

CHAPTER 2
WELLS AND SEISMIC
DATABASE

Well database

The well-to-seismic tying is based on the three reference wells Bandol-1, East-Wolverine-G-37 and Heron-H-73. These wells have the minimum set of data to perform the classical well-to-seismic tying (sonic and density logs but no checkshot) but also the biostratigraphic results insuring the age of the seismic horizons picked. Other information were used to better constrained the seismic interpretation on the whole area. An additional well (Emerillon-C-56) has been calibrated, and has sonic and density logs, biostratigraphic results but no checkshot. This well gives another constraint to the TWT interpretation, but only in the northern part of the Laurentian Sub-Basin.

These four wells bring fruitful information through their lithostratigraphy content but must be considered with care regarding the uncertainties in the well-to-seismic tying and in the time-to-depth conversion because of the absence of checkshot. These wells are located on the shelf except East-Wolverine-G-37 which is in the slope area. Due to this specific distribution, uncertainty in well-to-seismic tying and in the time-to-depth conversion increases basinward.

Six wells on the Nova Scotia Margin (Tantallon-M-41, Weymouth-A-45, Louisbourg-J-47, South Griffin-J-13, Dauntless-D-35 and Sachel-D-76) have been included in the time-to-depth conversion in order to constrain the velocity maps and depth maps of the western part of the studied area. They have all sonic and density logs and checkshot. The seismic lines have been tied to the six wells, and these wells have been used in the time-to-depth conversion during the Play Fairway Analysis 2011.

Table 1 summarizes the main technical characteristics of the well and the available petrophysical data for each one used in the well calibration and the time-to-depth conversion.

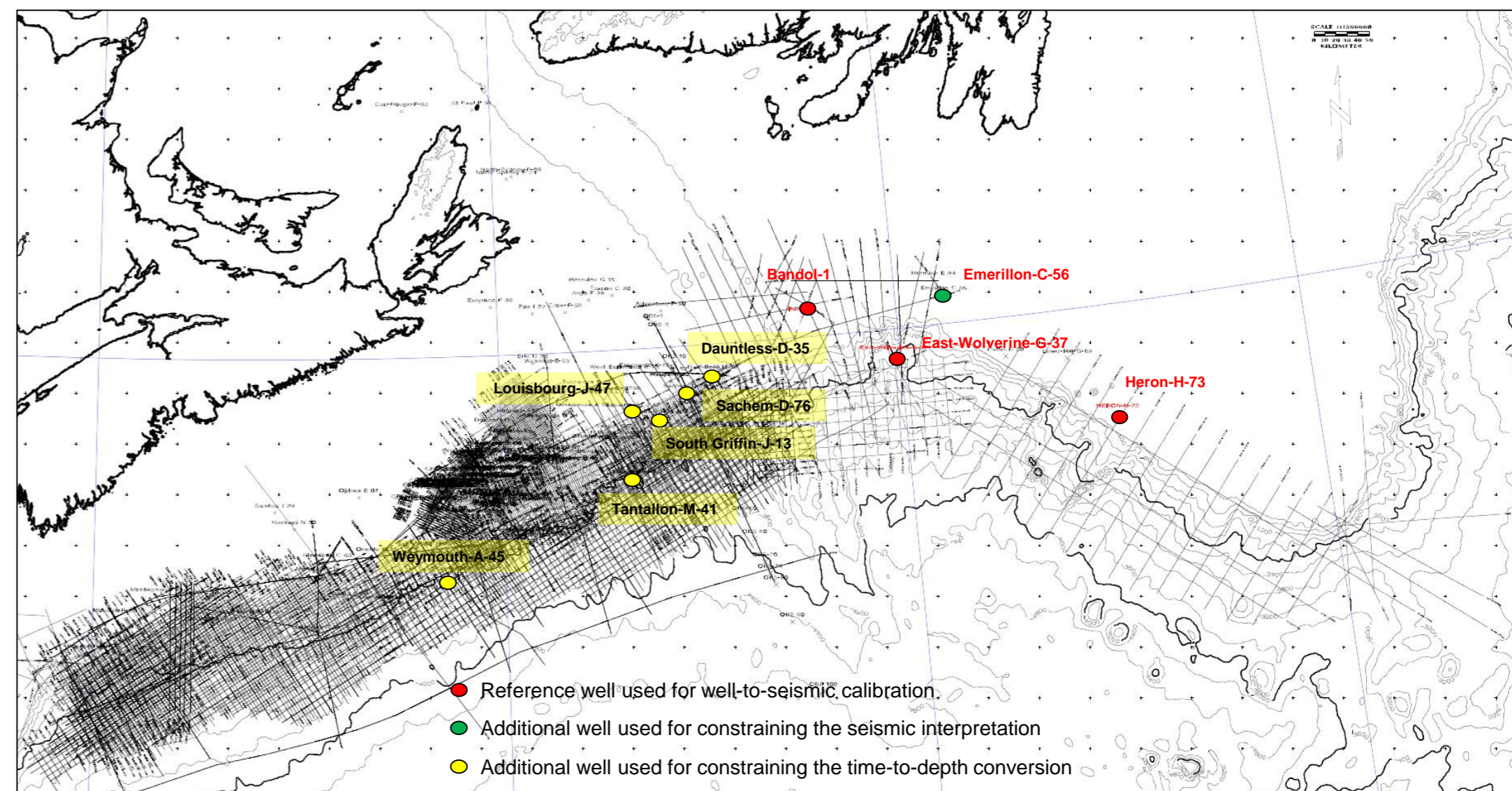


Figure 1 : Location map of the wells used for the well-to-seismic tying and the time-to-depth conversion

Well	X (UTM 20)	Y (UTM 20)	Total TVD (m)	Deviated well	Markers	Datum (m)	GR (GAPI)	DT (µs/feet)	RHOB (g/cm3)	Top Interval DT (m MD)	Base Interval DT (m MD) with deepest horizon penetrated
Bandol-1*	1036034	5026017	4050	No	T29, K94, K101, K130, K137 and J163	23 (KB)	GR	DT4P	RHOZ	1230	4050 (K137)
East-Wolverine G-37*	1126481	4988092	6760	No	T29, T50, K94, K101, K137 and J163	32 (KB)	GR	DT4P	RHOZ	3500	4800 (K130)
Heron H-73*	1347195	4930834	3630	No	T29, T50, K94, K101, K137 and J163	26 (RT)	GAM	DT	RHOB	770	3562 (J180)
Emerillon C-56	1175775	5046859	3260	No	T50, K94, K101, K137 and J163	28 (KB)	GR	DT	RHOB	1190	3250 (J163)

Table 1 : Available data for the 3 reference wells (with "*" sign) and the additional well in the Laurentian Sub-Basin for the well-to-seismic tying. These are additional data to the Play Fairway Analysis 2011.

Seismic database

The seismic interpretation has been carried out on various 2D seismic surveys located on the Laurentian Sub-Basin, the South Whale Basin, the Western Grand Banks of Newfoundland and the Eastern Nova Scotia Margin, and covering more than 130 km². These seismic data acquired and processed or even reprocessed do not have the same quality (Table1).

In total, six 2D seismic surveys were made available for the project:

- the three TGS surveys corresponding to migrated scanned paper-lines (except TGS regional 2D, available in the Play Fairway Analysis 2011) which display a poor quality, especially basinward in the area of salt tectonic;
- the GSC_2006 survey coming from the reprocessing of the St-Pierre seismic lines with improved the image quality;
- three paper-scanned seismic lines have been additionally loaded in the workstation GeoFrame4.5™ (Schlumberger™) to improve the East-Wolverine-G-37 well calibration. Two lines are from 2D seismic and one line comes from an external 3D seismic survey and crosses the East-Wolverine-G-37 well.

The overall quality of the seismic data is poor to fair. Scanned paper data (mainly TGS surveys) display poor amplitudes, especially toward the basin. It may lead to misinterpretation in some areas in which the salt is well-developed (diapir and allochthonous salt). Basinward, a good understanding of the Jurassic sediments is a key element to correctly locate the possible source rocks, but no well have been drilled in this area to constrain the seismic interpretation.

Severe mis-ties (until 200 ms) have also been noticed in the TGS_Laurentian Batch 1 survey and may correspond to incorrect 2D seismic lines location. Indeed, the mis-ties are not constant according to the TWT for the (X,Y) point, and do not affect always the Seabed. For this reason, it is not possible to properly correct these mis-ties for all the horizons. The northernmost strike line of this survey (line 1205-100M) has been removed as it was too badly located.

None of the provided seismic lines were large enough to be selected as a regional line imaging the whole area. Regional composite lines were made possible by the connection between each survey, especially in the dip direction from the shelf (North) to the basin (South). Some areas are poorly covered by seismic lines, mainly along the slope (between TGS surveys and St-Pierre/GSC_2006 surveys), or between the TGS_Laurentian Batch 1 and the TGS_Laurentian Batch 2, or even in the narrow French Tie Area. The bin size of the studied surveys is globally decreasing from 6x6 km in the East to 24x48 km in the West, leading to less interpretation-control toward the Western Grand Banks Area.

Depending on the length of the structure and the distance to the seismic, the mapped horizon continuity is more or less certain. Each map provides the seismic surveys location in order to illustrate the distance to the closest seismic data and to assess the uncertainty linked to the mapping. The Table 1 summarizes the main technical characteristics of the seismic data for each survey as well as an arbitrary seismic quality ranking ("poor" to "good") related to the interpretation.

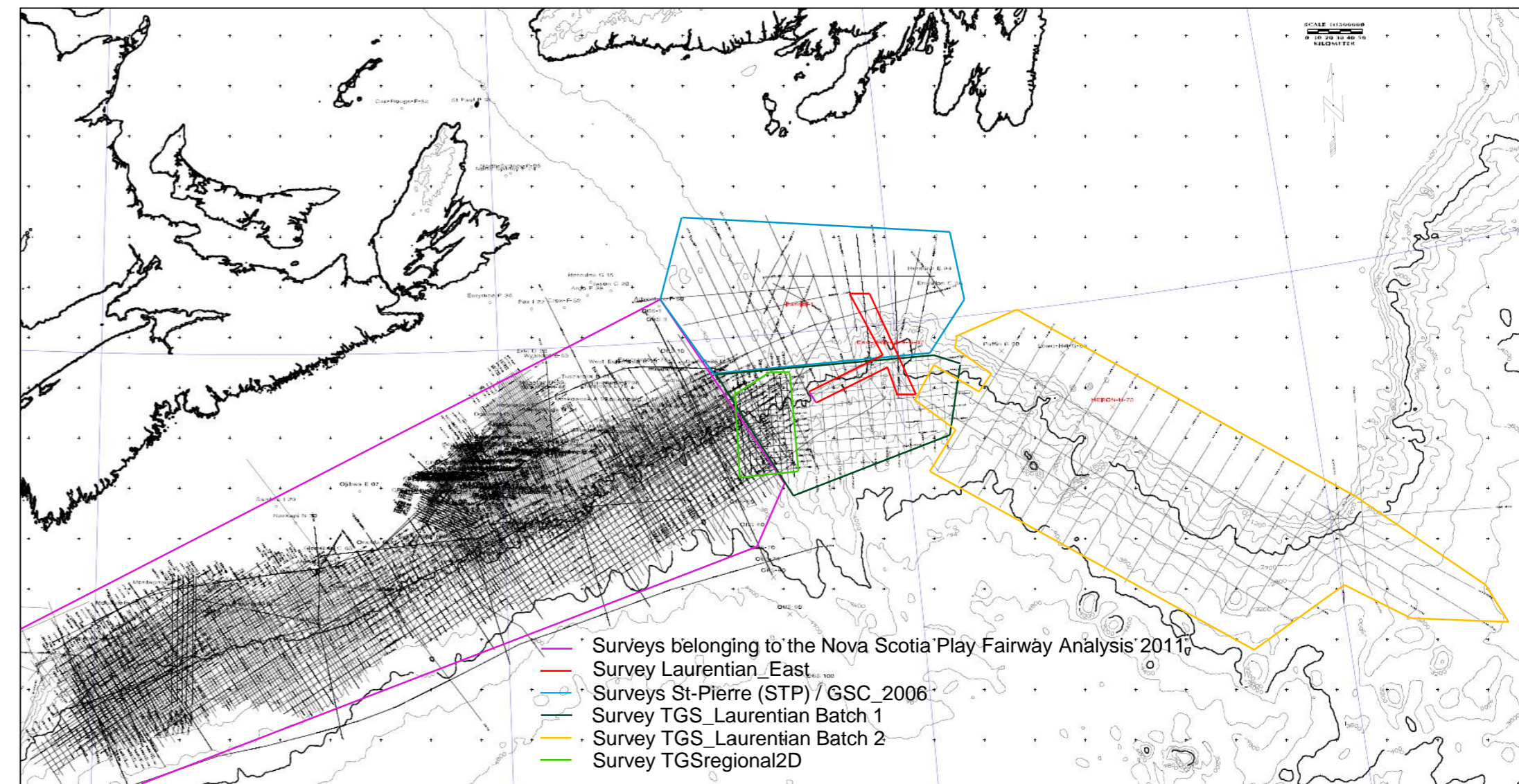


Figure 1 : Location map of the seismic surveys

Survey	Seismic Type	Surface	Bin size (kmxkm)	Quality	Location in the studied area	geological province	Associated calibrated well	Comment
TGS_Laurentian Batch 2	2D	82000 km ² 4872 linear-km	24x24 to 24x48	Poor	East	Basinward, Autochthonous Salt and Volcanism	Heron-H-73	Scanned seismic lines
TGS_Laurentian Batch 1	2D	14000 km ² 2128 linear-km	12x12	Less than fair	Central and South	Basinward, Autochthonous and Allochthonous Salt	None	Scanned seismic lines
TGSregional2D	2D	5100 km ²	6x6	Fair	West	Basinward, Autochthonous and Allochthonous Salt	None	Already available in the Play Fairway Analysis 2011
Laurentian_East	2* 2D lines + 1*3D lines	185 linear -km	N/A	Poor to good	Central	Basinward, Autochthonous and Allochthonous Salt	East-Wolverine-G-37	Used only for East-Wolverine-G-37 calibration
St-Pierre (STP)	2D	31000 km ² 2844 linear-km	10x10 to 10x40	Fair	North	Shelf-located, Few Autochthonous Salt	Bandol-1 and Emerillon-C-56	Superposed to GSC_2006 lines, interpreted by CNSOPB
GSC_2006	2D	31000 km ² 2844 linear-km	10x10 to 10x40	Good	North	Shelf-located, Few Autochthonous Salt	Emerillon-C-56	Superposed to STP lines

Table 1 : Available seismic surveys for the Laurentian Sub-Basin Study. These are additional data to the Play Fairway Analysis 2011 (except TGSregional2D seismic survey).