

Final Operational Report for Program ID 9229-A075-002E Turton Lake Heli-portable 2D Seismic (2003)

Geophysical Program ID: 9229-A075-002E
Program Name: Turton Lake Heli-portable 2D Seismic

Field Operation Dates: August 20 - September 27, 2003
Area of Operations: NTS 96-E-15, 96-L-2

Operator: Apache Canada Ltd.
Interest Owners: Apache Canada Ltd. (50%)
Paramount Resources (50%)

Data Acquisition Contractor: Trace Energy Services Ltd.
Survey Contractor: Mercedes Surveys
Data Processing Contractor: Matrix GeoServices Ltd.

Prepared by: Ronald K. Larson, P. Geoph.
Sr. Staff Geophysicist
Apache Canada Ltd.

Dated: January 9th, 2009

Table of Contents

1	Introduction.....	3
2	Program Area.....	4
3	Operational Summary (Dates, Equipment etc.)	6
4	Summary of Weather and Topography	7
5	Description of Operations (Parameters/Equipment).....	10
6	Processing Sequence	11
7	Seismic Sections	12
8	Geophysical Correlation: Synthetic Seismograms.....	15
9	Interpretive Maps	16
10	Appendix A: Complete Data Listing	21

1 Introduction

The Turton Lake seismic project (9229-A075-002E) was conducted by Apache Canada Limited (Operator) and Paramount Resources Ltd. (capital partner) in August and September 2003 north of Norman Wells, in the vicinity of Turton Lake in NTS sheets 96-E and 96-L.

The project involved acquisition and processing of three (3) 2D seismic lines, conducted using heli-portable equipment. Total line length is approximately 60 kilometers.

Line names are:
CEX6-Turton-01
CEX6-Turton-02
CEX6-Turton-04

Interpretation work in this report was conducted in 2003 / 2004 primarily by Mr. N. Kawaguchi, Sr. Staff geophysicist at Apache Canada at the time. Mr. Kawaguchi has since retired from industry. This report was compiled from archived data by Mr. R. Larson, Sr. Staff Geophysicist at Apache Canada Limited in December 2008 and January 2009.

This report includes digital data on CD. The contents of the CD(s) are listed in Appendix A, and on the CD itself. Notably, the CD includes copies of the text and figures of this report and survey data of the lateral position and elevation of both source and receiver points.

2 Program Area

Final line locations are shown in Figure 1. The three lines shot for project 9229-A075-002E are shown in heavy black. Other pre-existing 2D seismic shows in thin orange lines. Figure 2 is a more detailed shot point map (every 8th shot point). Topographic maps in these figures were produced using *.png files from the E-topo digital topographic map series, rectified into NAD27 Zone 9 using Global Mapper software, and ultimately displayed using Seisware software. Overlapping NTS sheets result in the angular white spaces as one sheet is drawn over another.

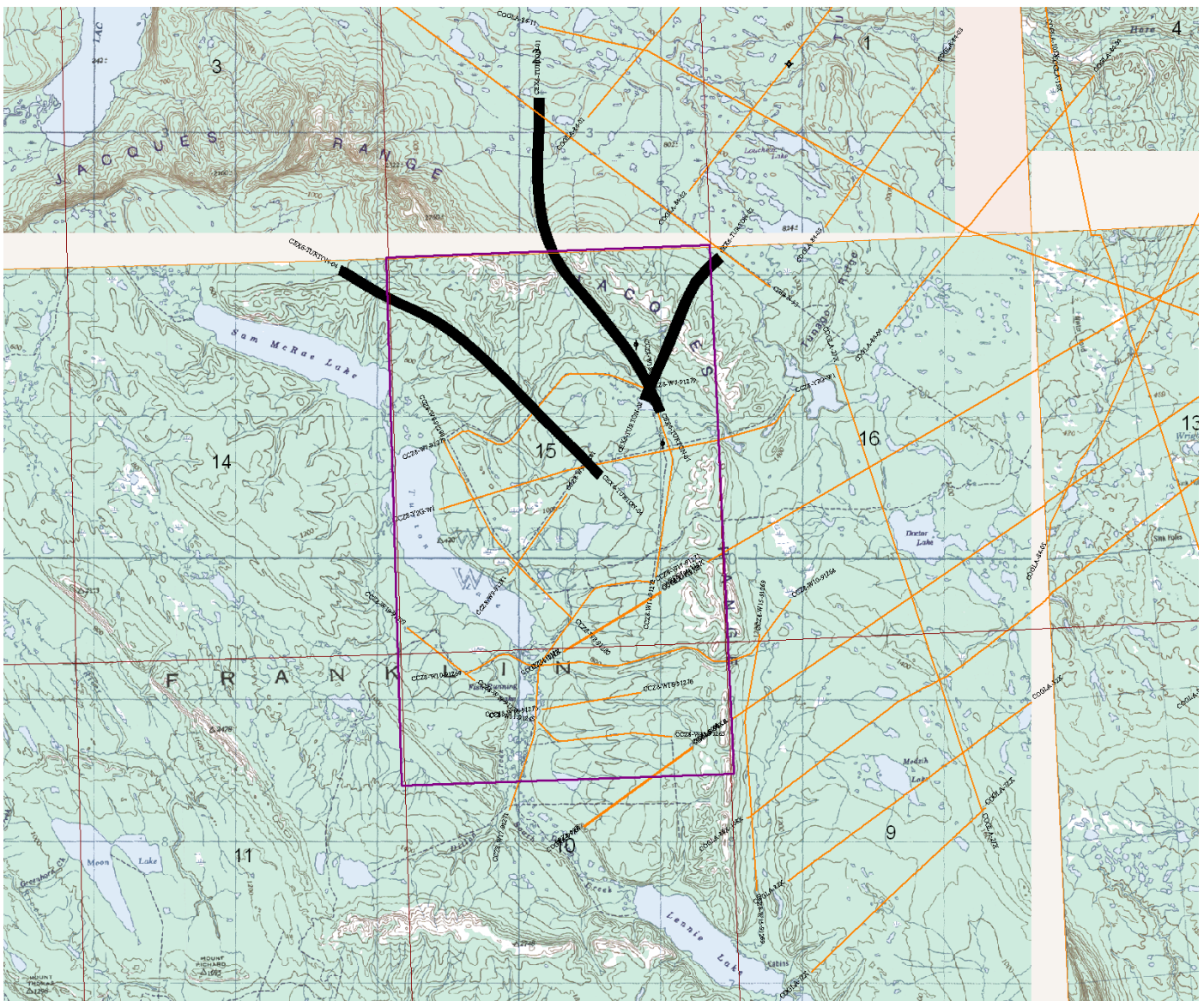


Figure 1. Line locations. 2D seismic lines for project 9229-A075-002E are shown in heavy black. Exploration area EL414 is shown as a maroon rectangle.

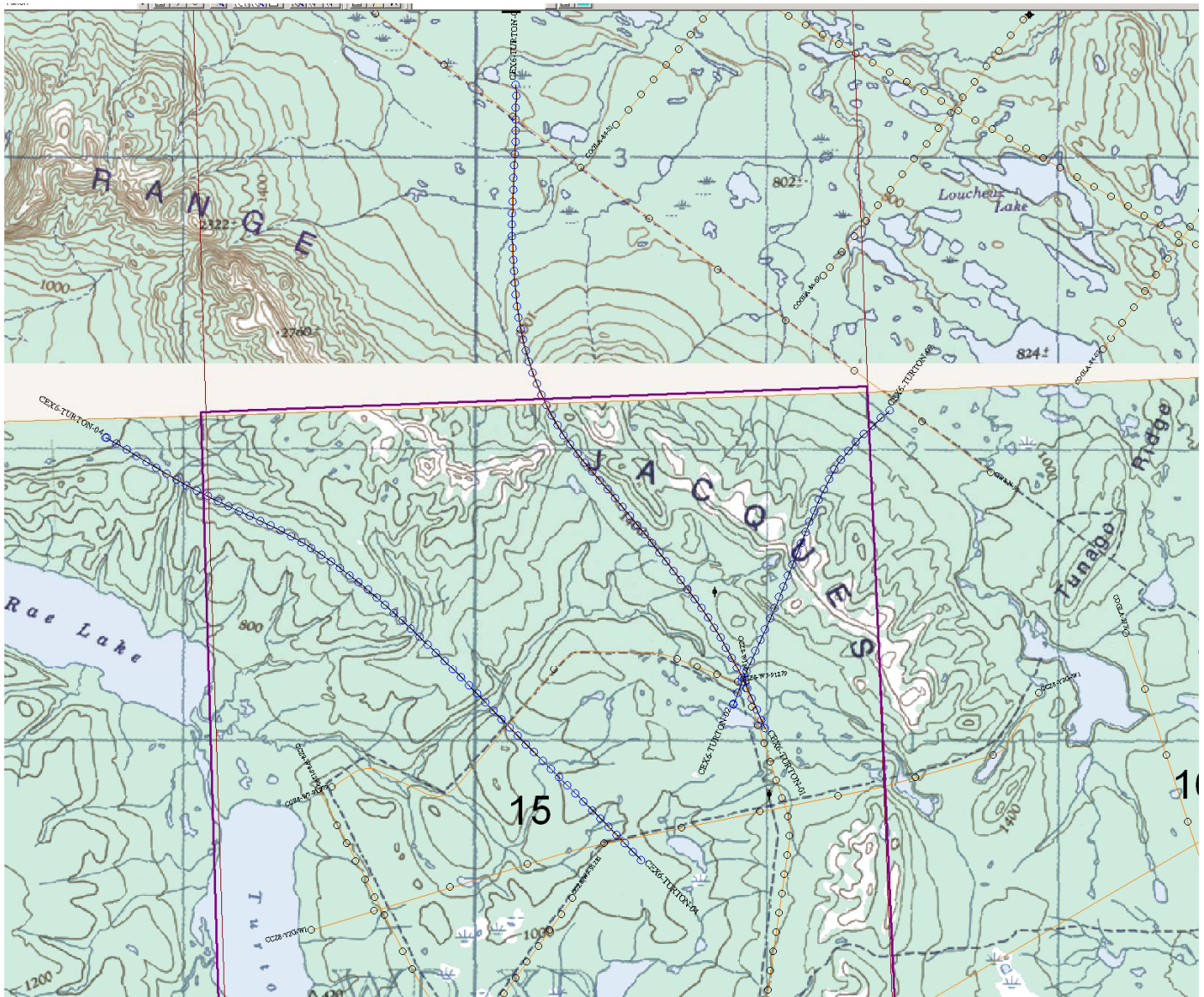


Figure 2. Shot point locations. Every 20th shot point on the three project 9229-A075-002E lines is displayed as a blue circle. Every 20th shot point on all other existing lines (in the Apache Canada Ltd. database) is shown with a black circle. It is evident that the 2003 data was acquired in a far more dense manner than previous data.

Shot point data is included on the data CD as SEG-P1 survey files (simple text files).

3 Operational Summary (Dates, Equipment etc.)

Seismic operations were conducted on behalf of Apache Canada and Paramount Resources by Trace Energy Services of Calgary, Alberta acting as prime contractor. Survey was conducted by Mercedes Surveys, also of Alberta.

Contractors & Equipment

Prime Contractor: Trace Energy Services (Calgary)
Recording equipment: I-O System 2
4x4 line trucks etc.

Sub-Contractors:

Survey: Mercedes Surveys (Calgary)
Survey Method - primarily GPS (refer to digital data)

Helicopter: Sahtu Helicopter (Norman Wells)
Partnership between Great Slave Helicopters & Sahtu Metis
1 x Bell 212 2 x Astar 350B

Drilling: Bertram Drilling (Carbon, Alberta)
Heli-portable drills

Slashing: Willow Lake Slashing
Tawow Slashing

Dates:

July 2003: Camp transported to Norman Wells
Aug. 17, 2003 First camp occupancy
Aug. 20, 2003 Survey & line preparation commences
Aug. 30, 2003 Shot hole drilling commences
Sept. 13, 2003 Shot hole drilling finishes
Sept. 10 -13, 2003 Line CEX6-Turton-04 recording
Sept. 14 -21, 2003 Line CEX6-Turton-01 recording
Sept. 24 - 26, 2003 Line CEX6-Turton-02 recording
Sept 26 - 30, 2003 demobilize equipment and personnel

No records were taken on Sept. 17, 22, 23, and 24 due to high wind.

4 Summary of Weather and Topography

Topography

Digital survey data provided with this report includes elevations for each shot and receiver station.

Chaining notes (provided as tif files with this report) indicate the following:

Line 1:

Creeks at stations 317 and 373

Steep hills and side hills between stations 757 & 759, and stns 793 & 800

Creek at station 985

Steep hill between stations 959 & 962

Steep sided valley between stations 1058 and 1067, creek @ station 1060.5

Creek at station 1236.5

Line 2

Steep rock face at station 186

Loose rocks and steep rock faces between stations 211 and 220

Creek at station 258

Steep side hills between stations 427 & 429 and stations 432 & 436

Steep hills between stations 511 and 524

Creek at station 633

Line 4

Creek at station 327

Deadfall between stations 354 and 362

Creek parallel to line but ~30m offset between stations 401 and 416

Creek at station 461

Steep loose rocks between stations 481 and 491

Creek at station 653

Steep hills between stations 696 and 700

Cliff at station 1987

Creeks at stations 1136 & 1280

Weather:

Observers Notes indicate the following:

Drillers Logs show fog on the mornings of Sept 1 and Sept. 5

September 12th: freezing rain leads to 1 hour shut down.

September 15th: Late start at 2:00 PM due to weather












September 17th: No shots recorded - presumably due to weather












September 19th: No shots recorded - presumably due to weather

September 24th: No shots recorded - wind gusts to 100 kmh

Weather Data for Norman Wells - August and September 2003

The following two images show weather data for the months of August and September 2003 at the Environment Canada weather station in Norman Wells. Note that on September 24 high winds are observed in Norman Wells, which is about 80 kilometers to the south of the seismic program area. The town of Norman Wells is about at least 600 feet lower in elevation than the program area.

Daily Data Report for August 2003											
D a y	Max Temp °C 	Min Temp °C 	Mean Temp °C 	Heat Deg Days °C 	Cool Deg Days °C 	Total Rain mm 	Total Snow cm 	Total Precip mm 	Snow on Grnd cm 	Dir of Max Gust 10's Deg 	Spd of Max Gust km/h 
01	16.9	8.8	12.9	5.1	0.0	12.8	0.0	12.8	0	29E	41E
02	11.3	8.8	10.1	7.9	0.0	0.0	0.0	0.0	0	30E	37E
03	18.5	7.5	13.0	5.0	0.0	0.0	0.0	0.0	0	27E	46E
04	16.7	9.7	13.2	4.8	0.0	T	0.0	T	0		<31
05	19.9	5.1	12.5	5.5	0.0	0.6	0.0	0.6	0		<31
06	14.3	3.6	9.0	9.0	0.0	3.4	0.0	3.4	0	30E	43E
07	20.9	5.9	13.4	4.6	0.0	2.4	0.0	2.4	0	32E	37E
08	10.9	3.1	7.0	11.0	0.0	1.2	0.0	1.2	0	30E	46E
09	18.1	1.0	9.6	8.4	0.0	0.0	0.0	0.0	0		<31
10	24.9	6.4	15.7	2.3	0.0	0.0	0.0	0.0	0		<31
11	27.1	8.8	18.0	0.0	0.0	0.0	0.0	0.0	0	33E	39E
12	19.6	12.4	16.0	2.0	0.0	0.7	0.0	0.7	0		<31
13	18.5	12.6	15.6	2.4	0.0	15.6	0.0	15.6	0	30E	35E
14	25.5	9.9	17.7	0.3	0.0	0.0	0.0	0.0	0		<31
15	28.5	9.8	19.2	0.0	1.2	0.0	0.0	0.0	0		<31
16	26.7	9.5	18.1	0.0	0.1	0.6	0.0	0.6	0	29E	48E
17	16.6	12.8	14.7	3.3	0.0	10.5	0.0	10.5	0		<31
18	19.6	12.6	16.1	1.9	0.0	0.0	0.0	0.0	0		<31
19	16.3	9.1	12.7	5.3	0.0	0.0	0.0	0.0	0		<31
20	15.4	10.5	13.0	5.0	0.0	0.4	0.0	0.4	0		<31
21	15.7	8.0	11.9	6.1	0.0	3.8	0.0	3.8	0		<31
22	14.4	10.9	12.7	5.3	0.0	5.6	0.0	5.6	0		<31
23	17.1	8.8	13.0	5.0	0.0	1.4	0.0	1.4	0	31E	37E
24	18.9	3.7	11.3	6.7	0.0	0.0	0.0	0.0	0	30E	44E
25	21.3	7.3	14.3	3.7	0.0	0.0	0.0	0.0	0		<31
26	23.9	10.3	17.1	0.9	0.0	0.0	0.0	0.0	0		<31
27	24.0	10.2	17.1	0.9	0.0	T	0.0	T	0		<31
28	21.4	11.6	16.5	1.5	0.0	T	0.0	T	0		<31
29	22.9	6.5	14.7	3.3	0.0	0.0	0.0	0.0	0		<31
30	24.9	10.4	17.7	0.3	0.0	0.0	0.0	0.0	0	13E	37E
31	22.3	16.4	19.4	0.0	1.4	0.0	0.0	0.0	0	12E	54E
Sum				117.5	2.7	59.0	0.0	59.0			
Avg	19.8	8.8	14.3								
Xbm	28.5	1.0								12E	54E

Daily Data Report for September 2003											
D a y	Max Temp °C 	Min Temp °C 	Mean Temp °C 	Heat Deg Days °C 	Cool Deg Days °C 	Total Rain mm 	Total Snow cm 	Total Precip mm 	Snow on Grnd cm 	Dir of Max Gust 10's Deg 	Spd of Max Gust km/h 
<u>01</u>	22.5	9.5	16.0	2.0	0.0	0.0	0.0	0.0	0		<31
<u>02</u>	21.3	8.7	15.0	3.0	0.0	0.0	0.0	0.0	0		<31
<u>03</u>	19.9	6.1	13.0	5.0	0.0	T	0.0	T	0	30E	43E
<u>04</u>	19.3	5.8	12.6	5.4	0.0	1.2	0.0	1.2	0	30E	37E
<u>05</u>	18.6	2.7	10.7	7.3	0.0	0.0	0.0	0.0	0		<31
<u>06</u>	17.0	2.4	9.7	8.3	0.0	0.0	0.0	0.0	0		<31
<u>07</u>	15.0	6.8	10.9	7.1	0.0	3.2	0.0	3.2	0		<31
<u>08</u>	12.3	9.2	10.8	7.2	0.0	12.2	0.0	12.2	0	30E	41E
<u>09</u>	14.8	4.5	9.7	8.3	0.0	0.6	0.0	0.6	0		<31
<u>10</u>	18.6	3.0	10.8	7.2	0.0	0.0	0.0	0.0	0		<31
<u>11</u>	18.9	1.1	10.0	8.0	0.0	0.0	0.0	0.0	0		<31
<u>12</u>	13.3	4.8	9.1	8.9	0.0	5.8	0.0	5.8	0		<31
<u>13</u>	4.8	0.9	2.9	15.1	0.0	T	T	T	0		<31
<u>14</u>	3.7	-1.9	0.9	17.1	0.0	0.0	0.3	T	0		<31
<u>15</u>	5.9	-1.8	2.1	15.9	0.0	0.0	0.0	0.0	0		<31
<u>16</u>	8.0	-1.0	3.5	14.5	0.0	0.0	0.0	0.0	0		<31
<u>17</u>	2.8	-0.6	1.1	16.9	0.0	0.0	T	T	0		<31
<u>18</u>	4.9	-1.0	2.0	16.0	0.0	0.6	0.0	0.6	0	12E	46E
<u>19</u>	3.0	-1.4	0.8	17.2	0.0	0.4	2.6	1.8	1		<31
<u>20</u>	5.9	-3.8	1.1	16.9	0.0	0.0	0.0	0.0	0		<31
<u>21</u>	5.3	-2.2	1.6	16.4	0.0	1.2	2.4	5.6	0		<31
<u>22</u>	0.6	-0.6	0.0	18.0	0.0	0.0	2.9	2.2	3	29E	33E
<u>23</u>	2.8	-1.4	0.7	17.3	0.0	0.0	0.3	0.2	1		<31
<u>24</u>	2.0	-1.8	0.1	17.9	0.0	1.8	0.4	2.2	0	11E	50E
<u>25</u>	3.0	-1.6	0.7	17.3	0.0	0.6	0.2	0.8	T		<31
<u>26</u>	3.4	-0.4	1.5	16.5	0.0	0.0	0.6	0.4	T		<31
<u>27</u>	7.4	-2.0	2.7	15.3	0.0	0.0	T	T	T		<31
<u>28</u>	8.2	-5.1	1.6	16.4	0.0	0.0	0.0	0.0	0		<31
<u>29</u>	12.7	-3.3	4.7	13.3	0.0	0.0	0.0	0.0	0		<31
<u>30</u>	14.7	-1.4	6.7	11.3	0.0	0.0	0.0	0.0	0		<31
Sum				367.0	0.0	27.6	9.7	36.8			
Avg	10.4	1.1	5.8								
Xtbn	22.5	-5.1								11E	50E

5 Description of Operations (Parameters/Equipment)

Recording parameters and Equipment:

2D seismic line geometry with source points and receiver points located on the same line. None of the lines in the project were straight lines, all were curved to some degree.

Number of receivers per shot: 240

Interval between receiver stations: 20 meters

Number of geophones per receiver station: 6 over 20 meters

Geophones: SM-24 by Ion Geophysical Natural frequency = 10Hz

Interval between Shot stations: 100 meters

Energy Source: Dynamite - 1 charge of 2 kilograms at 12 meters depth

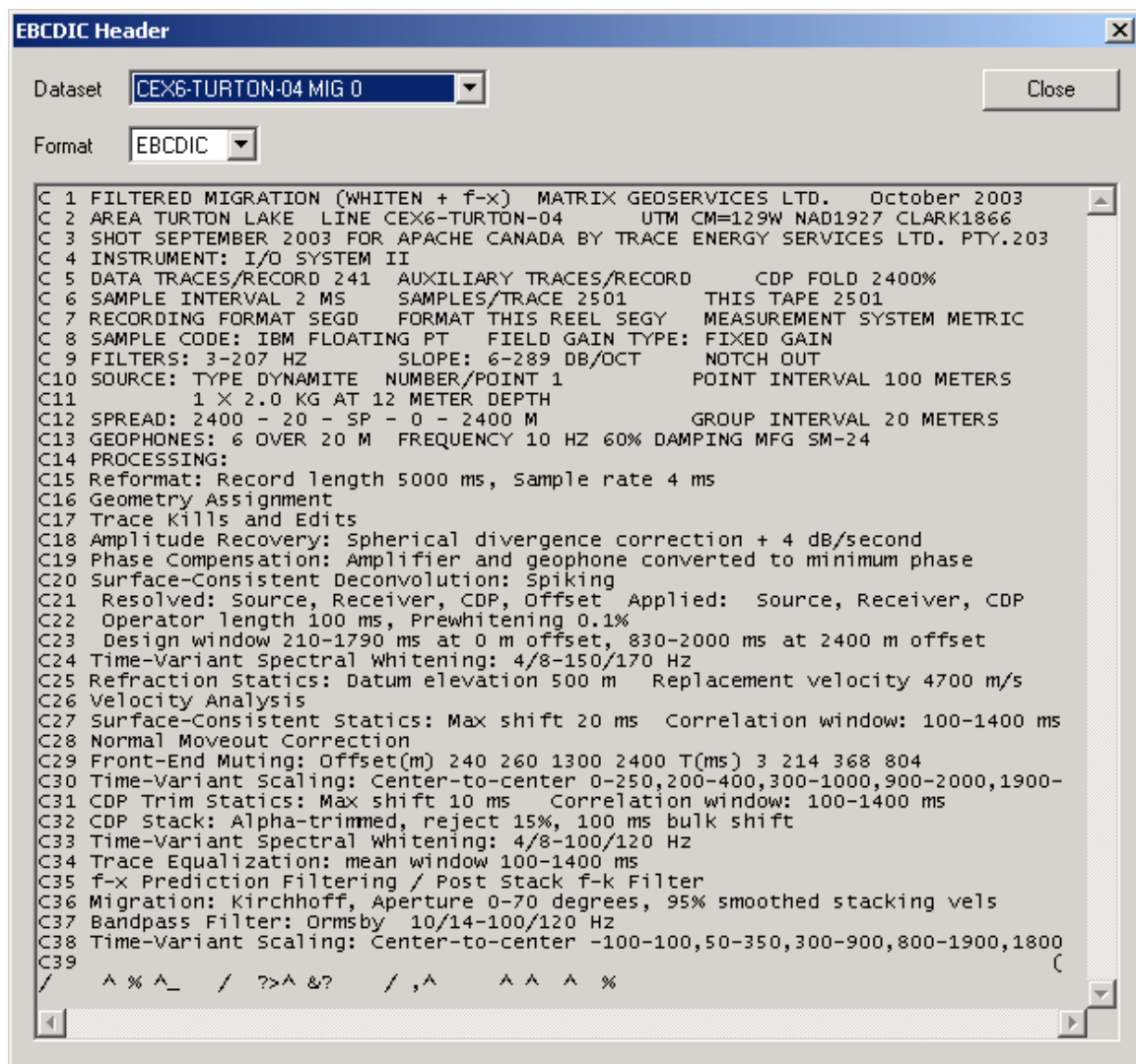
Recording System: I-O System 2

Survey:

GPS with monument control. Technical information and control is provided with the digital data that forms part of this report.

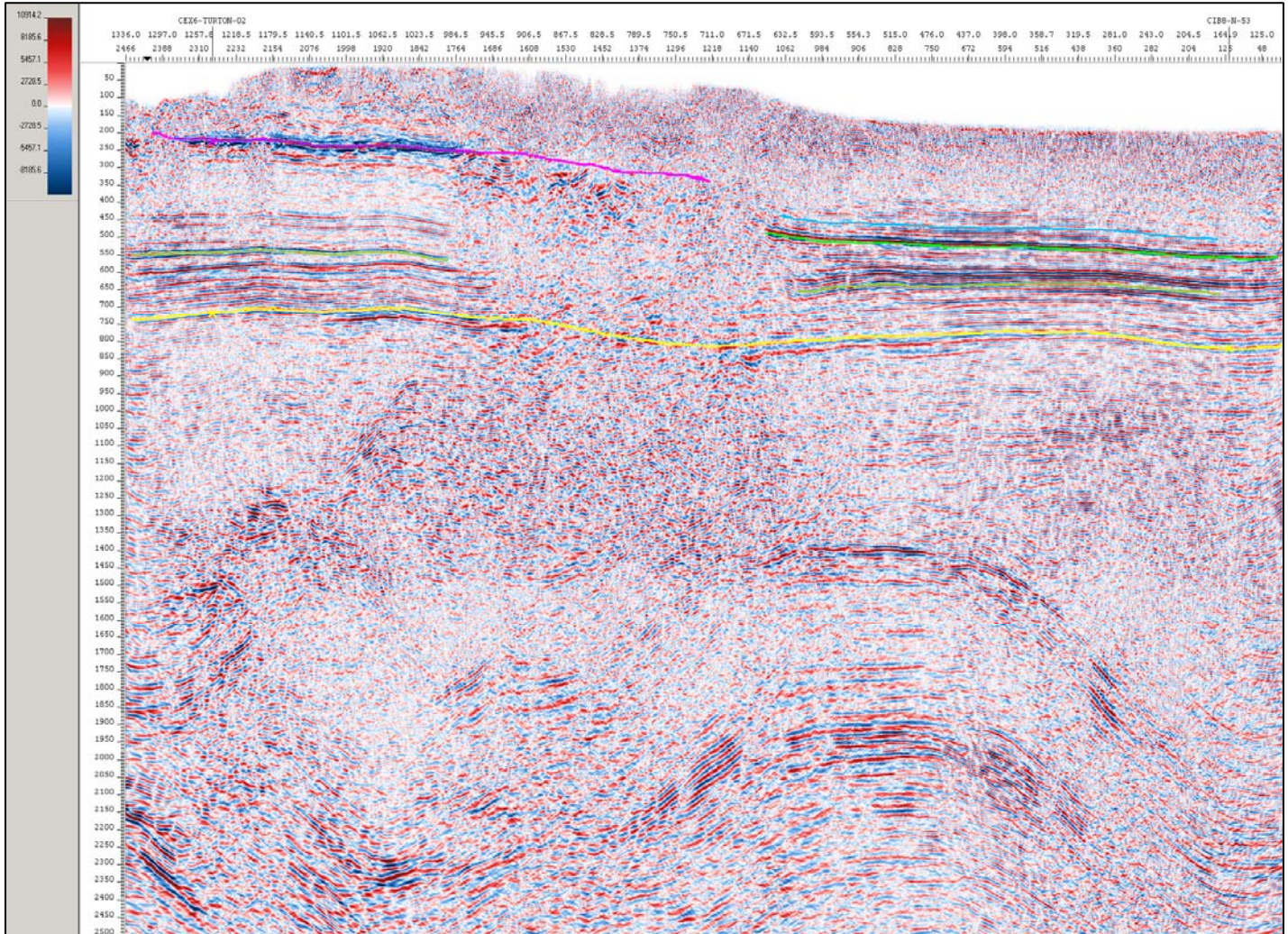
6 Processing Sequence

Data processing was conducted by Matrix GeoServices of Calgary, Alberta. A summary of the processing sequence is shown below in a screen captured image of the contents of the EBCDIC header of the SEG Y file of the migrated section for line CEX6-TURTON-04. Processing sequences were identical for all lines. The processing sequence is industry standard for its time, with no experimental or unusual steps taken.

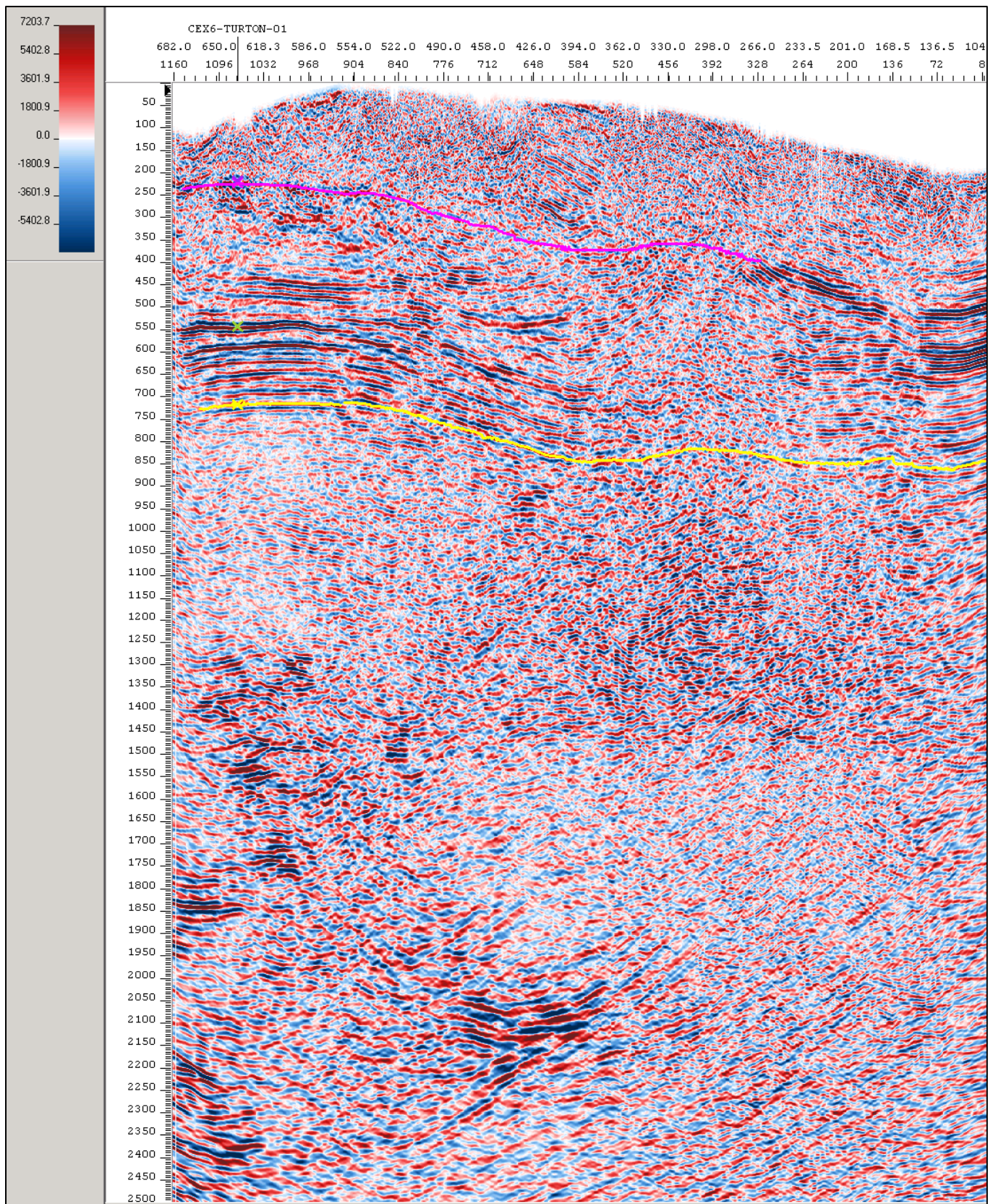


7 Seismic Sections

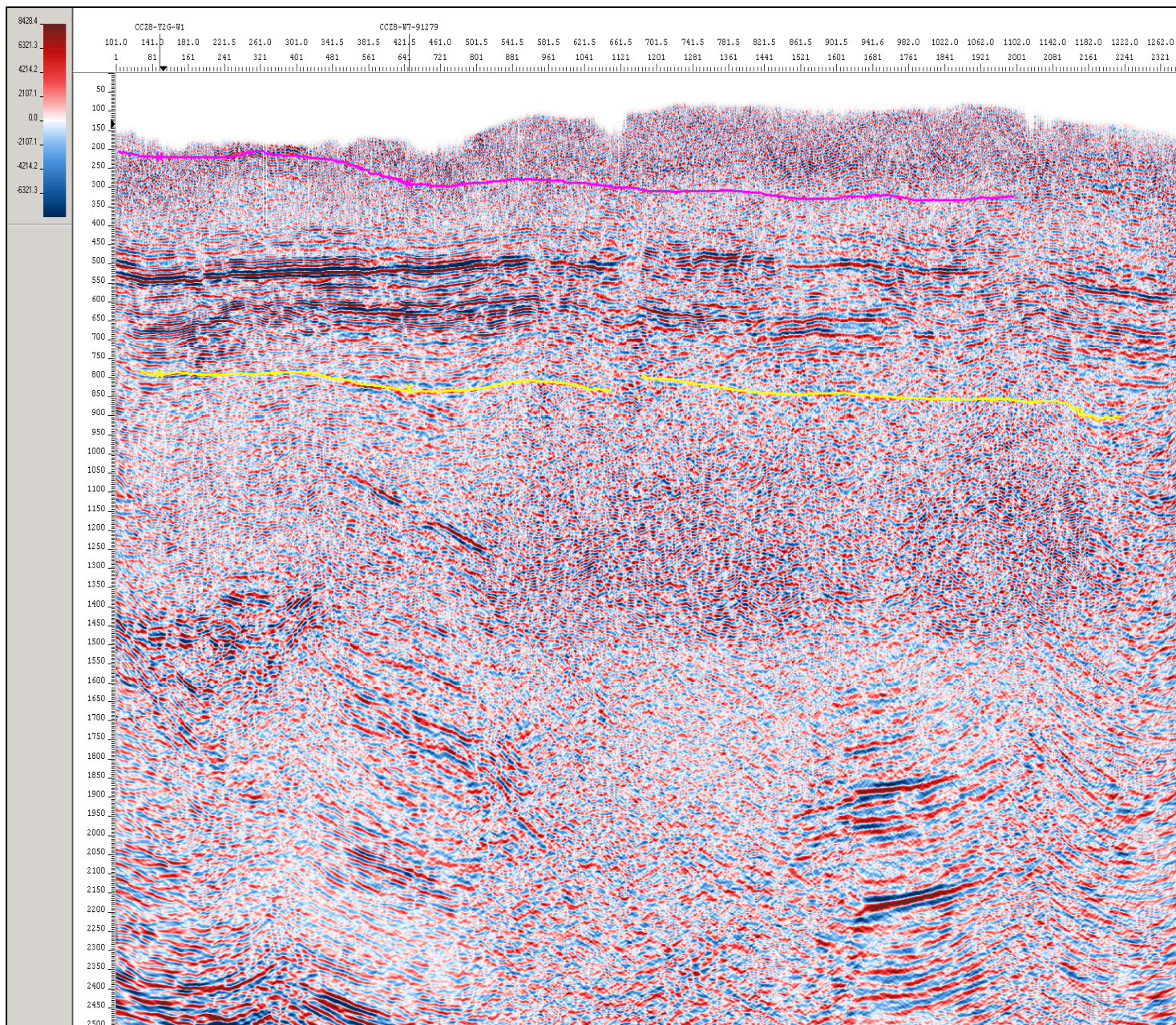
Images of all three lines are provided within the text of this report. Display scales differ. Plot file (cgm format) for all three lines are included with the digital data that forms part of this report. data quality is perhaps best described as fair, with noticeable amounts of noise in many areas. Very deep, sub-basement reflectors showing dramatic structure, are seen on all lines.



Line 1. The yellow horizon is believed to be the PreCambrian. The lowermost green horizon is believed to be the base of the Saline River Salt. The upper green horizon on the right side of the image is the Saline River Shale. The Magenta horizon at upper left is believed to be the Bear River Formation. North is to the right.



Line 2: The yellow horizon is believed to be the PreCambrian. North is to the right

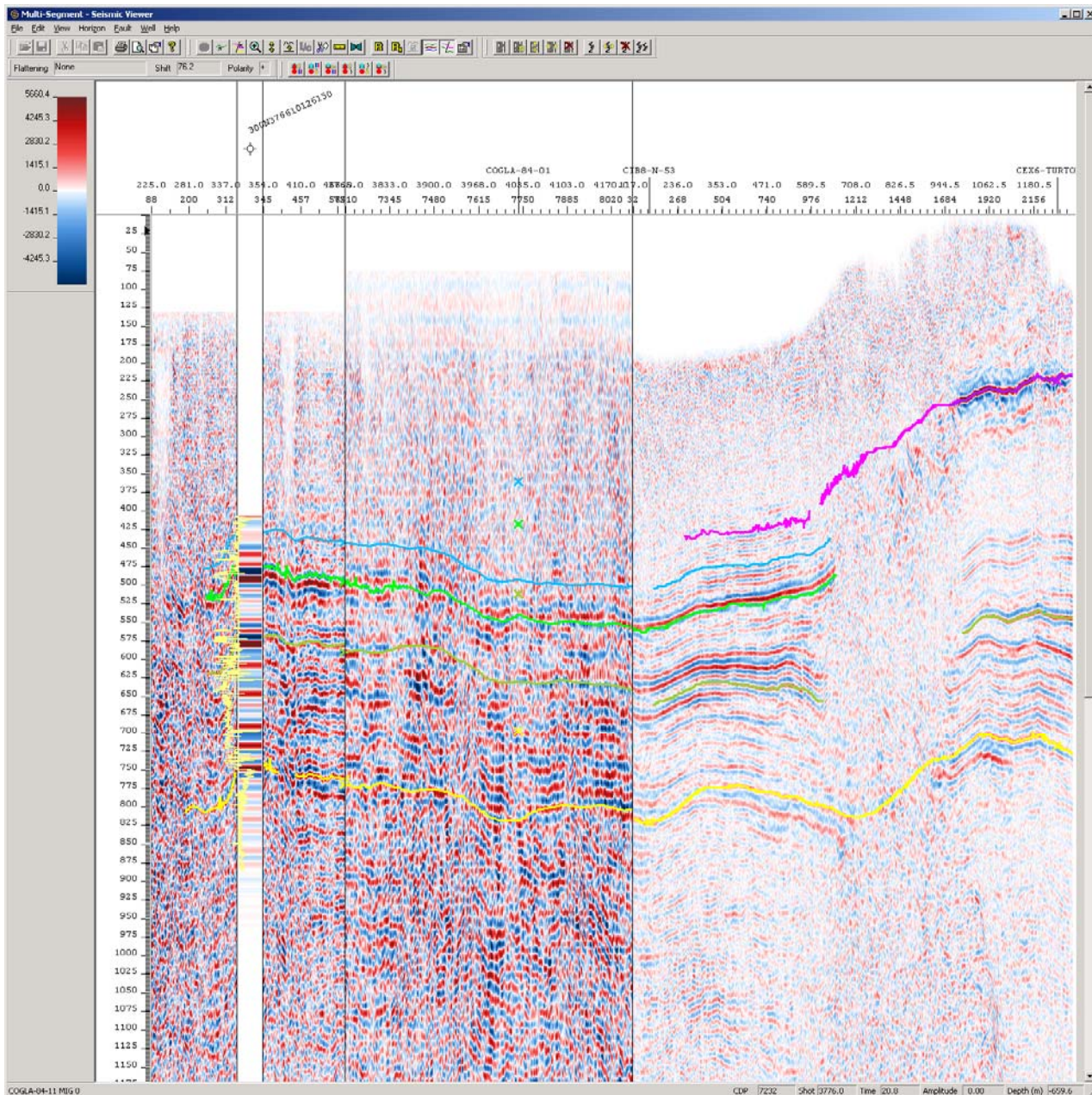


Line 4: The yellow horizon is believed to be the PreCambrian. North is to the right

8 Geophysical Correlation: Synthetic Seismograms

The nearest sonic log to the program with sufficient vertical extent to be useful from a correlation point of view is EXCO et al TUNAGO N-37 (300N376610126150) drilled in 1985. Uninterrupted sonic log data extends from near surface to TD.

The image below shows the correlation of the N-37 well to line COGLA-84-02 with jump ties extending to the CEX6-Turton-01 line via line COGLA-84-11

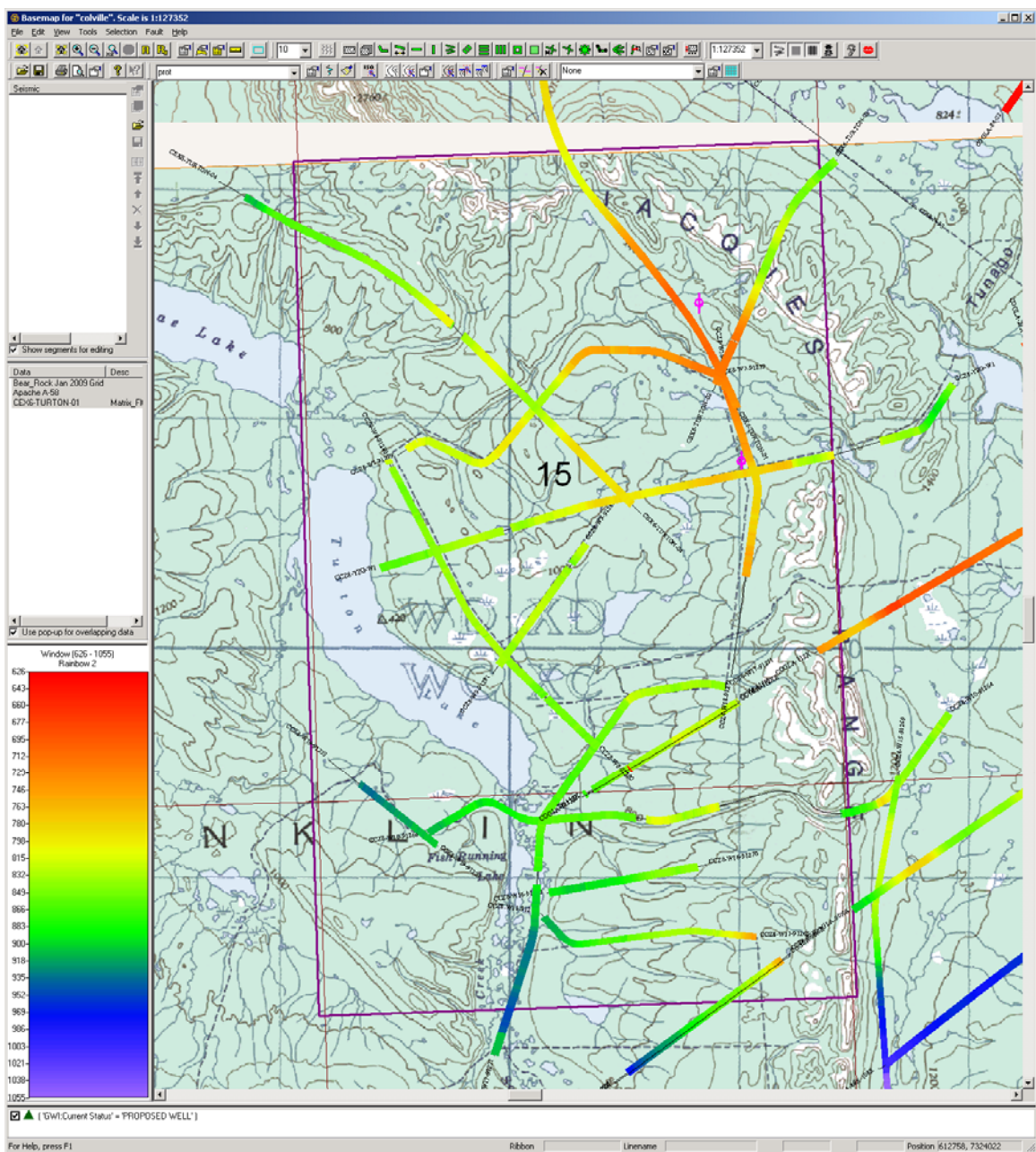


9 Interpretive Maps

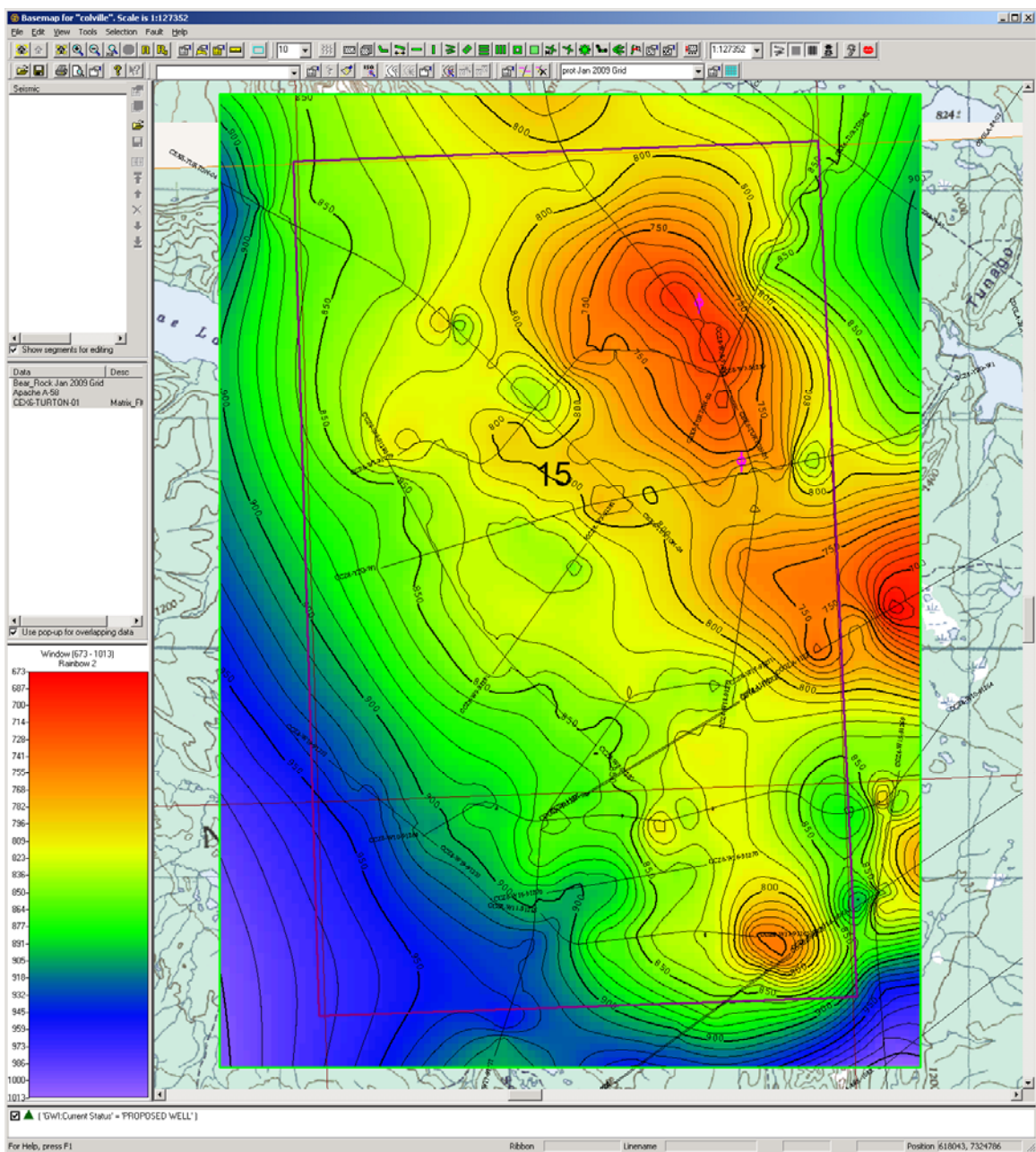
The primary exploration target for project 9229-A075-002E was the Mount Clark formation of Cambrian age, overlying the PreCambrian. The PreCambrian was picked as the "prot". Two PreCambrian time structure maps are provided (two way reflection time in milliseconds to top of the PreCambrian). The first show colour ribbons along the seismic lines. The second is gridded using a minimum curvature algorithm developed by Zokero, the developers of the Seisware seismic interpretation software.

The other formation picked was the Bear Rock, a Cretaceous formation.

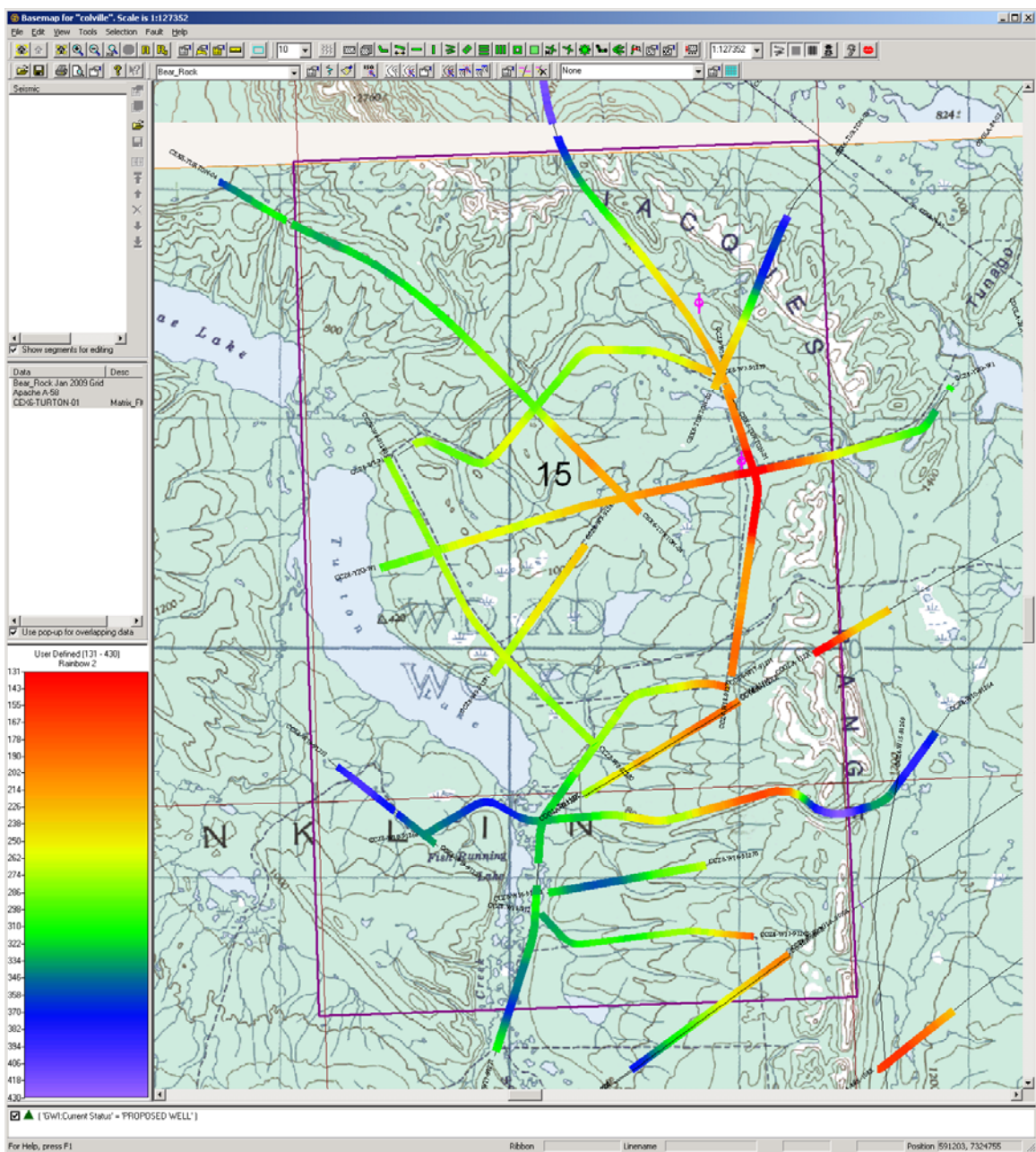
Again, two time maps of the Bear Rock are provided. Both are two way travel time in milliseconds to the top of the Bear Rock. One is the 'ribbon' map, the other is a colour filled grid map prepared with a minimum curvature gridding algorithm.



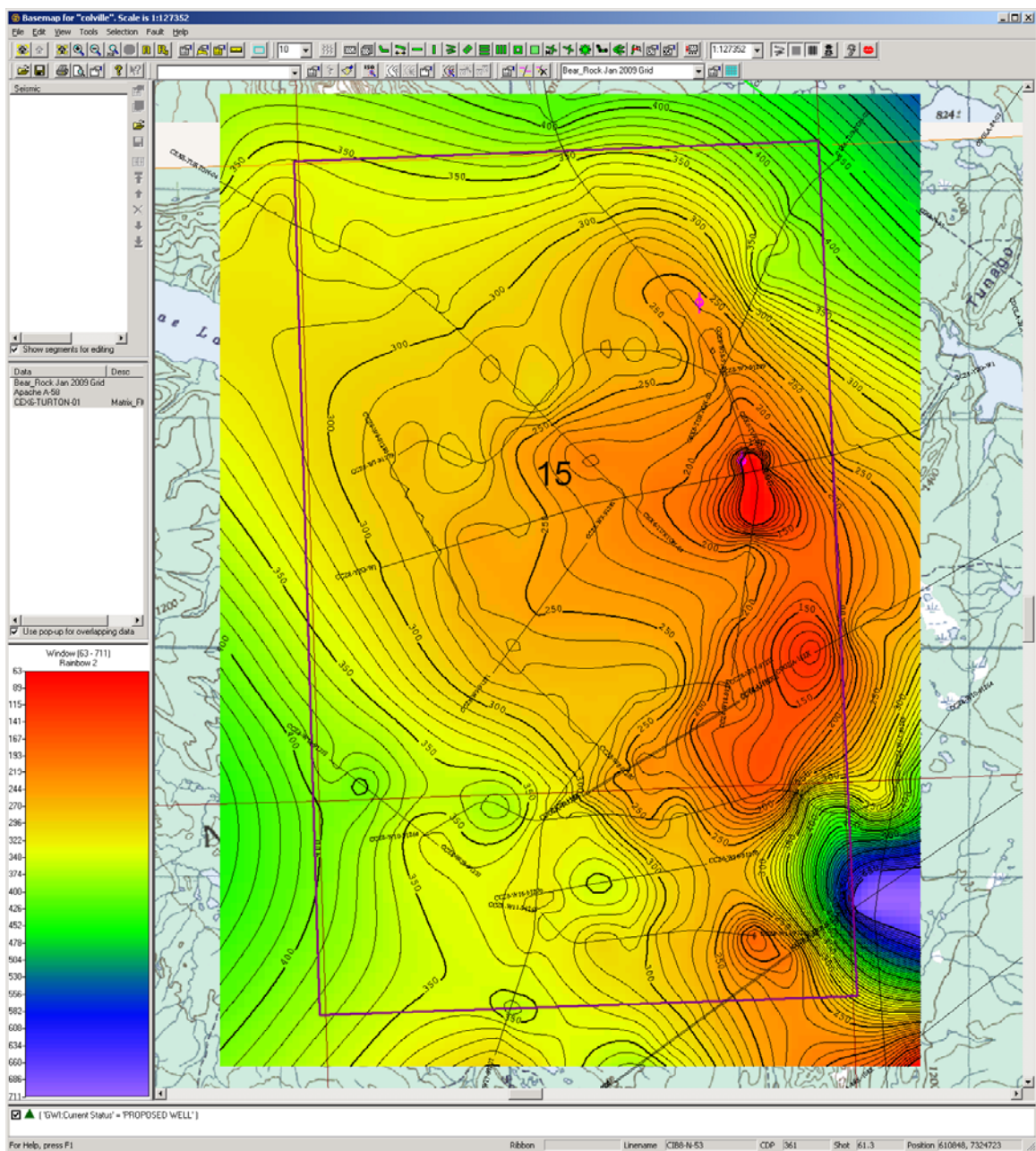
Ribbon map: Two way travel time in milliseconds to the top of the PreCambrian.



Grid map: Two way travel time in milliseconds to the top of the PreCambrian.
Contour interval = 10 ms.



Ribbon Map: Two Way travel time in milliseconds to the top of the Bear Rock



Grid Map: Two Way travel time in milliseconds to the top of the Bear Rock
Contour interval = 10 ms.

10 Appendix A: Complete Data Listing

A DVD is included with this report.

The DVD includes the full content of this report, plot files for maps and seismic sections., basic data for all three lines. Basic data includes survey data including GPS information and coordinates (with elevations) for all source and receiver locations. Basic data is sorted by line number and also includes observers notes, chaining notes, SEGP survey files, Skids and offsets logs, drilling logs,

The report also includes scaled hardcopy of all maps.

Digital data is organized on the DVD according to the following directory structures.

