidence of these faults in the seismic data set is expressed in the form of a weakened reflection from the top of the carbonate platform on the upside of the fault. The best example is located on the Norcen line 92-67.

Taconic Low AngleThrusting

These structural features are well documented in the surface geology and are easily visible on the Talisman seismic data particularly in the area of Parson's Pond. They exhibit complex thin skinned deformation with multiple stacked sheets and rapid variations in plunge. All of these thrust sheets appear to be far traveled and there is little evidence of significant Taconic thrusting involving the Table Point Marker in this Area.

Acadian High Angle Thrusting

These are the most prominent structural features in the data set. The largest Acadian feature is the Long Range Mountain Front itself. This appears to be a relatively high angle (35 degree) thrust that cuts up through the platform and brings granite to surface. There is a second major thrust front that runs up the coast from Portland Creek Pond. The principle exploration targets in the area are number of smaller thrusted structures involving carbonate platform reservoir located in front of the Long Range Thrust south of Portland Creek Pond. Many of the high angle faults imaged on seismic have indications of a complex history of reactivation. They often show signs of early extension followed by later compression and strikeslip movement.

Seismic Velocities

The seismic velocities in this area are high. The map "Average Velocity to Top Table Point" was created to convert seismic times to depth using stacking velocities combined with interpretations based on seismic and surface geology. The velocity map reflects a number of velocity trends. Velocities increase in a general way towards the mountain front reflecting an increase in the number and thickness of high velocity thrust slices. A series of high velocity anomalies northwest of Parson's

Pond are believed to be caused by the stacking of carbonate sheets of the Cow Head formation. The Long Range Thrust itself has an effect on the velocity field by bringing carbonate platform rocks (6,000 m/s) and Precambrian Granite (5,500 m/s) to surface.

Gravity Interpretation

Although gravity data was collected on all the seismic lines it was only used in a very general way to constrain the seismic interpretation. The gravity can be seen to respond to thick sequences of high density carbonate platform but these sediments were easily identifiable on the seismic itself.

List of Attachments

April 7, 1997

PROCESSING REPORT

Bellburns & Portland Creek, Newfoundland

The following is a description of the seismic processing services done by CGG Geophysics Canada under contract by Talisman Energy Inc. Approximately 160 kilometers of newly acquired land data was processed in the 1st quarter of 1996 in the following manner:

1) Reformat from field format (SEOD) to internal CGG processing format at 2 ms sample rate.

2) QC plots of the data were produced to identify shot records of unsatisfactory quality .These records were eliminated from the processing Flow.

3) Application of acquisition geometry taking into account a "crooked-line" surface layout.

4) Spherical divergence gain recovery was applied to the data following an amplitude decay test.

5) FK-filtering in shot mode. A reject fan filter of +/-2,800 rn/s was used.

6) Sort from shot mode to cdp mode.

7) Conversion to minimum phase.

8) A standard surface-consistent spiking deconvolution was applied to the data following tests that determined the operator length (80 ms) and pre whitening (0.1%). The operator design window was 300 to 3,300 ms at the near trace.

9) Analysis and application of elevation and weathering statics to a floating datum plane.

10) An interactive velocity analysis using semblence, constant velocity stacks, and a central cdp gather was performed.

PROCESSING REPORT

Bellburns & Portland Creek, Newfoundland

11) Analysis and application of surface-consistent residual statics. The method used was "packed-mode" targeting medium wavelength statics.

12) Analysis and application of surface-consistent residual statics. Conventional method used for targeting high-frequency statics.

13) An interactive velocity analysis using semblence, constant velocity stacks, and a central cdp gather was performed.

14) Dip moveout was applied. This is a variable velocity Kirchhoff algorithm for events dipping up to 90 degrees.

15) An interactive velocity analysis (after DMO) using semblence, constant velocity stacks, and a central cdp gather was performed.

16) The final NMO function and a post NMO mute was applied to the data referenced to a floating datum plane

17) Static correction to final flat datum. Intermediate datum = 300 meters ASL, structural datum = 150 meters ASL, and replacement velocity = 4,000 Meters/second.

18) Single channel dynamic equalization using 800 ms gate with a 50% overlap.

19) The cdp gathers were stacked at full acquisition fold (75 fold).

20) Phase rotation of vibroseis data to match dynamite data. Angle applied was -90.0 degrees.

21) Post-stack finite difference migration capable of migrating dips up to 90 degrees. The percentage of the smoothed DMO stacking velocity function was fixed at 90 percent.

PROCESSING REPORT

Bellburns & Portland Creek, Newfoundland

18 The data was filtered using a zero-phase bandpass filter of:

16/22 - 80/90 Hz	0.0 to 0.6 seconds,
10/16 - 70/80 Hz	1.0 to 1..8 seconds,
10/16 - 60/70 Hz	2.0 to 4.0 seconds

19) A single channel equalization operator was applied as follows:

0 - 800 ms	200 ms length with 50% overlap
800 - 4000 ms	800 ms length with 50% overlap

20) The data was output to tape in SEGY format and displayed to film.

PROCESSING REPORT

Bellburns & Portland Creek, Newfoundland

Processing Issues

Statics:

This was the most significant processing concern in this seismic survey. The near surface geology consists of very high velocity limestone outcrop and low velocity glacial till. It was difficult to choose a replacement velocity appropriate for the entire area due to the fast lateral changes in the near surface velocities. This surface condition also resulted in significant static "busts" in the reflection data. Offset dependent surface consistent residual statics were tested but proved unsuccessful in solving this complex problem.

Noise Content:

In many parts of the program, a poor signal to noise ratio was present. These areas were correlated to the low velocity glacial till areas within the survey. The high noise content made the data difficult to migrate.


-57°45'0''
-57°30'0''
50°15'
Time Structure
Petit Jardin Formation
Author:
M. Godlewski
Department:
Talisman Energy Inc.
Date:
April 02, 1997
Parsons Pond NFLD
Portland/Bellburns
Contour Interval 25ms
DATUM +150 m ASL + 200 ms STATIC SHIFT
MG96-074
MG96-072
92-067-T9G
92-073-T9G
MG96-073
MG96-071
92-068-T9G
MG96-064
92-069-T9G
MG96-069
89-2-L20
MG96-070
MG96-068
92-070-T9G
92-071-T9G
MG96-067
92-072-T9G
SCALE 1:50000.0
0 1 2 3 4 5
KILOMETERS

Time Structure

Top Table Point

Author: M. Godlewski	Department: Talisman Energy Inc.
Date: April 06, 1997	Parson's Pond Nfld
Portland/Bellburns	Datum +150m
	Contour Interval 20 ms

WHERE ARE THE FAULTS MARK?