North Amethyst Development Plan Amendment

North Amethyst Hibernia Formation

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Executive Summary

Husky Oil Operations Limited (Husky) proposes to amend the approved North Amethyst Development Plan to produce hydrocarbons from the Hibernia Formation of the North Amethyst Field. The North Amethyst Hibernia Formation lies within Production Licenses 1006, 1007 and 1008, and has an unrisked estimated mean original oil in place (OOIP) of 11.4 $10^6 m^3$ (71.8 MMbbl) in the North Amethyst region. The primary focus of the North Amethyst Hibernia development is the hydrocarbon column within the E-17 Block Basal Hibernia which has an estimated mean OOIP of 4.7 $10^6 m^3$ (29.6 MMbbl).

Development of the North Amethyst Hibernia Formation will not alter the existing depletion plan for the North Amethyst Ben Nevis/Avalon (BNA) Formation. The proposed development is intended to utilize spare drill slots in the North Amethyst Drill Center (NADC), and there are no anticipated alterations or additions required to the existing subsea infrastructures or the SeaRose FPSO.

Due to the limited aerial extent of the Basal Hibernia pool, it is anticipated that the development will consist of one production well and the lower interval of the existing water injection well (G-25 4). Husky will give consideration to delineating additional Hibernia Formation during drilling of the E-17 Block Basal Hibernia producer. Should the information collected in the producer prove further potential, consideration will be given to additional wells.

As part of the ongoing depletion planning of the North Amethyst Hibernia Formation, the second North Amethyst BNA water injector (G-25 4) was determined to be an optimal location for water injection within the Basal Hibernia Formation, thereby providing the potential for a single water injector to support producers in both reservoirs. In 2010, the Provincial and Federal Ministers of Natural Resources granted Husky the approval to install a two zone intelligent completion in the North Amethyst G-25 4 water injection well allowing for water injection into both the BNA and Hibernia Formations. The upper completion zone currently provides support for the G-25 3 BNA producer. The North Amethyst G-25 4 water injector was initially given a dual classification. The upper interval (BNA) is classified as development and the lower interval (Hibernia) is classified as delineation. Once the North Amethyst Hibernia Development Plan Amendment is approved, the delineation classification for the Hibernia portion of the well will be reclassified as development.

Submission of this document does not commit the Co-Venturers to proceed with the development. This potential development is currently in the preliminary design phase and has not yet been approved by the joint venture partners.

1.0 Introduction

Husky Oil Operations Limited (Husky), as the Operator and in joint-venture with Suncor Energy and Nalcor Energy – Oil and Gas are submitting this Amendment to the North Amethyst Development Plan for development of the North Amethyst Hibernia Formation. This Amendment was prepared pursuant to the *Canada-Newfoundland Atlantic Accord Implementation Act* and the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act.*

The potential of hydrocarbons in the Hibernia Formation in the White Rose Area was first presented in the White Rose Oilfield Development Application as a secondary zone encountered in White Rose E-09 and N-22 wells.

This North Amethyst Development Plan Amendment document will outline the North Amethyst Hibernia development project and the associated depletion plan.

2.0 Development Overview

2.1 Preamble

The White Rose oil field is located on the Grand Banks, approximately 350 km east of the Island of Newfoundland on the eastern edge of the Jeanne d'Arc Basin (Figure 2.1).

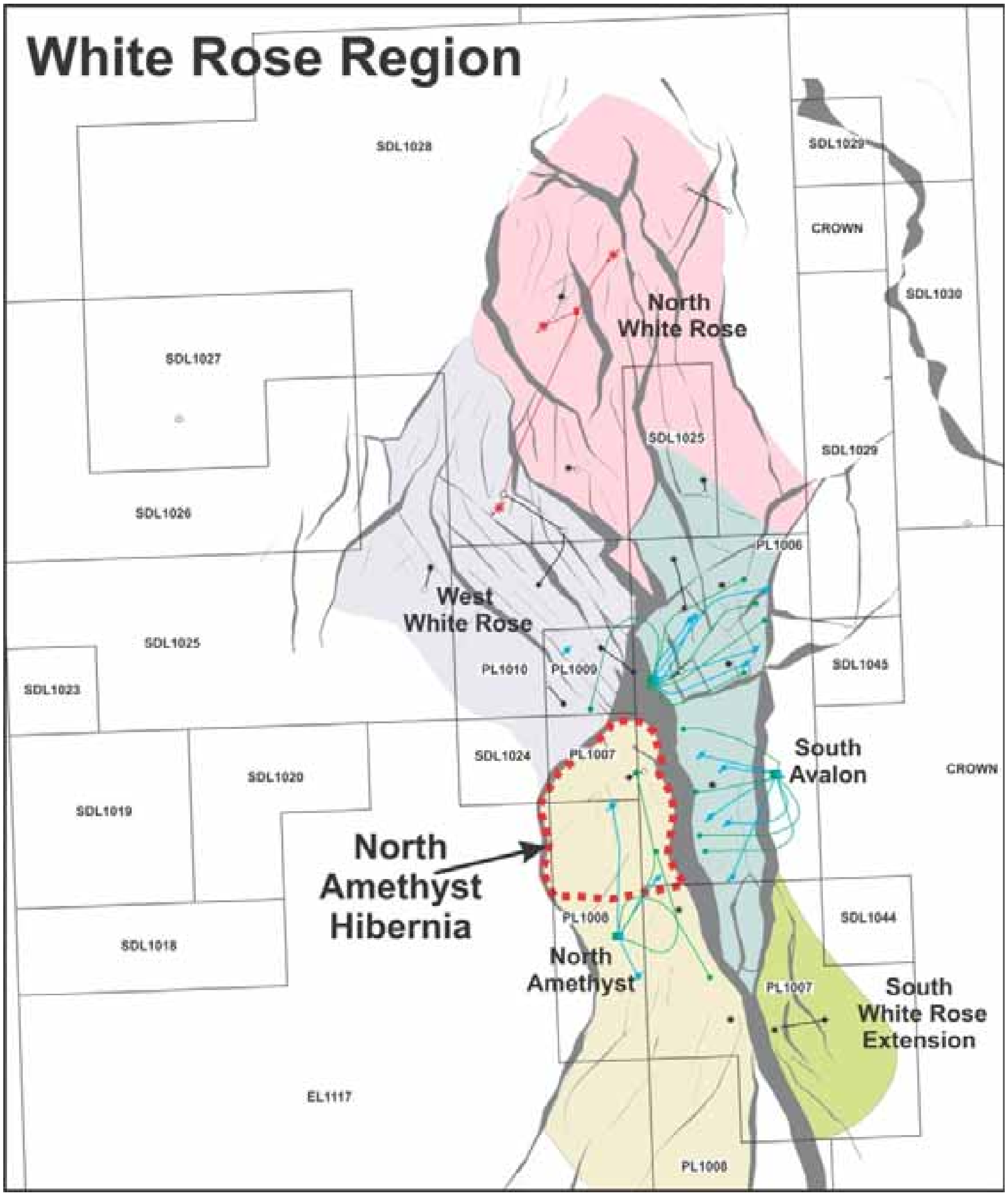
Figure 2.1 White Rose Oil Field

The White Rose Significant Discovery Area consists of both oil and gas resources, including the South Avalon Pool, the North Avalon Pool, and the West White Rose Pool. The South Avalon Pool has been under production since 2005. Husky recently received regulatory approval for a Pilot Scheme to further assess the potential for development of the West White Rose pool. The main oil reservoir at White Rose is the Ben Nevis/Avalon Formation sandstone.

The North Amethyst field commenced production in May 2010 and was the subject of a separate Development Application by Husky and its partners. The producing oil reservoir at North Amethyst is also the Ben Nevis/Avalon Formation sandstone. The North Amethyst Hibernia pool underlies the North Amethyst Ben Nevis/Avalon pool.

The proximity of the pools/field, specifically the North Amethyst Hibernia pool, with respect to White Rose is illustrated in Figure 2.2.

Figure 2.2 - Location of Pools/Fields in the White Rose Area



2.2 North Amethyst Hibernia Formation Discovery

Husky in its exploration/delineation program has targeted near White Rose field structures for tie-back into the existing facility. In 2008 an exploration component was added to the North Amethyst E-17 delineation well and it was deepened to test the older stratigraphy. The well encountered oil pay in the Berriasian-aged (~140 Ma) Hibernia Formation.

2.3 Development Plan Amendment Objective

The objective of this North Amethyst Development Plan Amendment is to outline Husky's proposed plan for development of the North Amethyst Hibernia Formation.

The Hibernia formation at North Amethyst underlies the Ben Nevis/Avalon formation and is segregated into three main fault blocks. The central E-17 block contains oil in both the Middle and Basal Hibernia members. The southern block has been penetrated by the G-25 1 well and encountered water, however, there remains the possibility of hydrocarbon accumulation occurring up structure of the well. There is potential for hydrocarbons in the northern most fault block, but this block has not been penetrated and as such the contacts are uncertain.

The primary focus of the North Amethyst Hibernia development is the hydrocarbon column within the Basal Hibernia of the E-17 block. Due to the limited aerial extent of the Basal Hibernia pool, it is anticipated that the North Amethyst Hibernia development will consist of one production well and one water injection well. The G-25 1 water injection well within the Hibernia Formation has previously been drilled and completed.

In 2010, the Provincial and Federal Ministers of Natural Resources granted Husky approval to install a two zone intelligent completion in the North Amethyst G-25 4 water injection well, allowing for water injection into both the BNA and Hibernia Formations. The letter indicating approval is provided in Appendix A. The upper completion zone currently provides support for the G-25 3 Ben Nevis/Avalon producer. The lower completion zone will be used in support of a future Hibernia Formation producer once an approved depletion plan amendment is in place for the Hibernia Formation.

Husky will give consideration to delineating additional Hibernia formation during drilling of the Basal Hibernia producer. Should the information collected in the producer prove further potential, consideration will be given to additional wells.

The Hibernia formation will be accessed through the existing North Amethyst drill center (NADC). Development of the North Amethyst Hibernia Formation will not alter the existing depletion plan for the Ben Nevis/Avalon (BNA) Formation. The proposed development is intended to utilize spare drill slots in the NADC, and there are no anticipated alterations or additions required to the existing subsea infrastructures or the *SeaRose FPSO*.

2.4 Co-Venturers

Husky is developing the North Amethyst Hibernia Formation with its co-venturers Suncor Energy and Nalcor Energy – Oil and Gas. The average interests of the co-venture parties in the project are:

- Husky Oil Operations Ltd. 68.875 percent
- Suncor Energy 26.125 percent
- Nalcor Energy – Oil and Gas 5 percent

2.5 Management

Husky, as the North Amethyst Field Operator, will manage the development of the North Amethyst Hibernia Formation and subsequent operations. The Operator's authority, role, responsibility and reporting requirements are outlined in the White Rose Growth Lands Exploration, Appraisal, Development and Operating Agreement that is already in place.

2.6 Canada-Newfoundland and Labrador Benefits

The proposed project will be executed using existing facilities and established personnel, procedures and infrastructure. The proposed activities are covered under Husky's current operations authorizations for drilling and production. Similarly, the project will use existing contracts and services that are in place for the White Rose and North Amethyst projects. No new contracts and no new employment are anticipated.

3.0 Geology

3.1 Lithostratigraphy

The Hibernia Formation within the greater White Rose region lithostratigraphically resembles examples of the same interval previously published by Sinclair et al. (2005). The established ages for the interval, as compiled from Husky internal biostratigraphic analyses, place the Hibernia within latest-Portlandian (Lower-most Berriasian; 144Ma) at its base, to middle-Valanginian (136 Ma) at the top of the mega-sequence. The basal contact is gradational (transition from Fortune Bay) to sharp based where erosional sequence boundaries cut into the Fortune Bay Shale. The top of the package is defined by the occurrence of the ‘B’ Marker limestone unit (south to central – not present in the northern region) that unconformably overlies the uppermost Hibernia sandstones.

3.2 Nomenclature & Classification

The general depositional setting for the Hibernia Formation within the Jeanne d’Arc Basin consists of synrift fluvio-deltaic sediment in the basal Berriasian section that gradually retrogrades into coarsening upward shoreface deposits in the Valanginian-aged Upper Hibernia (Sinclair et al. 2005). Results from the North Amethyst E-17 well suggest the Hibernia Formation in the North Amethyst region is dominantly a non-marine transitional to inner neritic depositional system further confirming the basin wide depositional setting in the White Rose region.

The detailed description of deltaic environments has been the subject of numerous studies that sample a wide range of facies classification schemes. In order to ensure continuity and clarity in describing the Hibernia Formation it is important to define a consistent facies, architectural element, and facies association framework over the earliest-Cretaceous interval. A modified facies scheme combining elements of Plink-Bjorklund and Steel (2005) and Davies et al. (2005) will be used in this document to describe the primary sedimentary structures observed in cored intervals. This in turn will be combined with the defined deltaic ichnofacies of MacEachern et al. (2005) in order to incorporate all observations into a cohesive interpretation of the Hibernia Formation over the eastern extents of the Jeanne d’Arc Basin.

3.2.1 Facies and Bedforms

Table 3.1 outlines the main facies encountered in the Basal Hibernia (E-17 core). Oil staining was present throughout the sandstone intervals, although the massive sandstone (Sm facies class) and planar cross laminated sandstone (Sp) had the most pronounced hydrocarbon stain. Grainsizes encountered were coarser within the Sm and Sp facies ranging from mgL to cgU. Basal lag deposits (Glg facies class) were commonly associated with the Sm and Sp beds. Facies associated with finer-grained sediment (Sl, F, some Sm) were commonly re-worked, with a bioturbation index of 3-4. Dewatering structures and escape traces were also observed in the finer-grained facies and are indicative of rapid rates of deposition.

Table 3.1 Facies and Architectural Elements of the Hibernia Formation Modified from Gani and Bhattacharya (2007).

Basal Hibernia Formation: Classification of Facies & Facies Association			
Facies		Description	Interpretation
Mudstone	M	Massive to parallel laminated, featureless and fissile. Rare to limited bioturbation.	Low-energy deposition in a Prodelta setting. May also occur within interdistributary bay regions.
Siltstone	F	Massive to parallel laminated, local fgL sandstone lenses. Soft sediment deformation and dewatering structures may occur. Moderately bioturbated with Skolithos, Planolites, and local Thalassinoides filled with fgL sandstone. Commonly interbedded with fgL sandstone beds on the order of .5 to 2 cm in thickness.	Proximal Delta Front setting. Can occur within Distributary Channels or Lower Shoreface Setting.
Coals	C	Structureless, mm to 2cm thick tabular beds and lenticular seams. Associated with Sl as drapes and interbeds.	Thin small scale scour fill to overbank deposit within crevasse splay setting.
Parallel Laminated Sandstone	Sl	Parellel to wavy bedded fgL to mgU sandstone that locally may have pebble sized clay rip up clasts. Organic carbonaceous debris and locally coal deposited along laminae. Bioturbation is moderate with Skolithos, Thalassinoides, Planolites.	Lower and Upper plane bed flow regimes in a Proximal Delta Front setting. Can occur within Distributary Channels or Lower Shoreface Setting.
Planar Cross Laminated Sandstone	Sp	fgU to cgU sandstone, normal graded, pebble-sized shale rip up clasts may locally be present at base,	Dune bedform within distributary channel.
Massive Sandstone	Sm	fgU to cgU sandstone, massive and featureless. Mottled appearance suggests highly bioturbated by Macronicnus, local ophiamorpha. Dewatering 'dish' structures commonly disrupt primary bedforms.	Basal portion of distributary channel/terminal distributary channel. Also present within Mouth Bar deposit.
Massive Conglomerate	Glg	Massive, featureless, erosive based intervals ocurring as lenses at the base of Sp/Sm intervals. Contain chert, quartzite, lithic, pebble-sized mudstone clasts, and bioclastics commonly matrix supported, and poorly sorted. May be locally diagenetically cemented.	High energy fluvial basal lag of Distributary Channel fill.

3.2.2 Facies Architecture

Facies and their connection to Architectural Elements are outlined by Gani and Bhattacharya (2007) as facies units and their associated stacking patterns whereby a combination of facies make up an architectural element. A single, or multiple, architectural element is then equivalent to a morphological element (channels, bars, splays, etc.). The importance of making this coarser, scaled-up classification hinges on the architectural element being closely correlated to amalgamated depositional units that are of flow unit scale within the reservoir (e.g. Tye, 2004). It is important to note that Facies Associations are commonly on a coarser scale than the architectural elements and represent a larger portion of the depositional setting (e.g. Postma 1990, Bhattacharya and Walker, 1992). Finally, Gani and Bhattacharya (2007) clearly state that the number of architectural elements defined is dependent on the detail in the description of the system studied and note that each element is linked to the next by a clearly defined bounding surface. In summary, facies are grouped together to form architectural elements that are bound by defined surfaces, and these architectural elements are in turn grouped together to build a facies association that are bound by clear sequence boundaries.

3.3 Hibernia Formation

The Hibernia Formation was formally defined by McAlpine (1990) via two type sections with Hibernia K-14 for the type section and Hebron I-13 for a distinct package in the upper-most strata with the latter being labeled the 'Hebron Well Member'. The definition of the type interval in the K-14 well characterizes the Hibernia Formation as a 'sandstone-dominated unit occurring between the underlying Fortune Bay Shale and the overlying White Rose Shale [sic] or alternatively the overlying 'B' Marker" (McAlpine, 1990). Lithologically, the lower unit is composed of thick fining-upwards sequences of moderate to well sorted fine to very coarse-grained quartz arenites (cross-bedded, parallel laminated, and/or current rippled) with abundant carbonaceous stringers, and commonly having basal lags composed of siderite, shale rip-up clasts, chert, and quartzite (McAlpine, 1990). The 'Hebron Well Member' defined by McAlpine (1990) is quite simplistic in nature and as a formal 'member' is of limited use. Nevertheless, the lithological character provides some insight to the upper-most strata of the Hibernia Formation in a proximal setting. McAlpine (1990) defines the lithology as medium to coarse-grained sandstone that fines upward into fine-grained sandstone (moderate to well-sorted) with the upper intervals composed of fine-grained sandstone and limestone/siltstone interbeds. The sandstone within the interbedded package is moderately sorted fine to medium grained, with carbonaceous debris, bioclastics, and mud clasts, and have parallel horizontal laminae to wavy bedding that is bioturbated.

On the Eastern flank of the Jeanne d'Arc basin the Hibernia Formation consists of the Upper Hibernia Member, Middle Hibernia Member, Lower Hibernia Member and the Basal Hibernia Member. These intervals are discussed in further detail in the following sections.

3.3.1 Upper Hibernia Member

Interpretation of this interval is largely based on log signature in combination with depositional environment information from cuttings and biostratigraphy. The type section for the Upper Hibernia in the White Rose region is defined by a composite between Amethyst F-20 well (moderately good net reservoir in a series of coarsening upwards sandstone packages) and the North Amethyst G-25 1, G-25 4, and White Rose N-22 wells (dominantly interpreted as prodelta to offshore marine;). To the east, preservation of this interval over the core White Rose development area is poor due to the erosional truncation of the Upper Hibernia by the mid-Aptian unconformity.

3.3.2 Middle Hibernia Member

Cored section for this interval is encountered in the White Rose N-22 well, Amethyst F-20 well, and the North Amethyst G-25 4 well. White Rose N-22 was taken through the contact between the base of the Upper Hibernia and into the Middle Hibernia members. The core data and log signature for this interval suggests limited reservoir quality in a series of small coarsening upwards cycles, however both of these intervals at N-22 encountered hydrocarbon in the well and were successfully DST'ed. Hydrocarbon within the Middle Hibernia interval was also encountered in the North Amethyst E-17 well. No core was collected over the interval. Although not hydrocarbon bearing, the North Amethyst G-25 4 well recovered 53.6 m of core with porosities up to 23.8% and permeability's up to 168 mD. Like N-22, the G-25 4 core shows small non-reservoir to reservoir quality coarsening upward cycles. The interbedded nature of these cycles may reduce the effective recovery of hydrocarbons over this interval.

3.3.3 Lower Hibernia Member

The type section for this interval can be found in North Amethyst E-17, North Amethyst G-25 1, and North Amethyst G-25 4. It consists of a poor quality interval of interbedded (sandstone, siltstone, claystone) heterolithic strata. No core has been collected from this interval. At the North Amethyst E-17 well, the non-hydrocarbon bearing Lower Hibernia, has proved to be a barrier between the Middle Hibernia and the Basal Hibernia oil legs.

3.3.4 Basal Hibernia Member

The basal interval of the Hibernia Formation on the South East flank of the Jeanne d'Arc basin consists of several fining upwards sandstone packages deposited within a fluvial-dominated deltaic sequence. The type section for this interval was sampled in the North Amethyst E-17 and North Amethyst G-25 4 wells. In general the wells encountered a Basal Hibernia package of fining upwards fgU to cgL sandstone with good oil stain over the porous cored interval of North Amethyst E-17. Porosity and permeability in the reservoir quality sandstone (core plugs) were up to 23 percent and 3000 mD, respectively. Wireline logs suggest sandstone of equivalent quality exist below the cored intervals.

Due to issues when coring (jam off) the North Amethyst E-17 and North Amethyst G-25 4 wells only 11.4 meters of E-17 core and 28.0 meters of G-25 4 core were recovered from the Basal Hibernia unit. The 39.4 m interval of rock that was collected managed to sample several distinct facies that can be used to classify the majority of the Basal Hibernia (Table 3.1).

3.4 Analogue Assessment

The Hibernia Formation, as sampled in the White Rose region, consists of a mix of continental through to shoreface sediments. Due to erosion of the uppermost intervals by the mid-Aptian Unconformity, faulted section, and locally condensed section through the emergent Amethyst high, a complete Hibernia section sampled by well penetrations is rare. In fact, the best preservation of the entire section (B Marker to Fortune Bay) exists within the Amethyst F-20, North Amethyst G-25 4, and White Rose N-22 wells. Working with these examples for the Upper and Middle Hibernia, and all wells for the Lower and Basal intervals, several ancient and modern examples of deltaic environments are reviewed as analogues to the Hibernia Formation at White Rose.

Ponten and Plink-Bjorklund (2009) document an Eocene-aged shelf-margin clinothem complex in the Central Basin of Spitsbergen that bares some similarity to the Hibernia complex of the Jeanne d'Arc Basin. Through detailed mapping of the Storvola Mountain outcrop a detailed history of highstand, through falling-stage, and into lowstand and transgressive systems tracts was documented. In particular, the highstand deltaic intervals (wave-dominated delta front and tidally influenced distributary channels) cut by fluvial erosion associated with the early lowstand deltas (distributary channels, hyperpycnal-flow mouth bars) are similar in character to the Basal Hibernia interval at White Rose. A challenge commonly faced in any subsurface work is the difference in scale between seismic observation and facies interpretation from geological core and cuttings descriptions. This is further confounded by the concept of flow units in relation to depletion planning and reservoir management.

3.5 Stratigraphy

The Berriasian-aged sequence tied to the Hibernia Formation corresponds with a Lowstand Systems Tract associated with the Basal Hibernia and culminates in what appears to be a Type 1 sequence boundary (e.g. Von Wagoner et al., 1990) identified as the middle Valanginian Unconformity. This unconformity is directly overlain by the shallow water 'B' Marker carbonate that is laterally extensive within Jeanne d'Arc Basin, and marks the end of the Hibernia Formation depositional package. In the centre of the basin, full Hibernia section is preserved and the Upper, Middle, and Lower/Basal Hibernia intervals are commonly identified by wireline log signature. Within the White Rose region the Hibernia section is far more difficult to discern due to faulted, eroded, and non-deposited portions of the stratigraphy.

3.6 Depositional Environment

The composite depositional schematic figure for the entire Hibernia Formation is illustrated in Figure 3.1. With the collected data assessed in the previous sections, the Hibernia Formation is interpreted to represent several cycles of sea level rise and fall within an initially prograding Lowstand fluvial dominated delta (Basal Hibernia), through Transgressive to Highstand fluvial dominated deltaic deposits (Middle Hibernia), and finally a second Lowstand to Highstand systems tract fluvial dominated delta of the Upper Hibernia.

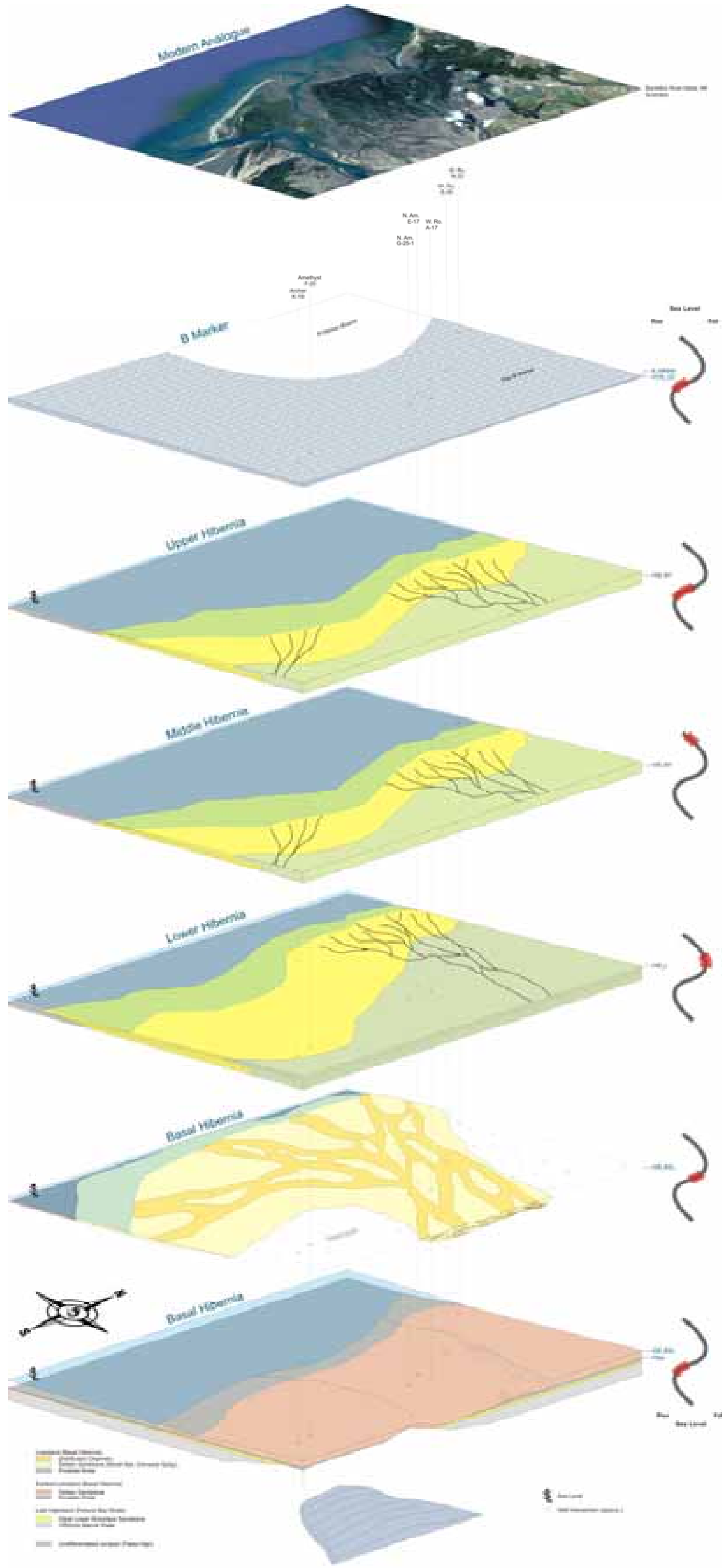


Figure 3.1 Composite Depositional Schematic for the Entire Hibernia Formation

3.7 Hibernia Geology at North Amethyst

The North Amethyst Block has been penetrated by three wells (Figure 3.2). The discovery well, North Amethyst E-17, was oil bearing in the Middle and Basal Hibernia. The Hibernia delineation portion of the G-25 1 well did not encounter hydrocarbons. The third Hibernia penetration was G-25 4 which is a Ben Nevis water injector that has been deepened and dually completed with intent to support the Ben Nevis and future Hibernia production.

Structurally the potential hydrocarbon bearing region of North Amethyst Hibernia is segregated into three main fault blocks by post-depositional normal faults with throws ranging from <20 m to 160 m. (Figure 3.3). The primary hydrocarbon region is the E-17 block which contains oil in both the Middle and Basal Hibernia members. To the south, the G-25 1 well encountered water; however, there remains the possibility of hydrocarbon accumulation occurring above the G-25 1 well penetration. There is potential for hydrocarbons in the northern most fault block, but this block has not been penetrated and as such the contacts are uncertain.

Figure 3.2 North Amethyst Basal Hibernia Top with Block Names, Well Penetrations, and Location of Cross-Section A-A' (Figure 3.3)

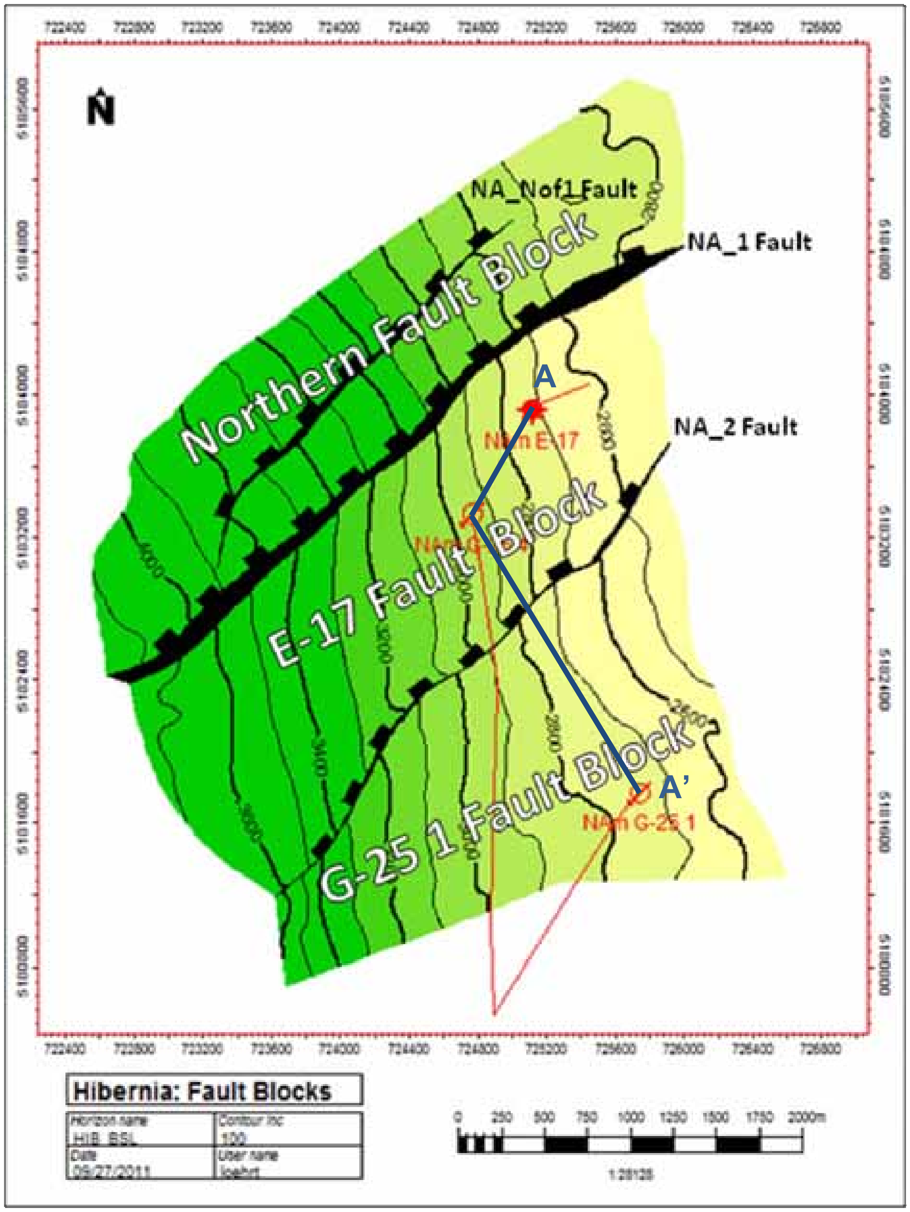
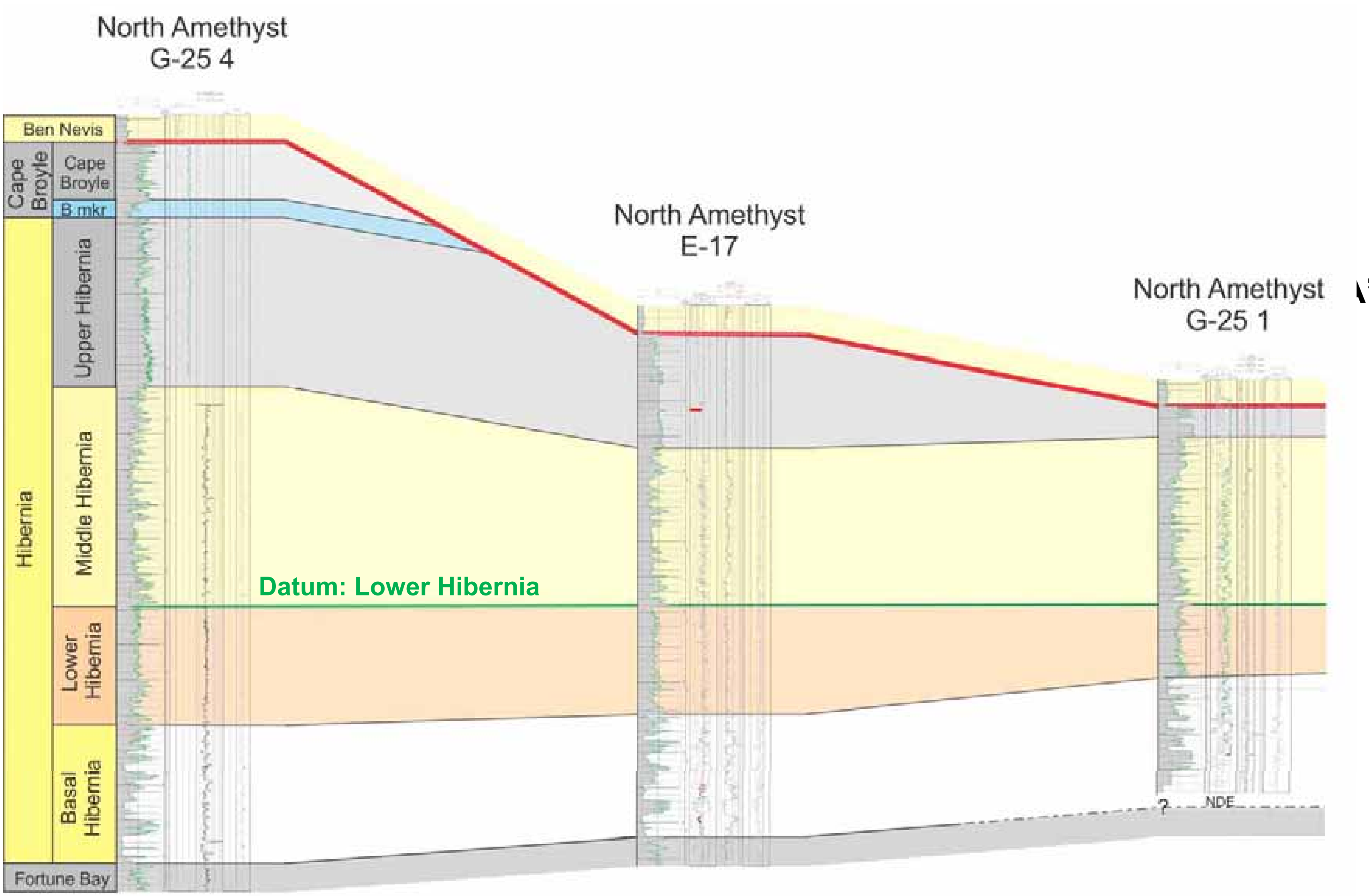


Figure 3.3. Stratigraphic cross-section through North Amethyst region (Datum: Lower Hibernia Top)



4.0 Geophysics

This section describes the seismic data and geophysical mapping specific to the North Amethyst field.

4.1 Seismic Data Acquisition

In 2008 a high resolution 3-D seismic data volume was acquired by Husky over the greater White Rose Area, including the North Amethyst field. The survey covered approximately 1600 km2 (shown in yellow on Figure 4.1).

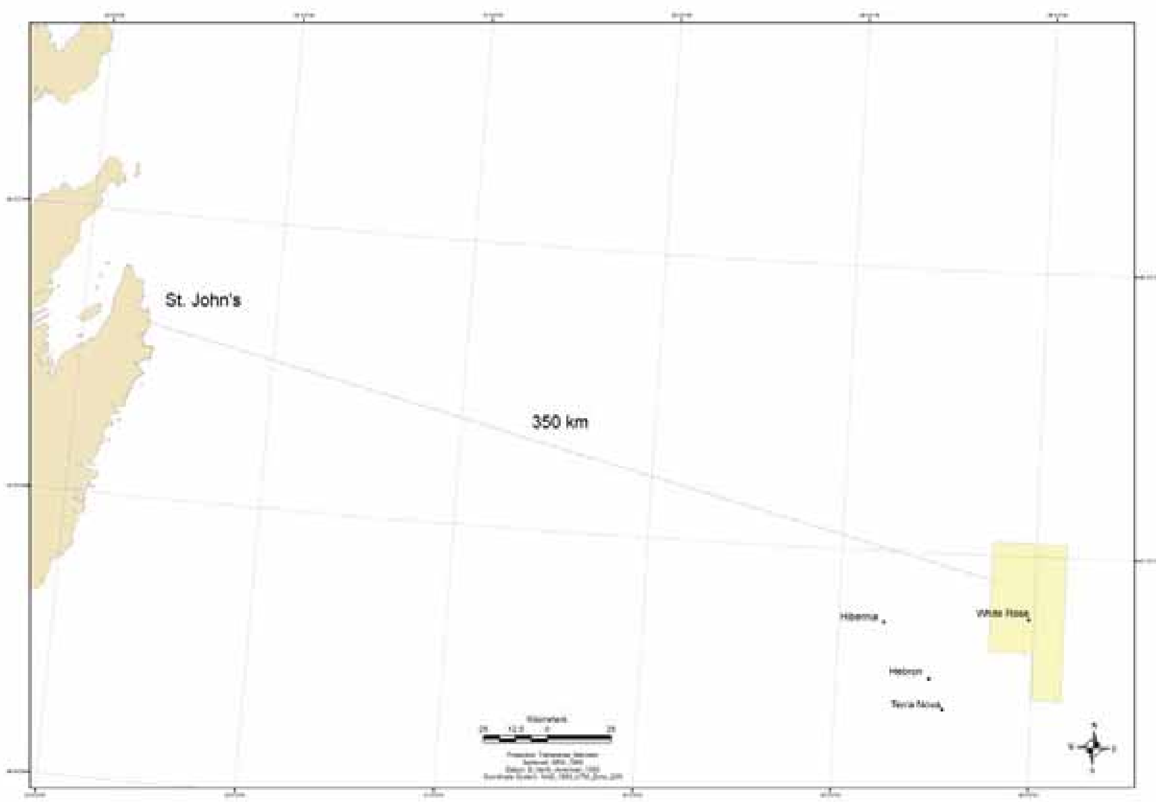


Figure 4.1 Outline of White Rose 2008 3-D Seismic Survey

The main objectives of the new seismic survey were to resolve the structural and stratigraphic complexity of the White Rose area. To accomplish this, the fold was increased when compared to previous data, thus increasing the frequency content. In addition, higher density line spacing helped increase fault resolution. This in turn would assist in the following:

- Positioning of delineation and development wells within in the White Rose field.
- Resolving production issues such as communication between producer/injector pairs in satellite regions.

4.2 Seismic Interpretation – Synthetic Ties

The main wells used to correlate the seismic markers of the Hibernia Formation within the North Amethyst field were White Rose A-17, North Amethyst E-17, G-25 1 and G-25 4. A good fit can be seen between the synthetics generated from the sonic and density logs and the seismic data. An example of the individual well synthetic is provided in Figure 4.2.

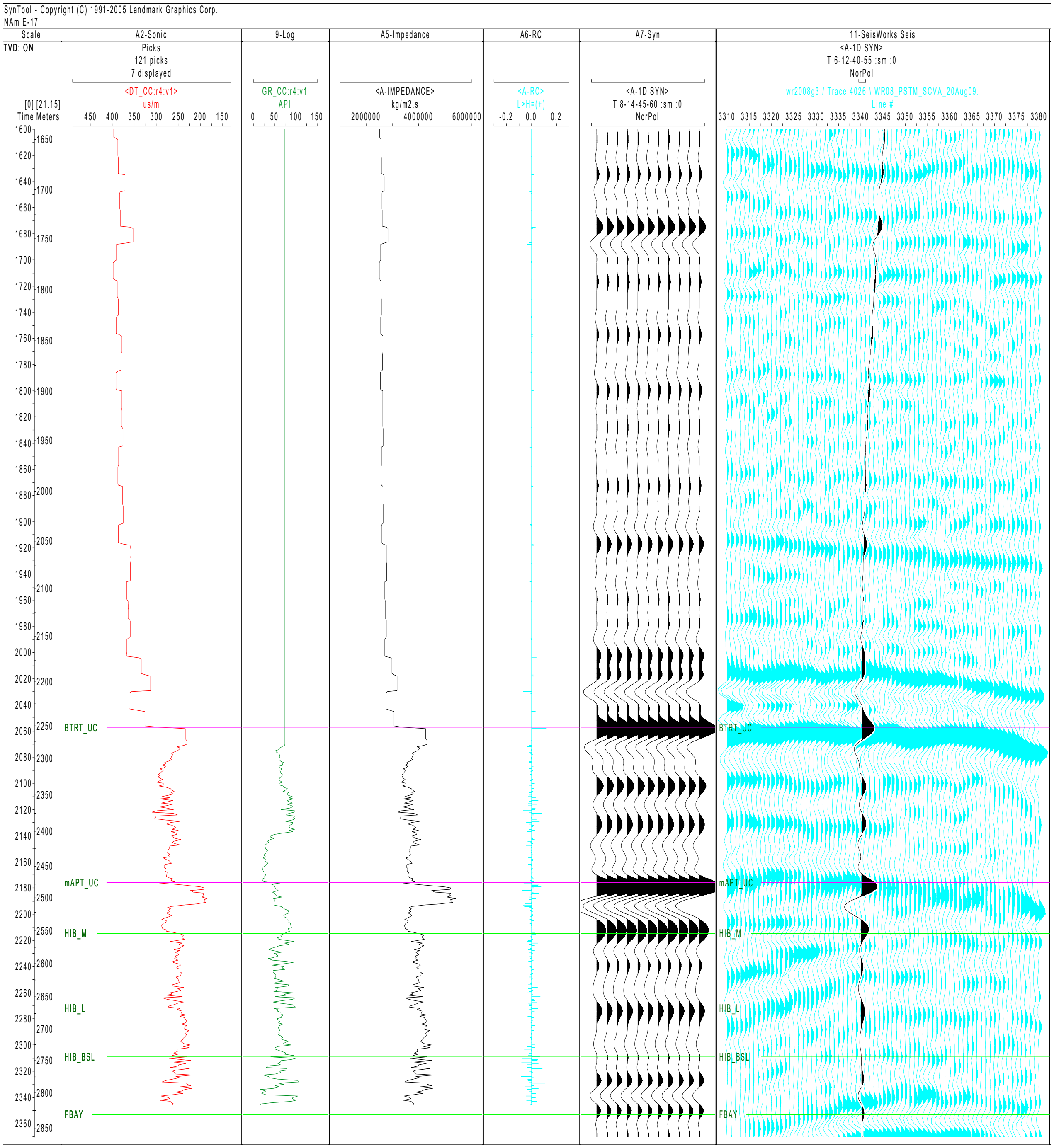


Figure 4.2 E-17 Synthetic Ties

4.3 Seismic Markers

The ties between the synthetic seismograms, VSP's, and marine seismic data are generally good. Most data correlation problems occur due to the complexity of faulting and the lack of available well ties. Mapping the top and bottom of the Hibernia Formation (Fortune Bay) is generally a challenge. However, the quality of the White Rose 2008 seismic data allows for an elevated degree of confidence when trying to 'loop-tie' specific seismic markers.

Seismic interpretation was performed on all lines and crosslines (12.5m by 12.5m line grid) over the area of interest. The interpretations were also confirmed with arbitrary lines, time slices and continuity slices. The interpretation was completed using a LINUX operating system, Landmark Seisworks and Geoprobe.

Five seismic markers were correlated and mapped over the area of interest:

- Mid Aptian Unconformity
- Middle Hibernia
- Lower Hibernia
- Basal Hibernia
- Fortune Bay

The mid-Aptian unconformity is, in general, a medium to high reflectivity peak, but it may change to low amplitude or even change polarity as it truncates layers of different age and composition (Figure 4.3).

The Middle Hibernia is generally a medium to high reflectivity peak over the area of interest and in places it subcrops the mid-Aptian unconformity (Figures 4.3 and 4.4).

The Lower Hibernia has been mapped within the area of interest as a consistent zero crossing and again in places it subcrops the mid-Aptian unconformity (Figures 4.4 and 4.5).

The Basal Hibernia has been mapped within the area of interest as medium to high reflectivity trough (Figure 4.6).

The Fortune Bay is, in general, a medium to high reflectivity peak. However, this peak is difficult to track as the formation starts to thin to the south (Figure 4.7).

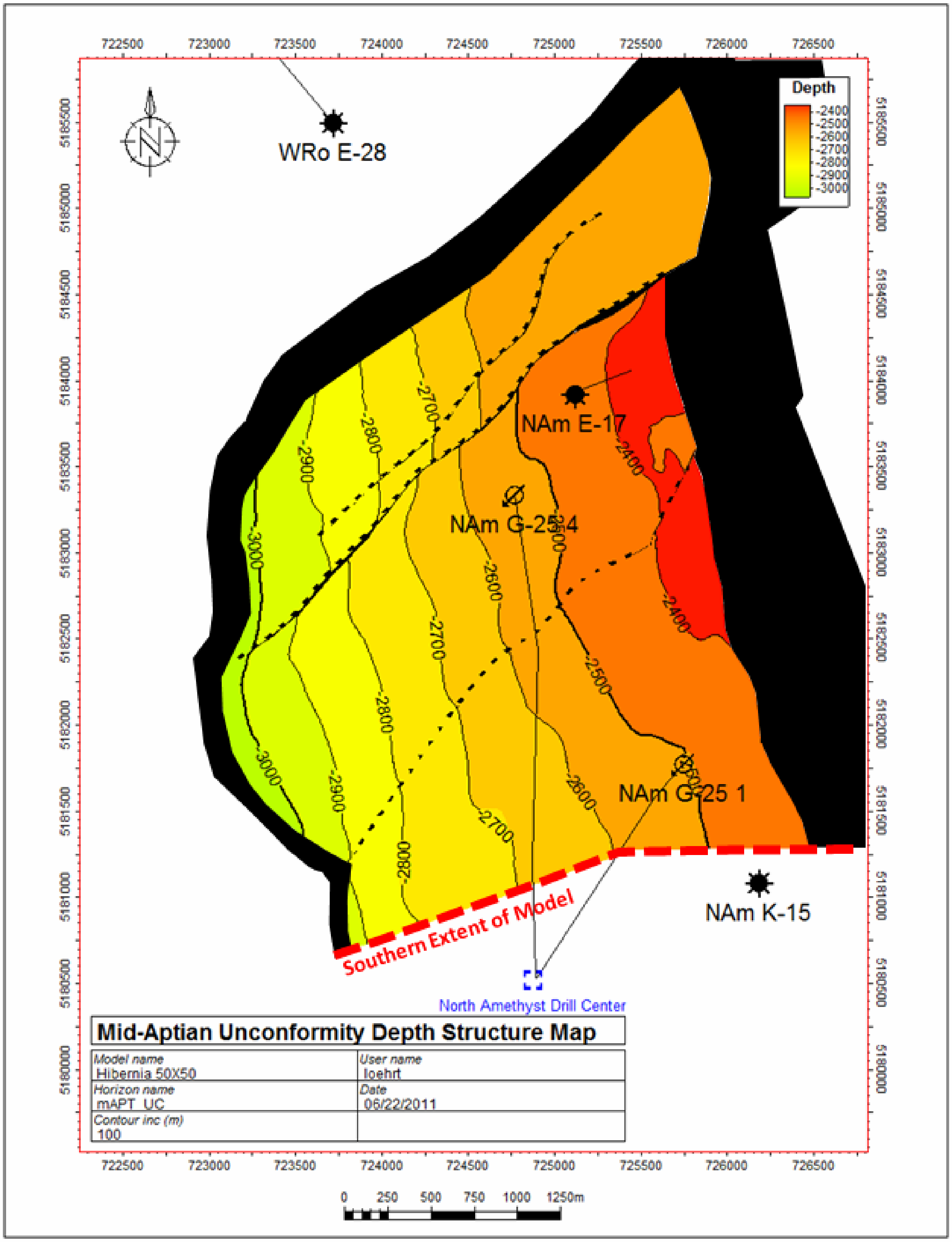


Figure 4.3 Mid-Aptian Unconformity

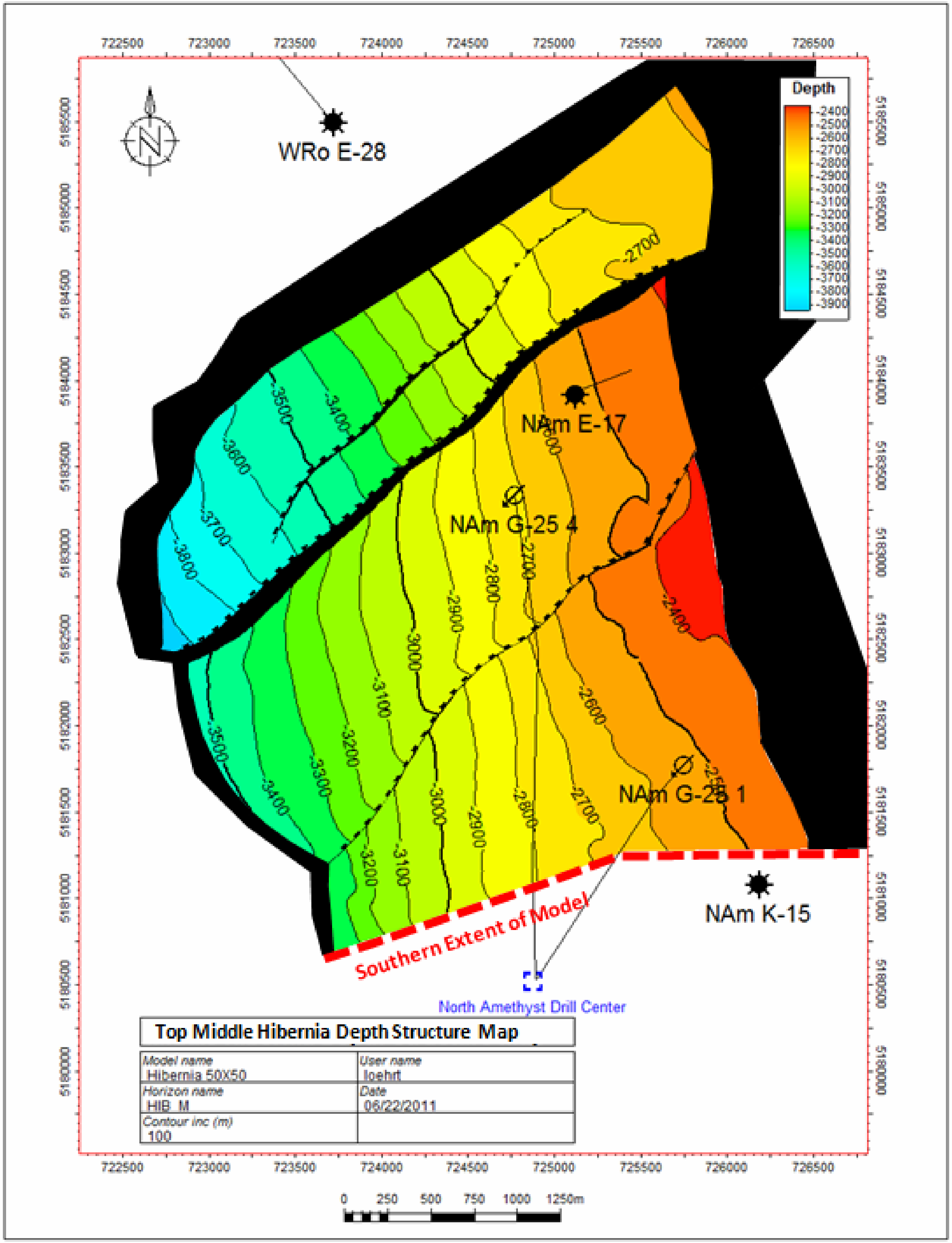


Figure 4.4 Middle Hibernia

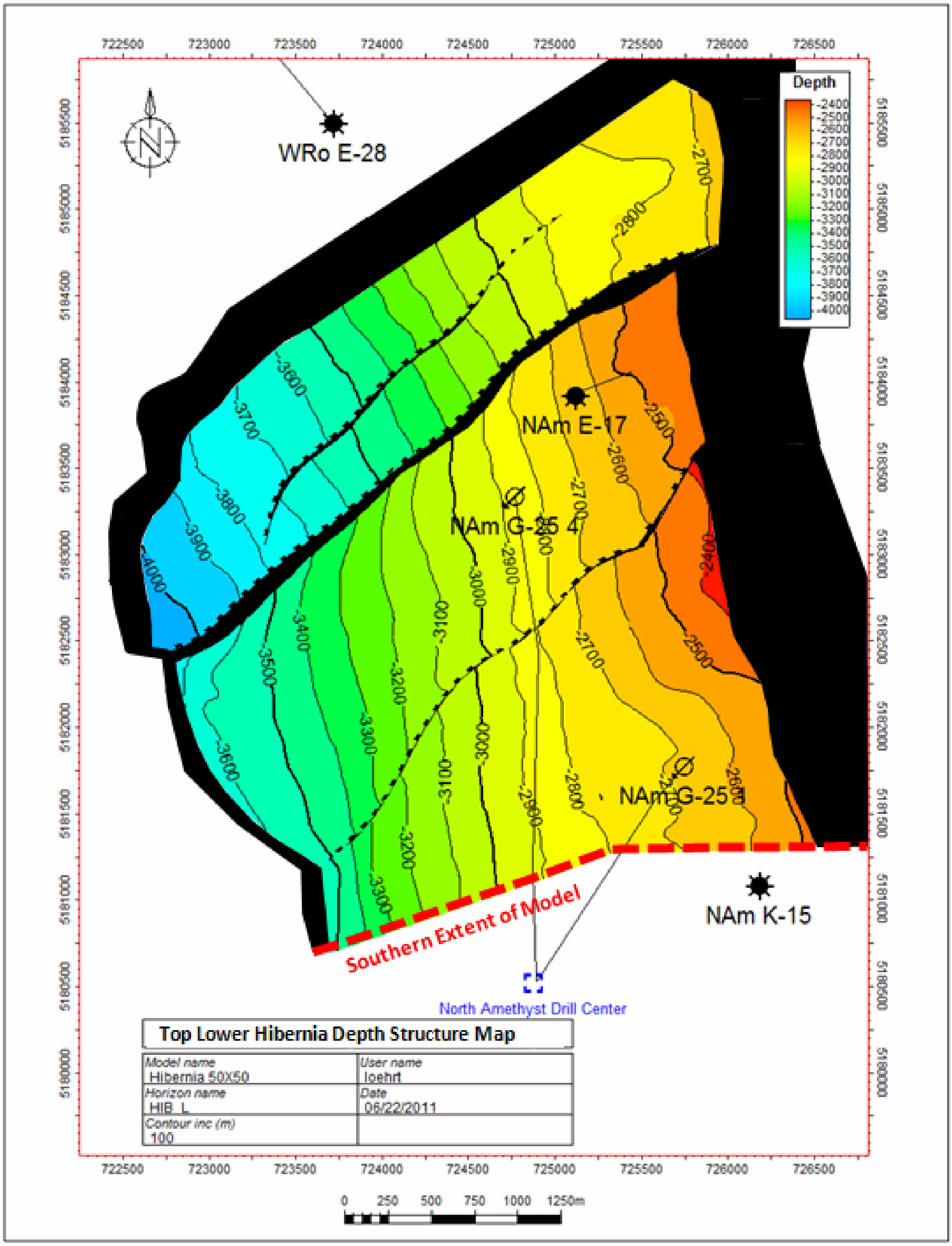


Figure 4.5 Lower Hibernia

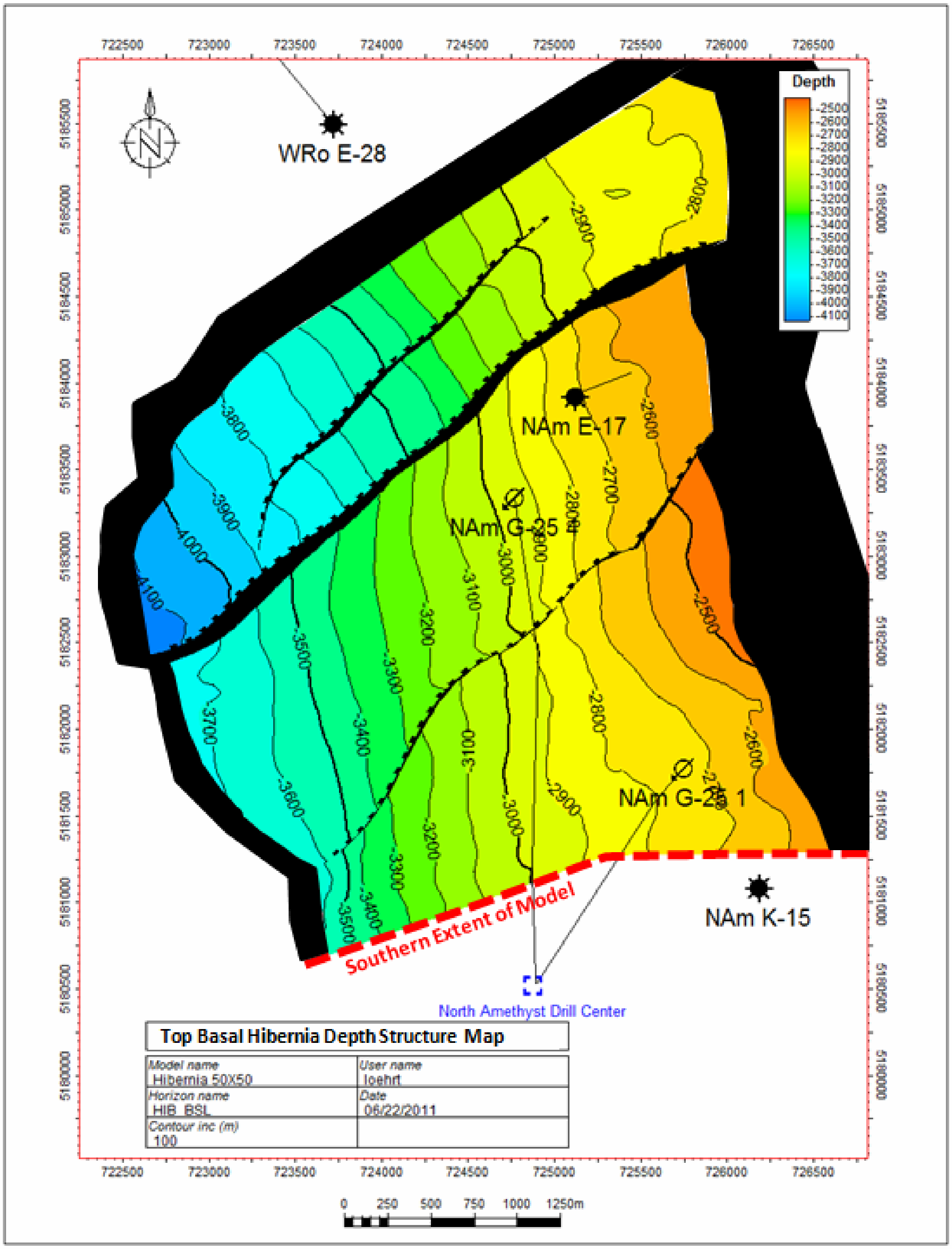


Figure 4.6 Basal Hibernia

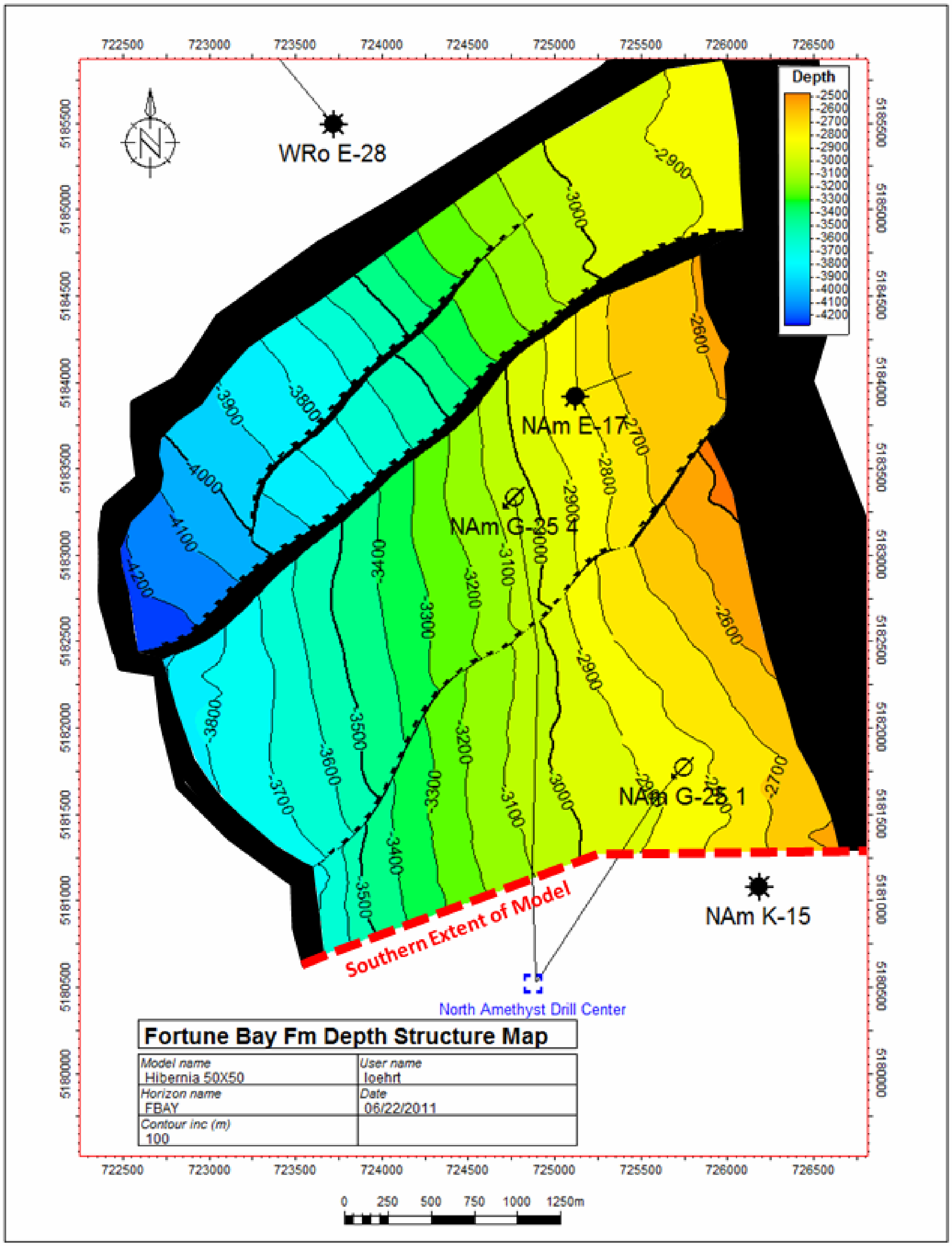


Figure 4.7 Fortune Bay

Two interpreted, migrated seismic sections are included to illustrate the main structural elements and tie the wells in the area Figures 4.9 through 4.12. Their locations are shown on the seismic sections index map Figure 4.8.

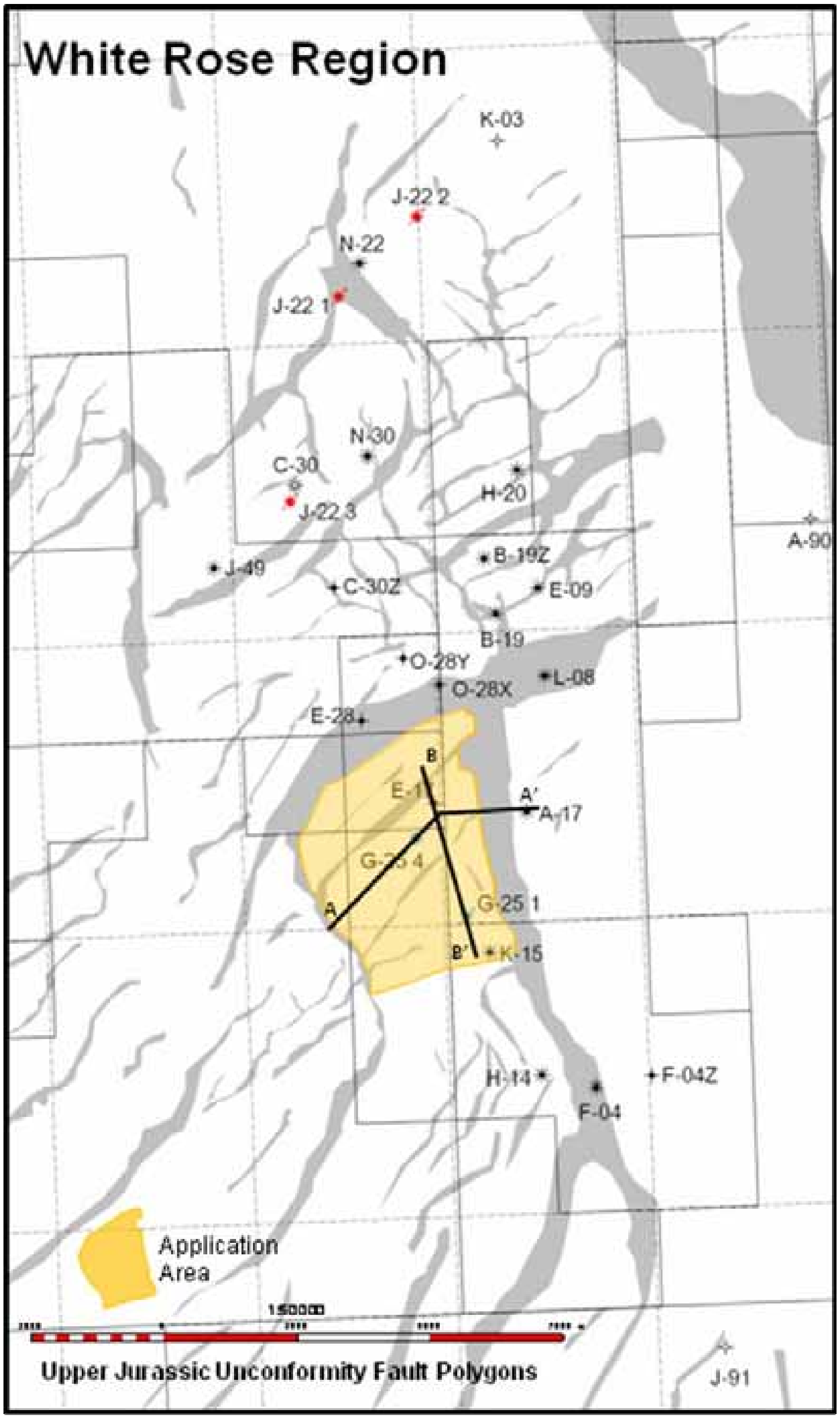


Figure 4.8 Seismic Section Index Map

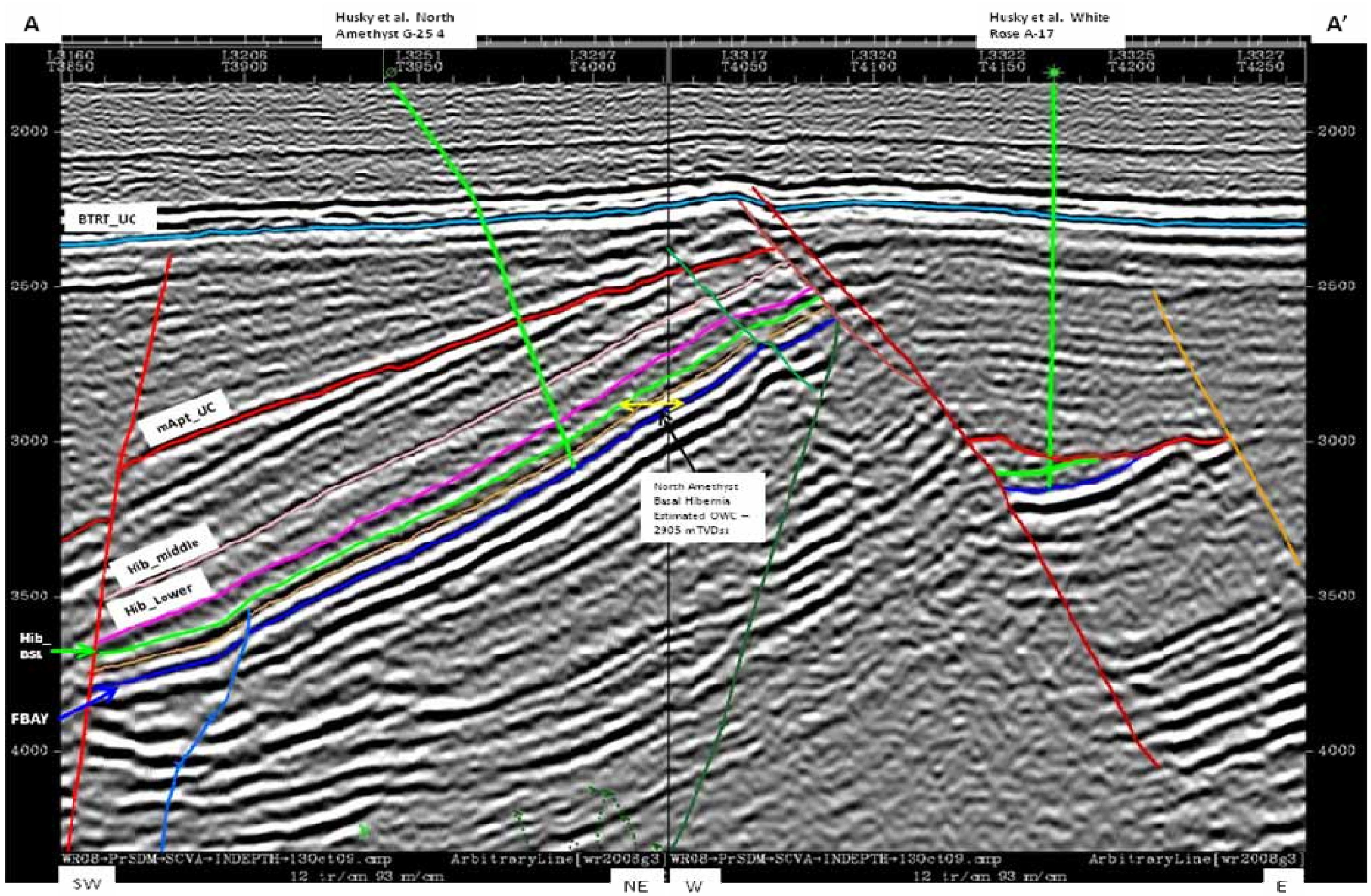


Figure 4.9 Seismic section through the Central Ridge of the North Amethyst Structure

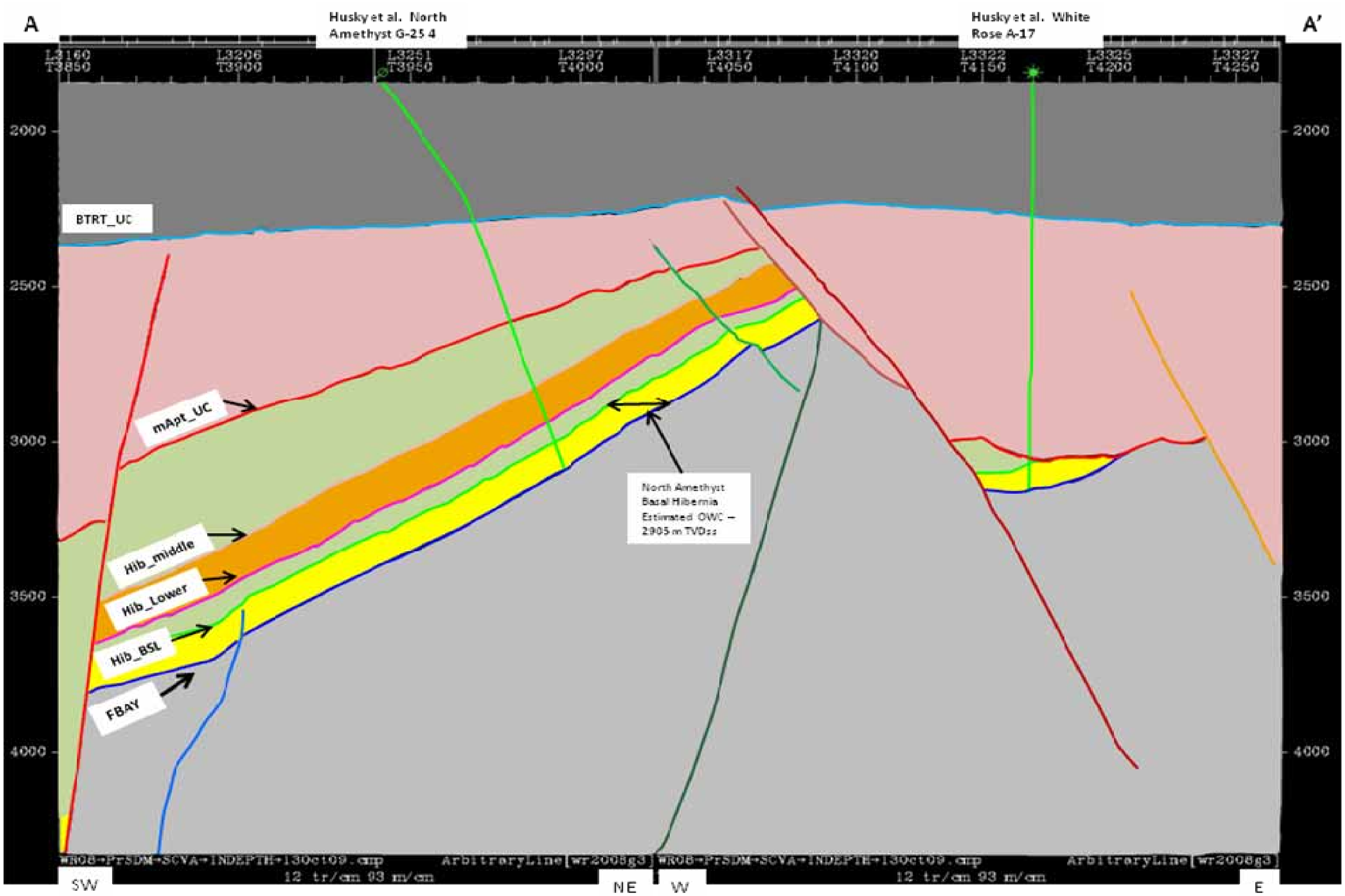


Figure 4.10 Schematic section through the Central Ridge of the North Amethyst Structure

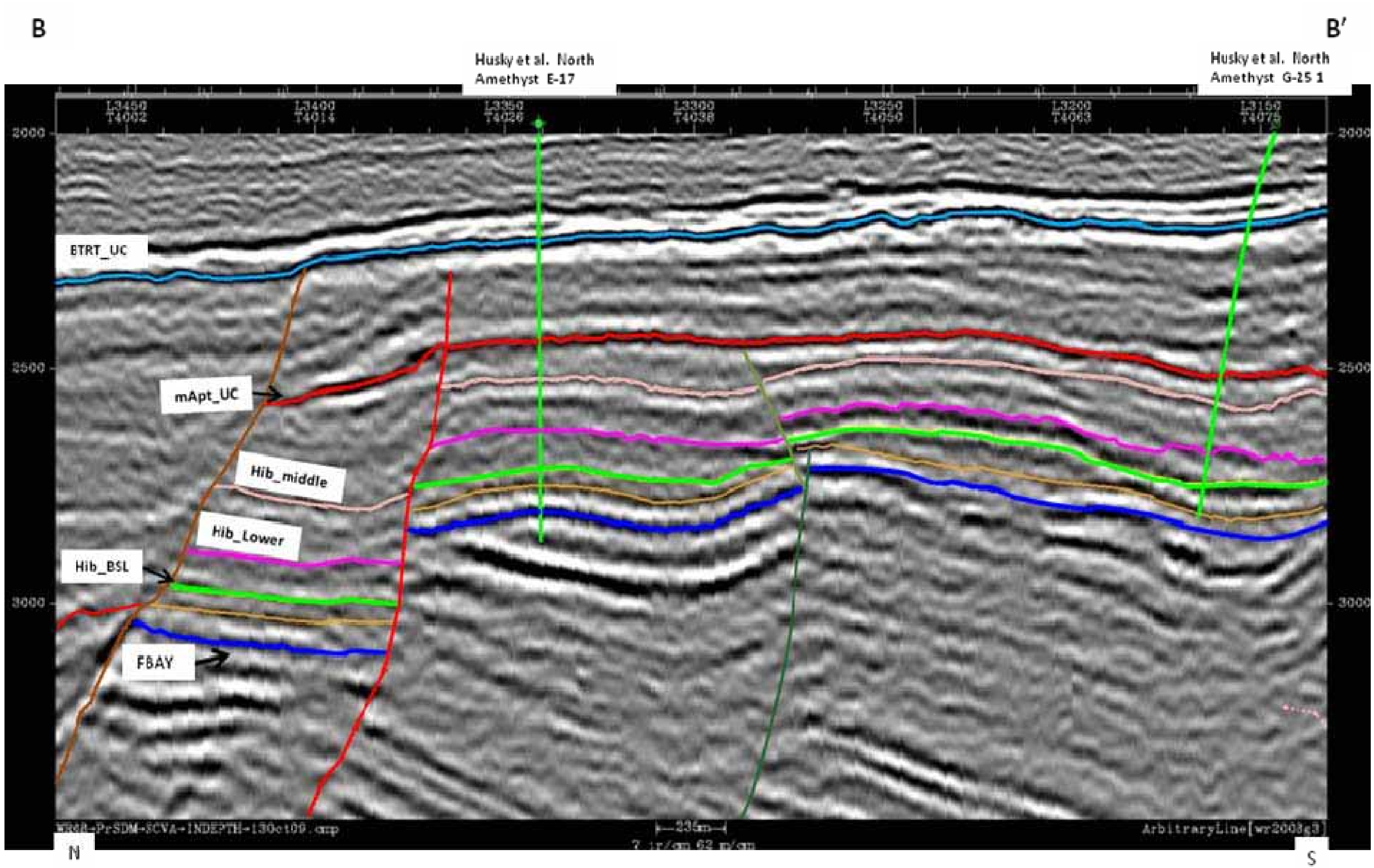


Figure 4.11 Seismic section through North Amethyst

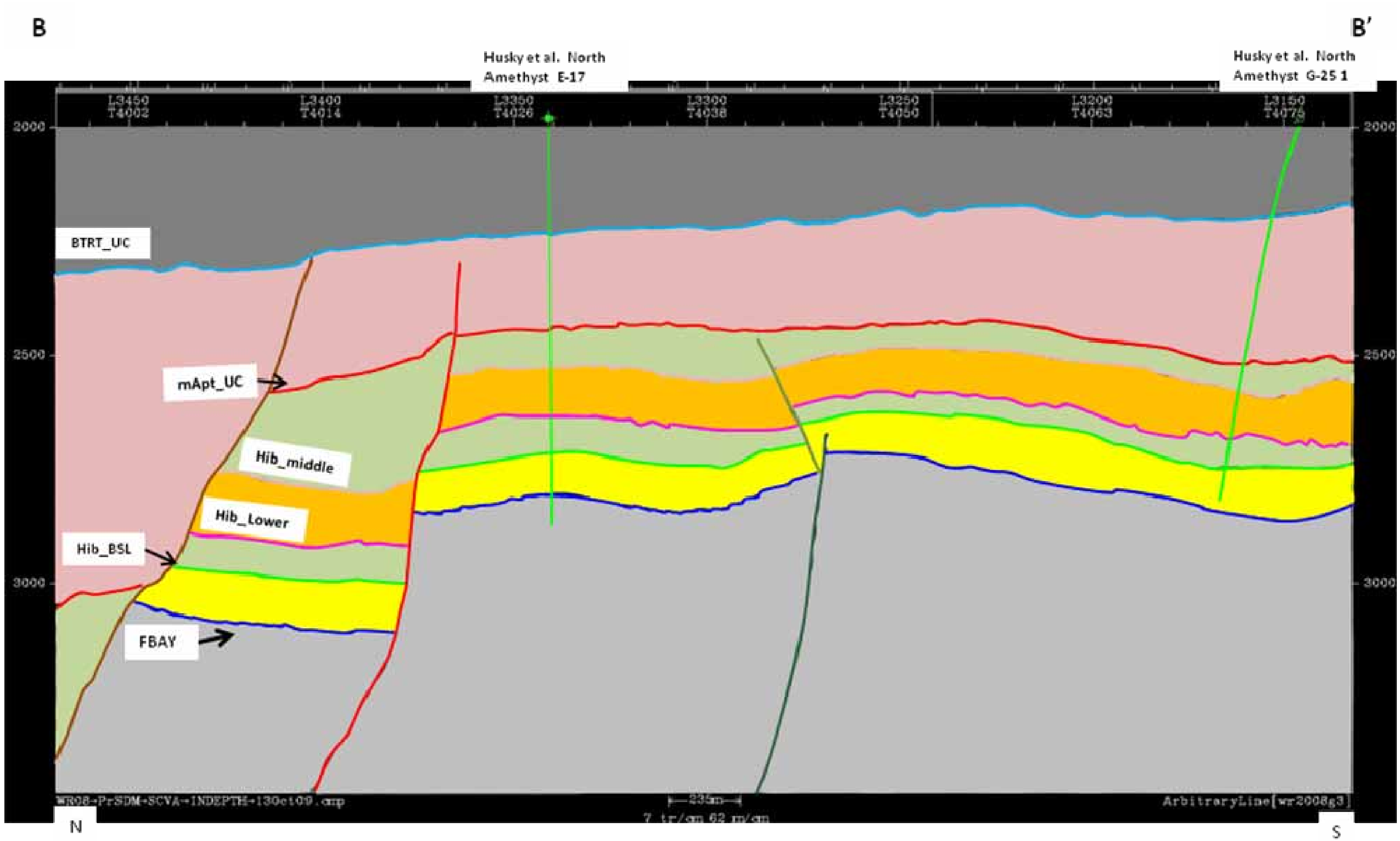


Figure 4.12 Schematic section through North Amethyst

5.0 Petrophysics

5.1 North Amethyst Hibernia Data Acquisition

5.1.1 Log Data

Table 5.1 provides a detailed list of the logs acquired from the North Amethyst Hibernia wells to date.

Table 5.1 North Amethyst Hibernia Log Data

Well	Date Logged	Logs Acquired
E-17	Sep-2008	AIT-PEX-DSI-EMS-OBMI, MDT, VSI
G-25 1	May-2009	AIT-PEX-EMS, MDT, DSI-OBMI-GPIT
G-25 4	Nov-2010	AIT-PEX-EMS, OBMI-GPIT, MDT, MSCT, VSI

Note: Acronyms are defined within the White Rose Complex Development Field Data Acquisition Program

All the acquired logs appear to have good quality for the Hibernia interval.

5.1.2 Core

In considering both conventional and side wall cores, the Middle, Lower and the Basal Hibernia were sampled in the two North Amethyst wells E-17 and G-254 (Table 5.2).

Table 5.2 Core Sample Data

Well	Core Type		Start	Finish	Formation
E-17	Conventional	Core #1	2864	2877	Basal Hibernia
G-25 4	Conventional	Core #1	3958	4012	Middle Hibernia
G-25 4	Conventional	Core #2	4261	4290	Basal Hibernia
G-25 4	Sidewall	44 recovered	4151	4324	Middle, Lower and Basal Hibernia

5.2 Porosity and K_Air Permeability

The routine and sidewall core analysis data was depth shifted to tie with the wireline logs, than used to calibrate porosity logs and establish a porosity/permeability relationship for the Hibernia sand (Figure 5.1).

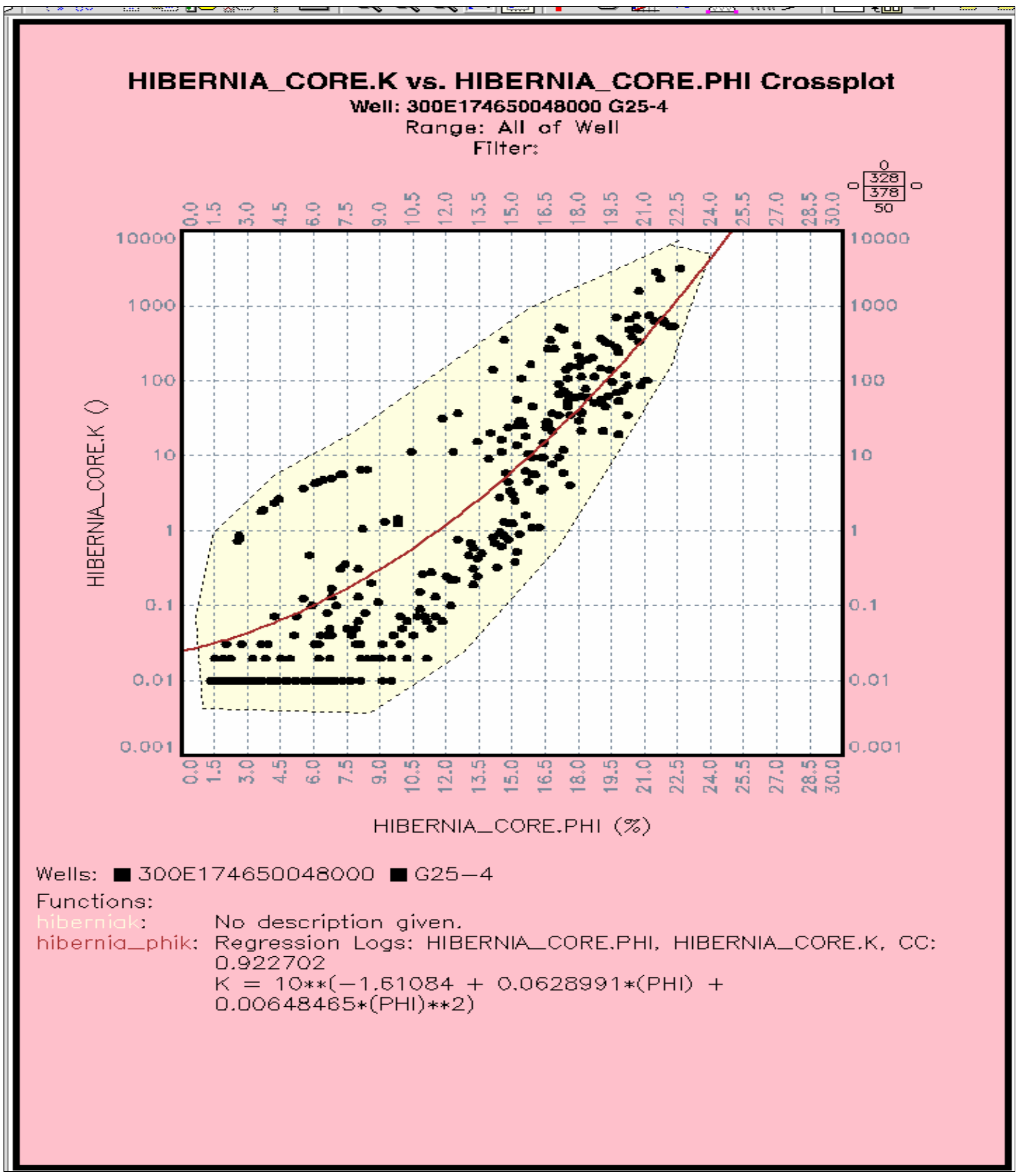


Figure 5.1 North Amethyst "Hibernia" Porosity/Permeability Relationship

5.3 Permeability

The permeability values were derived using the equation listed below. This equation is the core porosity/permeability relationship listed in Figure 5.1

$$k = 10^{\left(-1.61084 + 0.0628991\phi + 0.00648465\phi^{2}\right)}$$

5.4 Volume of shale

The volume of shale has been calculated using the well bore and mud weight corrected spectral Gamma Ray Log. A frequency plot of the corrected Gamma Ray through the Hibernia sand was used to determine the GR clean sand and GR shale end points used in the analysis (Figure 5.2).

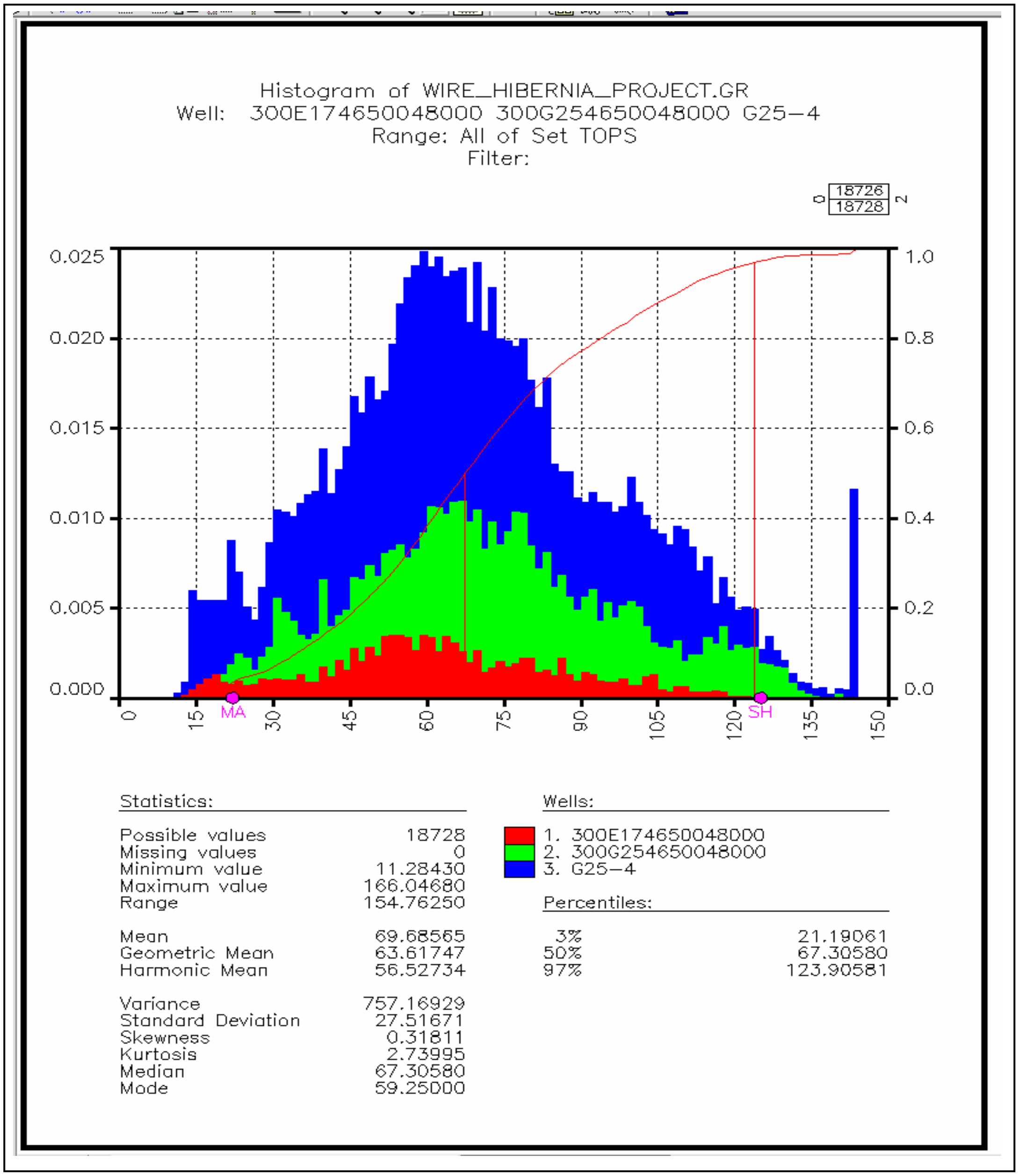


Figure 5.2 GR Frequency Histogram for the E17, G25-1 and G25-4 Wells

5.5 Effective porosity

The effective porosity was calculated using the density neutron porosity logs corrected for shale volume. The calculated porosity was adjusted to tie with core porosity values. The final computed density porosity match very well with the core values throughout the reservoir.

5.6 Water saturation

Given the low clay content of the reservoir rock, as observed in wireline logs and core samples, a simple Archie relationship was used to derive formation water saturations where a = 1, m = 2 and n = 2. The calculated water saturation was a good match with the core Dean Stark water saturations.

Another critical input in the Archie water saturation calculation is the formation water resistivity (Rw). Rw = 0.14 @ 25 degree c. This value was determined from the analysis of the water sample recovered by the MDT on the E17 well. (Figure 5.3).

Husky Energy Inc.
White Rose Area, Hibernia Formation
Reservoir Engineering Study
Hycal File #: R148NE (2008)

APPENDIX A1
WATER COMPOSITIONAL ANALYSIS

Operator:	Husky Energy Inc.		
Well Name:	E-17	File #:	R148NE (2008)
Field:	White Rose	Formation:	Hibernia
Sample Point:	Bottomhole	Date sampled:	29-Sep-08
Container I.D.:	SN 3238 (CYL 7095)	Analysis Lab:	Maxxam

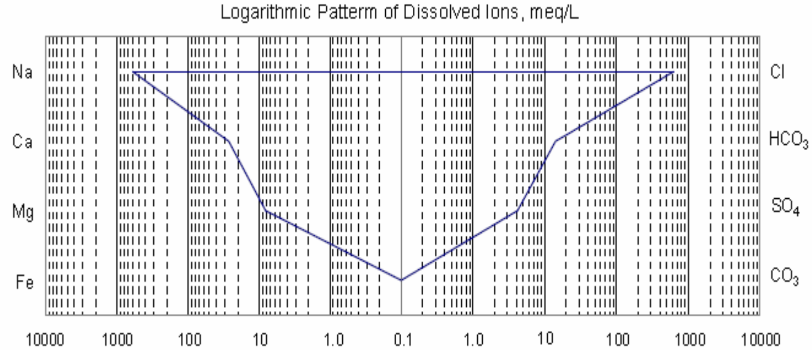
CATIONS		
Ion	mg/L	meq/L
Na^{+}	13800	600.27
K^{+}	232	5.94
Ca^{+2}	536	26.75
Mg^{+2}	98.5	8.11
Ba^{+2}	1.52	0.02
Sr^{+2}	83	1.89
Fe^{+3}	0.01	0.00
B^{+3}	0	0.00
Mn^{+3}	0	0.00

ANIONS		
Ion	mg/L	meq/L
Cl^{-}	22000	620.54
Br^{-}	0	0.00
I^{-}	0	0.00
HCO_3^{-}	860	14.09
SO_4^{-2}	200	4.16
CO_3^{-2}	0.4	0.01
OH^{-}	0.4	0.02
H_2S	Absent	---

Total Dissolved Solid (mg/L)

39500	37000
At Ignition	Calculated
Total suspended solids (mg/L)	Oil & Grease Content (mg/L)
1.027	1.337
Relative Density @ 25 ºC	Refractive Index @ 25 ºC
6.20	0.14
Observed pH	Resistivity ohm.m @25ºC
1800	700
Total Hardness As $CaCO_3$ (mg/L)	Total Alkalinity As $CaCO_3$ (mg/L)

Logarithmic Patterm of Dissolved Ions, meq/L



Remarks:

Figure 5.3: Water Analysis Report for the Well E17

5.7 Petrophysical Cutoffs

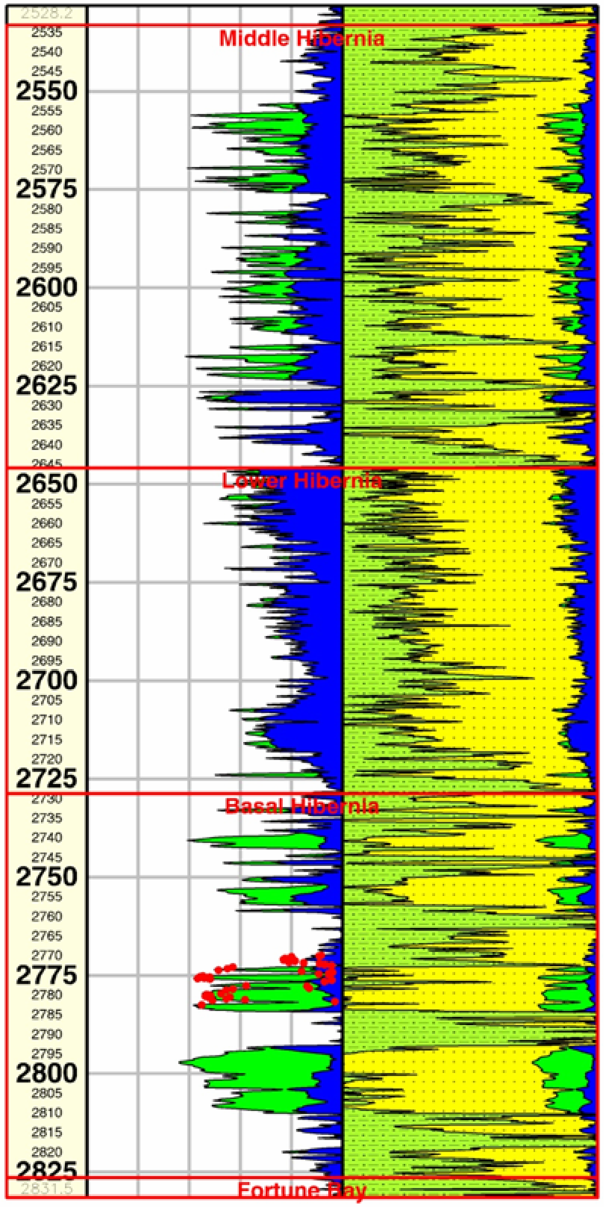
The net reservoir and pay criteria used for North Amethyst Hibernia are:

Reservoir Cut-offs
Porosity cut-off 10%
Shale volume cut-off 30%

Pay Cut-offs
Porosity cut-off 10%
Shale volume cut-off 30%
Water saturation cut-off 50%

5.8 Petrophysical Summaries

Petrophysical summary figures for North Amethyst Hibernia wells are provided in Figures 5.4, 5.5 and 5.6.



North Amethyst E-17 Summary

Tops

Middle Hibernia: 2533.0 m TVDSS
Lower Hibernia: 2645.8 m TVDSS
Basal Hibernia: 2728.7 m TVDSS
Fortune Bay: 2826.5 m TVDSS

	Gross Thick	Reservoir N-G (%)	Pay N-G (%)	Avg Por (%)	Avg SW (%)	Avg K (md)	Avg Vsh (%)
Middle Hibernia	113m	46m 41%	22m 20%	17.2	36	302	18
Lower Hibernia	83m	36.4m 44%	.91m 1.1%	16.3	22	120	15
Basal Hibernia	98m	39m 39.8%	31m 31.5%	19.2	20	712	07
Total Hibernia	293m	121m 41.3%	54m 18.4%	18.2	26.3	533	11.5

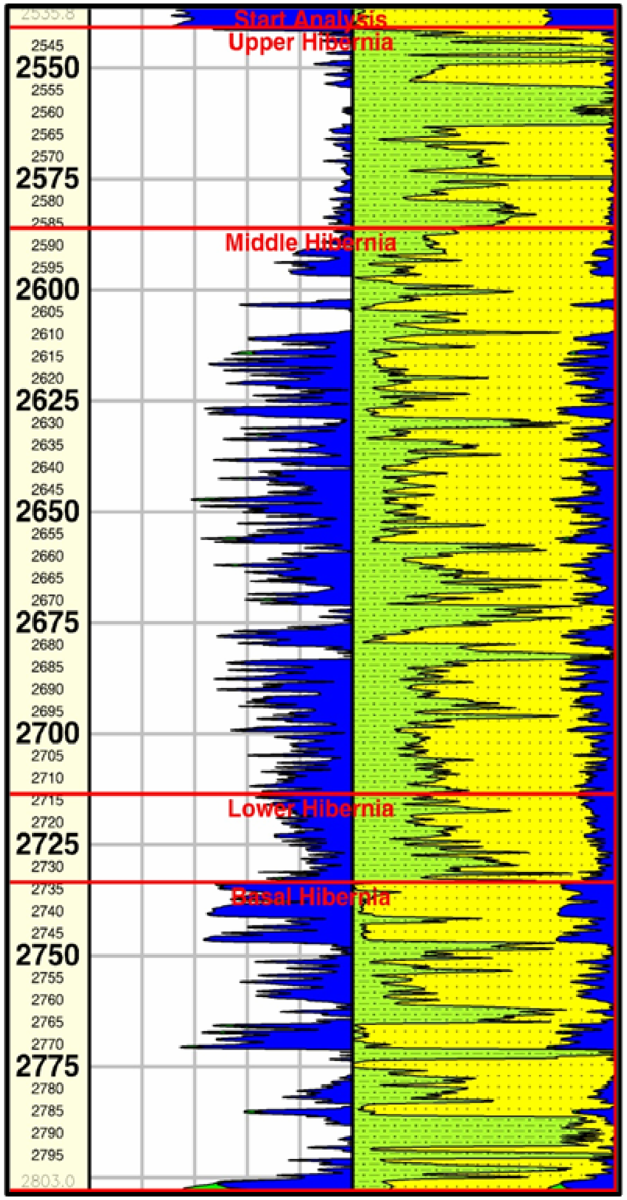
Reservoir Cutoffs

Phi >=10 %, Sw <= 1 Vsh < 0.30

Pay Cutoffs

Phi >=10 %, Sw < 50% Vsh < 0.30

Figure 5.4 E-17 Summary Hibernia Formation



North Amethyst G-25 1 Summary

Tops

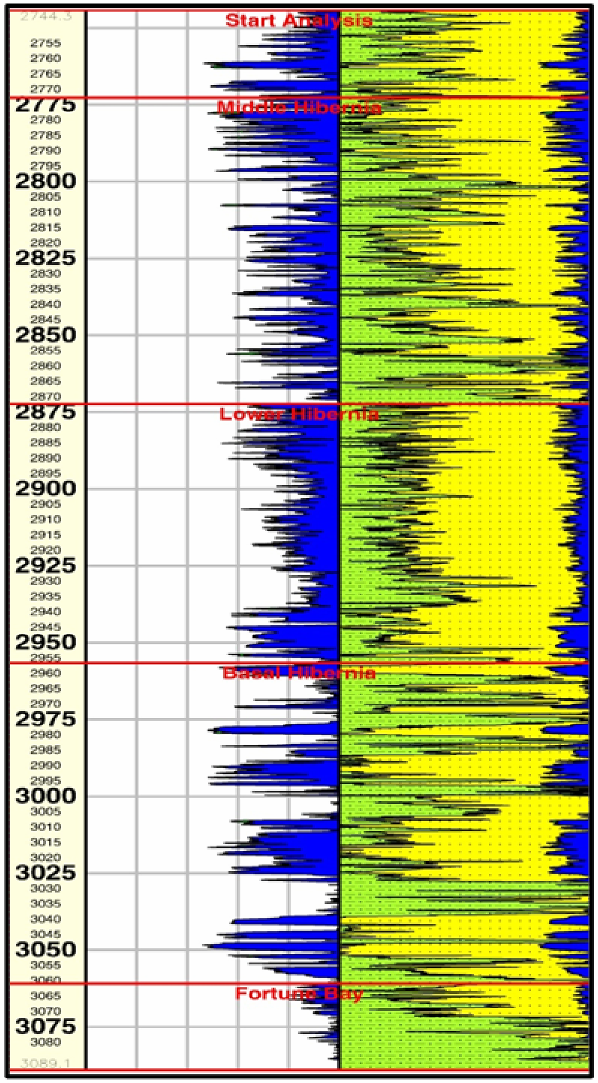
Middle Hibernia: 2586.0 m TVDSS
Lower Hibernia: 2713.4 m TVDSS
Basal Hibernia: 2734.0 m TVDSS

	Gross Thick	Reservoir N-G (%)	Pay N-G (%)	Avg Por (%)	Avg SW (%)	Avg K (md)	Avg Vsh (%)
Middle Hibernia	128m	51.5m 40.2%	0	14.6	96	120	23
Lower Hibernia	20m	5.3m 26.6%	0	11.7	99	3	32
Basal Hibernia	69.5m	25m 36%	0	17.2	95	627	10
Total Hibernia	217m	81.5m 37.5%	0	15.2	96	267	20

Reservoir Cutoffs
Phi >=10 %, Sw <= 1 Vsh < 0.30

Pay Cutoffs
Phi >=10 %, Sw < 50% Vsh < 0.30

Figure 5.5 G25-1 Summary Hibernia Formation



North Amethyst G-25 4 Summary

Tops

Middle Hibernia: 2772.7 m TVDSS
Lower Hibernia: 2872.3 m TVDSS
Basal Hibernia: 2956.7 m TVDSS
Fortune Bay: 3060.8 m TVDSS

	Gross hick	Reservoir N-G (%)	Pay N-G (%)	Avg Por (%)	Avg SW (%)	Avg K (md)	Avg Vsh (%)
	32.4m	8.10m 25%	0	15.3	96	102	13
Middle Hibernia	100m	32m 32%	0	14.2	96	36	14
Lower Hibernia	84m	24m 29%	0	13	96	11	17
Basal Hibernia	104m	35m 34%	0	15.3	97	72	11
Total Hibernia	320m	99m 31%	0	14.4	96	50	13.5

Reservoir Cutoffs

Phi >=10 %, Sw <= 1 Vsh < 0.30

Pay Cutoffs

Phi >=10 %, Sw < 50% Vsh < 0.30

Figure 5.6 G25-4 Summary Hibernia Formation

6.0 Resource Estimate

6.1 Introduction

Two major faults NA_1 and NA_2, run SW-NE through the middle the North Amethyst Ridge at the Hibernia level, dividing the Hibernia Formation into three fault blocks: Northern Block, E-17 Block, and G-25 1 Block. (Figure 6.1). The three fault blocks have allowed for varying fluid contacts across the North Amethyst Hibernia formation. Evidence of varying fluid contact is shown in the North Amethyst E-17 well which is structurally lower than the wet G-25 1 well. The northern block has yet to be penetrated with a well and as such carries a high degree of uncertainty to the presence of oil.

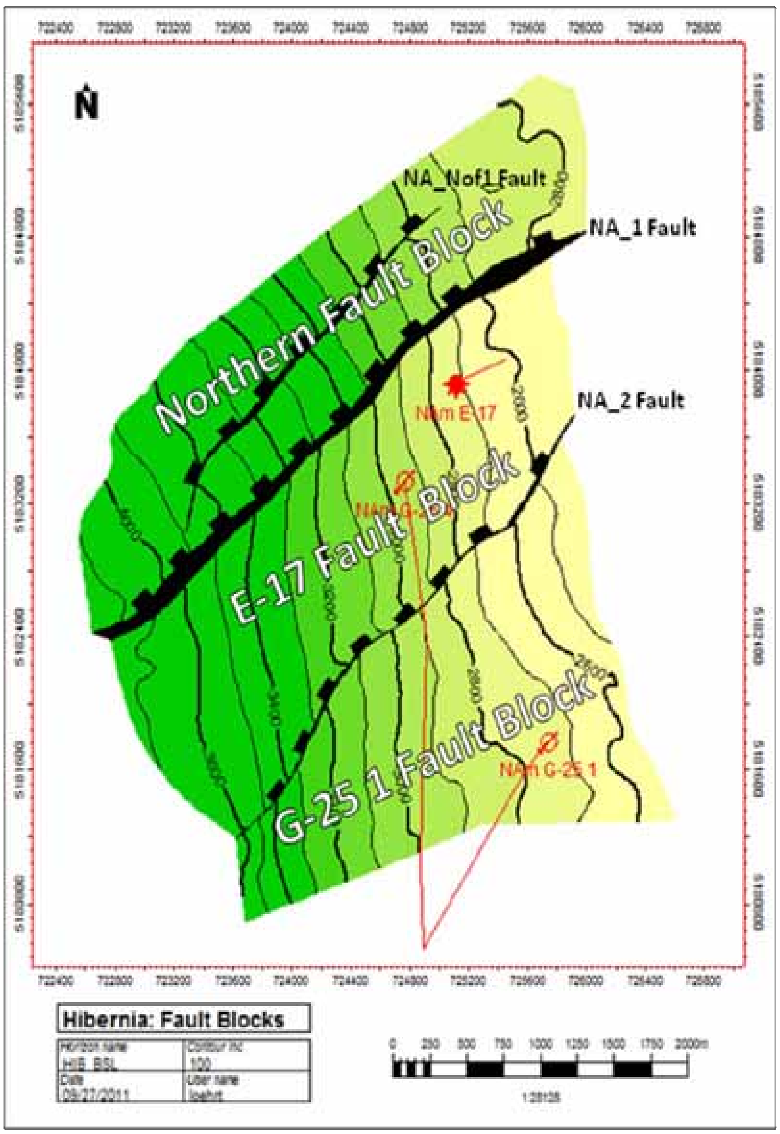


Figure 6.1 North Amethyst Fault Blocks at Hibernia Level

In-place volumetric assessments are based on reservoir modeling and probabilistic simulation. Deterministic volumes are based on a single realization of the structure and geology, and use the fluid contacts encountered in the North Amethyst E-17, North Amethyst G-25 1, and North Amethyst G-25 4 wells. The deterministic value and probabilistic ranges presented are based on an unrisked success case. Hydrocarbon has been delineated in the Basal and Middle Hibernia of the E-17 block; however, the presence of oil in the northern and G-25 1 block remains uncertain.

The primary uncertainty affecting the North Amethyst Hibernia OOIP numbers are fluid contacts as North Amethyst E-17 is the only well to encounter hydrocarbon within the Hibernia formation. In order to capture this uncertainty, high side and low side bulk rock volumes were created by adjusting the oil water contacts in a positive and negative fashion across the various fault blocks and then used within the probabilistic distribution to help define high and low cases.

6.2 Deterministic Resources in Place

Deterministic volumes are presented for the E-17 block and are based on a single realization of the structure and geology, and use the fluid and pressure data obtained from the E-17 well.

The deterministic oil in-place for the E-17 block is 41.5 MMbbls (6.6 10^6m3). This is split between the middle Hibernia which contains 9.5 MMbbls (1.5 10^6m3) and in the Basal Hibernia which contains the remaining 32.0 MMbbls (5.1 10^6m3). No gas cap reserves are believed to be present.

6.3 Probabilistic Resource-In-Place

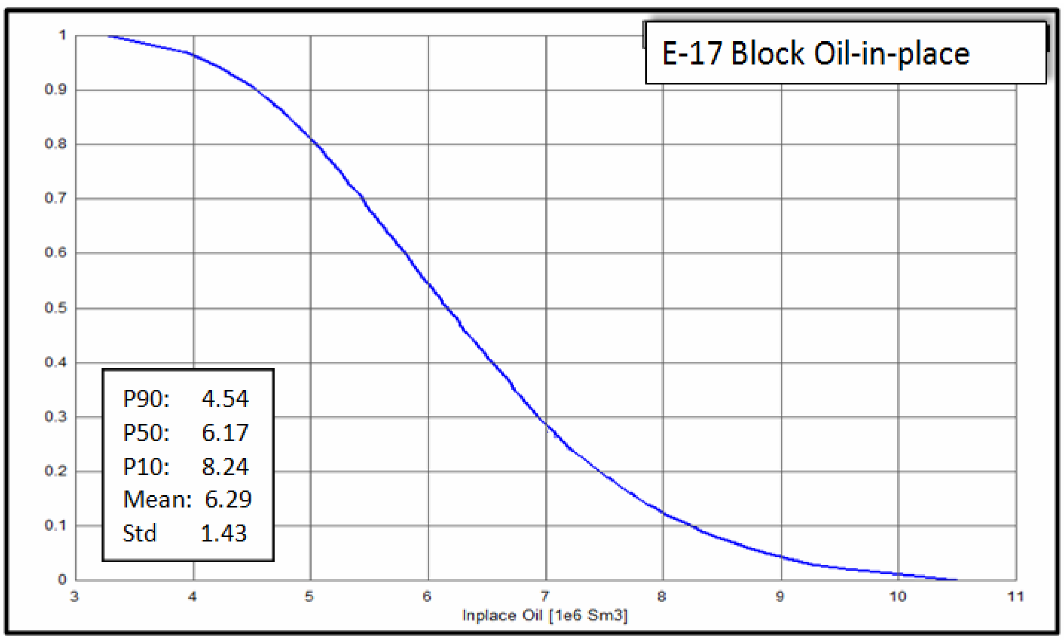
The probabilistic resource in place estimates for the North Amethyst Hibernia blocks were generated using GeoX software. In order to generate a probabilistic distribution for the North Amethyst Hibernia, ranges of bulk rock volume, porosity, net-to-gross, and water saturation were determined on consistent intervals within the formation. In general, each parameter was assigned a distribution based on a most-likely value, an assigned maximum and minimum and mode. As in past studies BRV was addressed first followed by net-to-gross (N:G), porosity (Phi), water saturation (Sw), formation volume factor (FVF), and gas oil ratio (GOR).

Probabilistic distributions for the resource in place were generated for each of the three fault blocks. The distributions for the G-25 1 block and the Northern block are presented as unrisked distributions. The G-25 1 block has not encountered an oil water contact and the Northern block has not been penetrated.

Table 6.1 E-17 Block Probabilistic OOIP

	P90	P50	P10	Pmean
E-17 Block	28. 6 MMbbls (4.54 10^6m3)	33.0 MMbbls (6.17 10^6m3)	51.8 MMbbls (8.24 10^6m3)	39.5 MMbbls (6.29 10^6m3)

Figure 6.2 E-17 Block OOIP Distributions ($10^6 m^3$)



E-17 block input parameters and detailed results are located in Appendix B "E-17 Block Probabilistic Oil in Place Inputs and Results"

Table 6.2 Northern Block Unrisked Probabilistic OOIP

	P90	P50	P10	Pmean
Northern Block	13.9 MMbbls (2.2 10^6m3)	30.2 MMbbls (4.8 10^6m3)	48.2 MMbbls (7.66 10^6m3)	30.7 MMbbls (4.88 10^6m3)

Table 6.3 G-25 1 Block Unrisked Probabilistic OOIP

	P90	P50	P10	Pmean
G-25 1 Block	3.27 MMbbls (0.52 10^6m3)	7.68 MMbbls (1.22 10^6m3)	18.56 MMbbls (2.95 10^6m3)	9.53 MMbbls (1.52 10^6m3)

6.4 Probabilistic Recoverable Resources

The probabilistic recoverable resource estimate for the North Amethyst Basal Hibernia E-17 Block was determined using a range of recovery factors applied against the Basal Hibernia OOIP distribution.

Table 6.4 E-17 Block Basal Hibernia Probabilistic Recoverable Resource

	P90	P50	P10	Pmean
E-17 Block Basal Hibernia	4.29 MMbbls (0.68 10^6m3)	8.33 MMbbls (1.32 10^6m3)	14.0 MMbbls (2.22 10^6m3)	8.79 MMbbls (1.40 10^6m3)

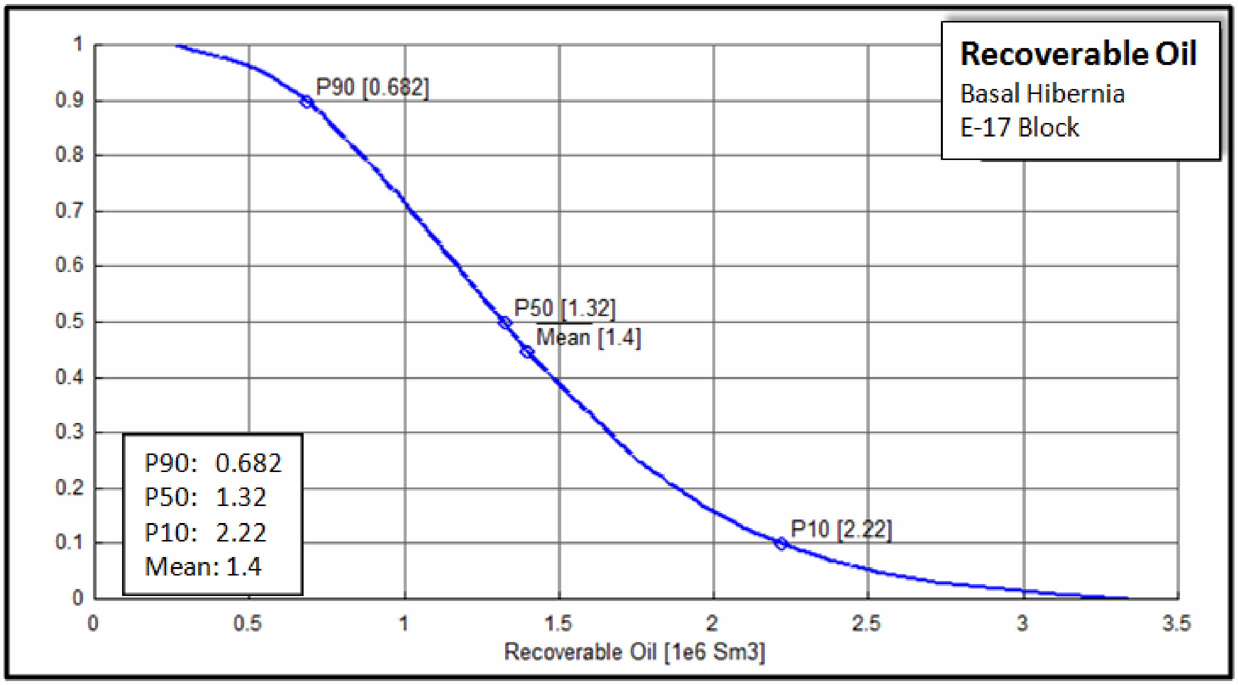


Figure 6.4 E-17 Block Basal Hibernia Recoverable Resources Distribution ($10^6 m^3$)

7.0 Reservoir Engineering

7.1 Basic Reservoir Data

7.1.1 Reservoir Pressure and Temperature

Reservoir pressures were obtained using Schlumberger's MDT (modular dynamic formation tester) tool in the North Amethyst Hibernia pool. The pool is defined by fluid gradients encountered in the G-25 1, G-25 4, E-17 wells (Table 7.1).

Table 7.1 Fluid Gradients in North Amethyst Wells

Well	Reservoir Gas Gradient (kPa/m)	Reservoir Oil Gradient (kPa/m)	Reservoir Water Gradient (kPa/m)	PVT Live Oil Gradient (kPa/m)
G-25 1	N/A	N/A	10.01	N/A
G-25 4	N/A	N/A	9.86	N/A
E-17 Middle	N/A	7.83	10.13	N/A
E-17 Basal	N/A	7.43	N/A	7.4

The pressure elevation plot for the North Amethyst Hibernia pool is illustrated in Figure 7.1.

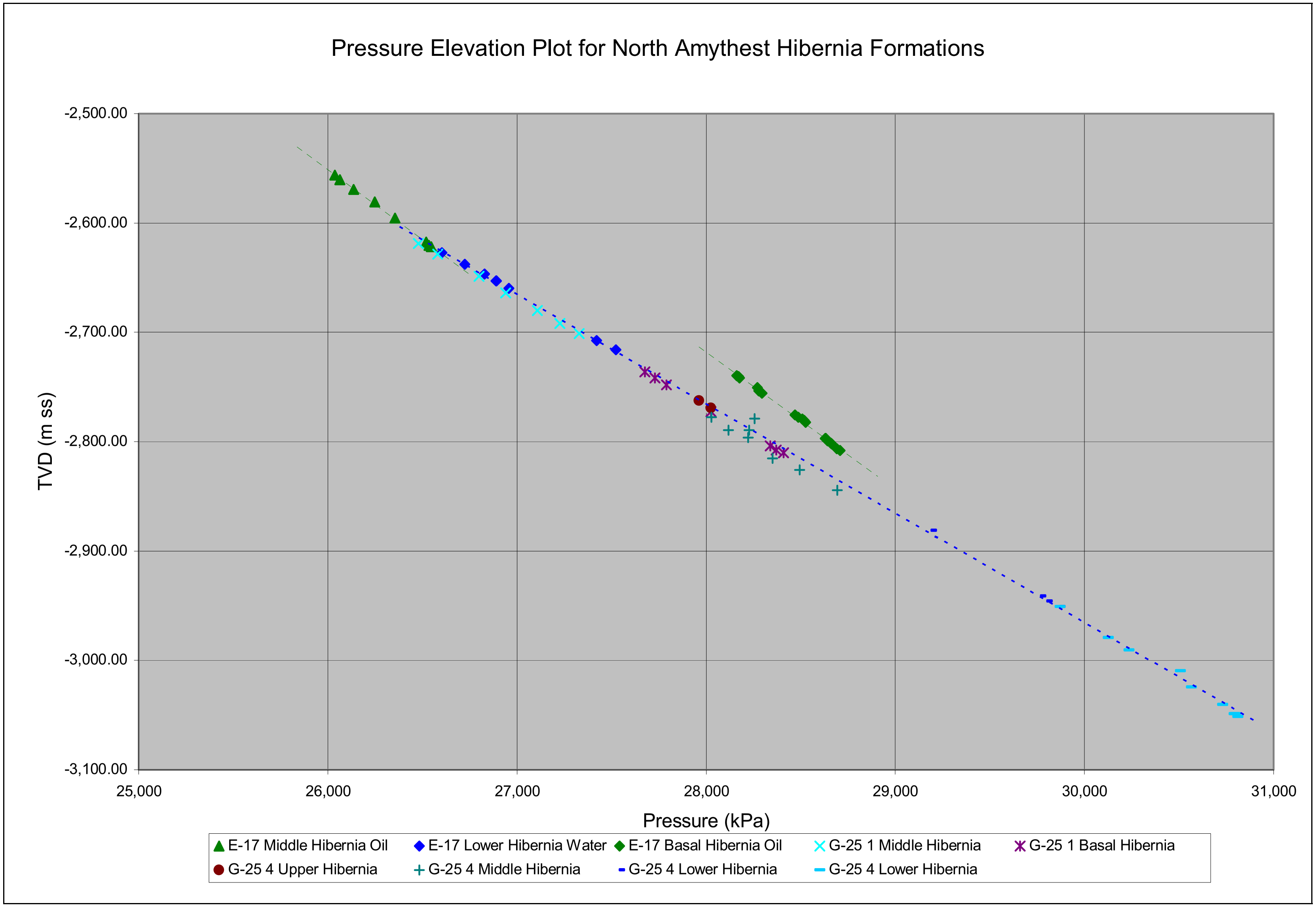


Figure 7.1 Pressure Elevation Plot for North Amethyst Hibernia Pool

In addition to MDT data, a vertical interference test was also performed with the MDT tool in the Hibernia formation of the E-17 well. The purpose of the test was to assess the vertical communication, permeability and skin values in the formation. The results of the tests are provided in Table 7.2.

Table 7.2 Vertical Interference Test Results

Test Formation	Test Depth (m)	Top (m)	Bottom (m)	Formation Pressure (kPa)	Kh (md)	Kv (md)	Kh/Kv	Skin
Middle Hibernia	2654.5	2653.6	2655.0	26056.0	56	6.5	8.62	0.9
Basal Hibernia	2875.0	2871.0	2879.0	28508.7	214	20	10.70	1.0
Basal Hibernia	2894.0	2888.0	2898.0	28648.2	330	31	10.65	2.5

The temperature gradient in the North Amethyst Ben Nevis/Avalon Formation is well understood due to the number of North Amethyst development wells that have been drilled. It is expected that the gradient will continue into the deeper Hibernia formation. Currently there are three wells by which the Hibernia temperature was measured, G-25 1, E-17 and G-25 4. Figure 7.2 demonstrates the temperatures encountered during MDT testing on all three wells.

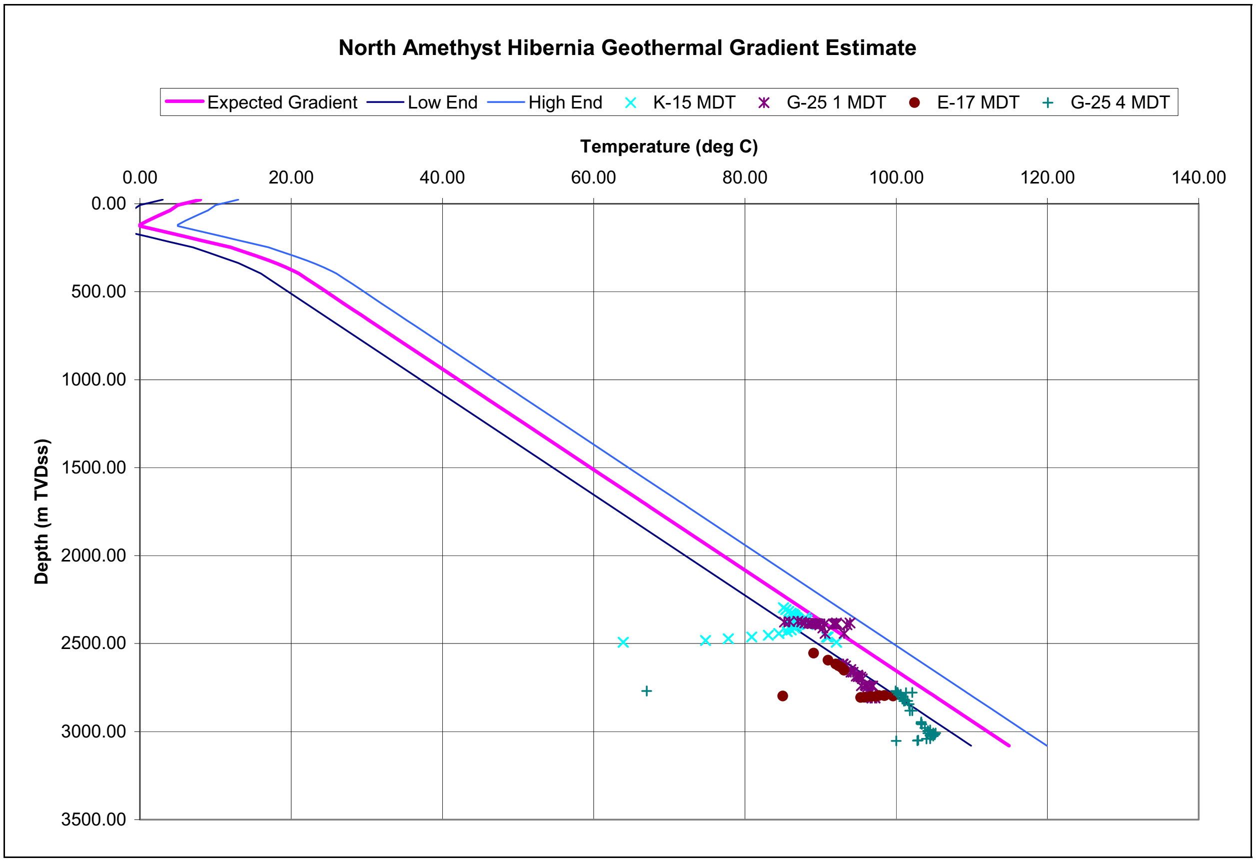


Figure 7.2 North Amethyst Hibernia Geothermal Gradient Estimate

The maximum temperature detected at maximum depth during logging the G-25 4 well was 105°C. Incorporating the reduction in temperature expected during logging due to circulation of drilling mud, the reservoir temperature is estimated to be 109° C to 119° C (at 3100 m TVDss) for the North Amethyst Hibernia area.

7.1.2 Fluid Characterization

A full suite of reservoir fluid samples were obtained in the E-17 well. Fourteen oil samples and four water samples were recovered. One separator flash test and one differential liberation test were conducted on oil sample 1200. These tests indicated a bubble point pressure of 24,700 kPa and an average initial gas-oil-ratio and formation volume factor of approximately 104 sm^3/sm^3 and 1.29 m^3/sm^3, respectively. A summary of the differential liberation analysis is provided in Table 7.3.

Sample:	**1200**
Sample Type:	Bottomhole
Sample Date:	21-Sep-08
Sample Depth (mMD):	2891.5
Reservoir Properties	
Reservoir Temperature (°C)	109
Saturation Pressure (kPa)	24,700
Initial Reservoir Pressure (kPa)	28,630
Solution Gas-Oil Ratio (m^3/m^3)*	104
Oil Formation Volume Factor (res m^3/m^3)*	1.2964
Oil Density (kg/m^3)*	743.7
API Gravity:	29.85
Compositional Analysis	
N2 mole fraction	0.0041
C02 mole fraction	0.0159
H2S mole fraction	0.0000
C1	0.4779
C2	0.0244
C3	0.0117
i-C4	0.0026
n-C4	0.0064
i-C5	0.0032
n-C5	0.0048
C6	0.0090
C7+	0.4400

* property at saturation pressure at reservoir temperature

Table 7.3 North Amethyst Hibernia E-17 Differential Liberation Oil PVT Summary

The E-17 well did not encounter any free gas in the Hibernia Formation. Due to the current reservoir pressure of ~28,630 kPa and the expected saturation pressure of ~24,700 kPa no gas cap is expected in the Basal Hibernia pool.

Figures 7.3, 7.4, 7.5 and 7.6 illustrate the oil formation volume factor, gas-oil ratio, viscosity and density for the E-17 differential liberation fluid study conducted.

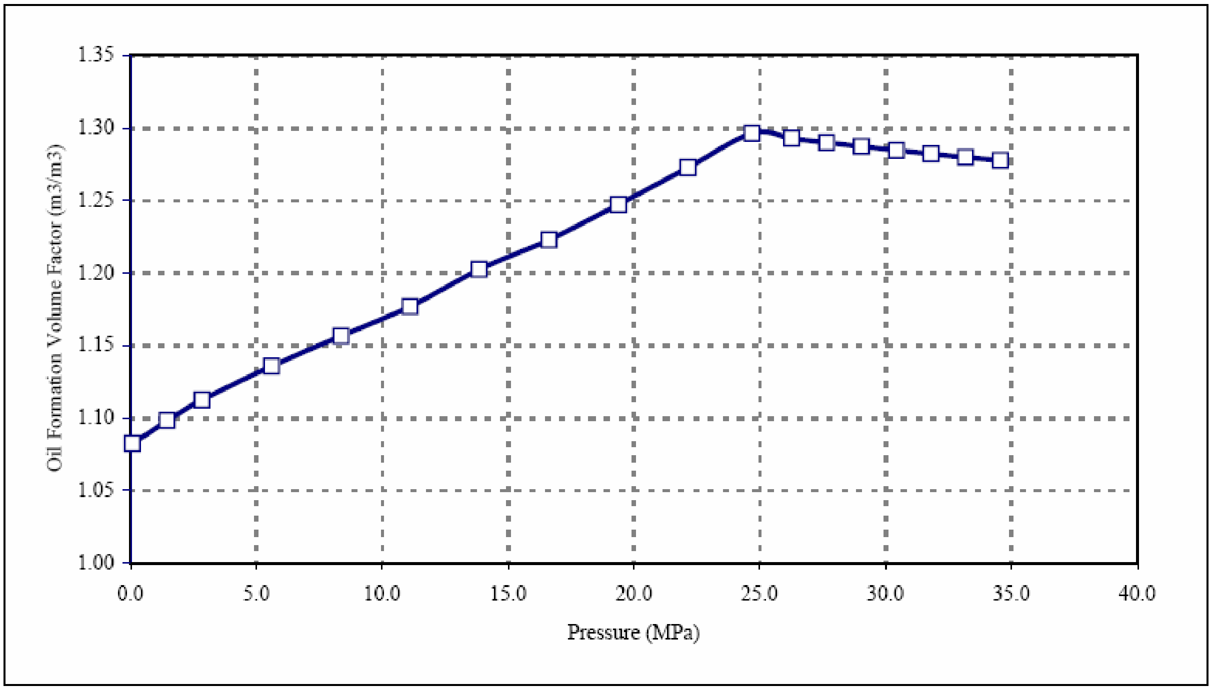


Figure 7.3 North Amethyst Hibernia E-17 Differential Liberation Oil Formation Volume Factor @ 109 °C

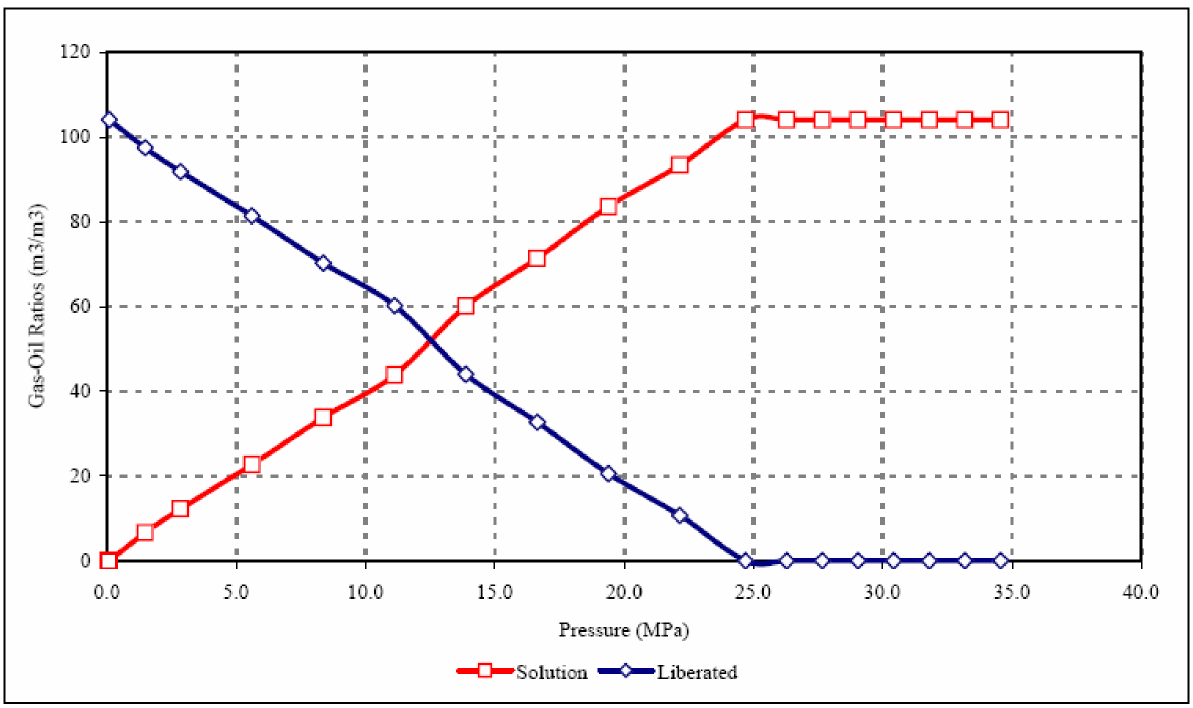


Figure 7.4 North Amethyst Hibernia E-17 Differential Liberation Gas-Oil Ratio @ 109 °C

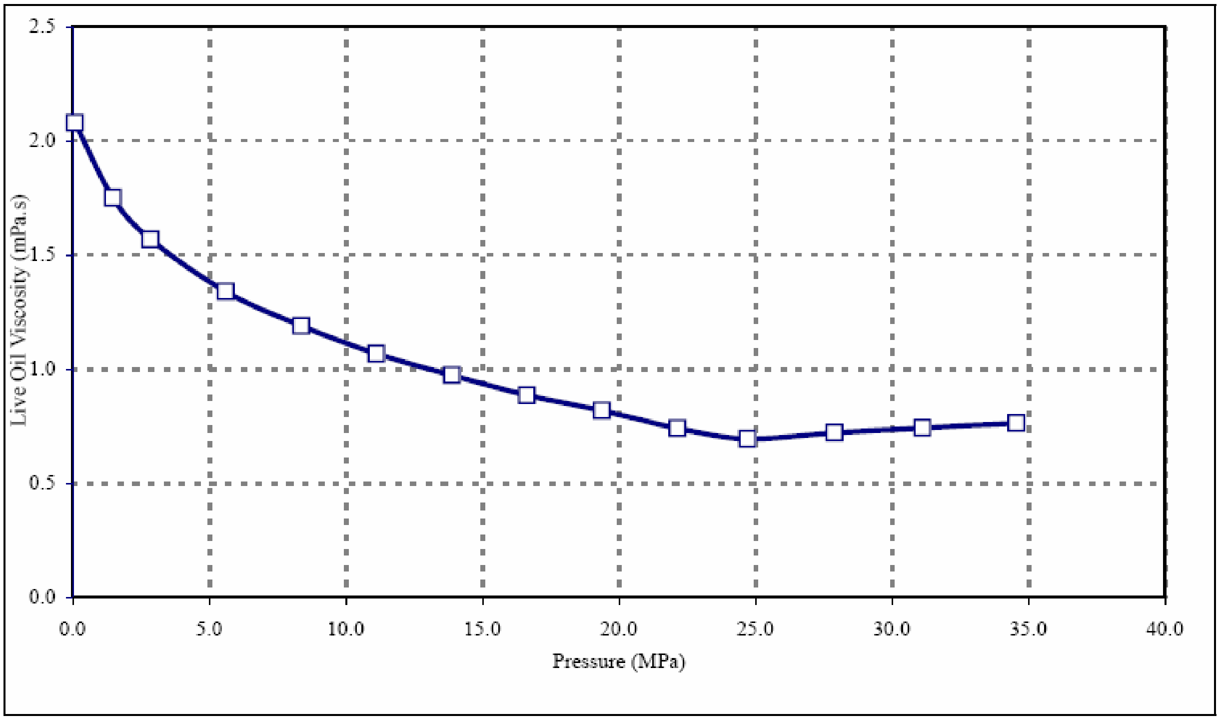


Figure 7.5 North Amethyst Hibernia E-17 Differential Liberation Oil Viscosity @ 109 ^{0}C

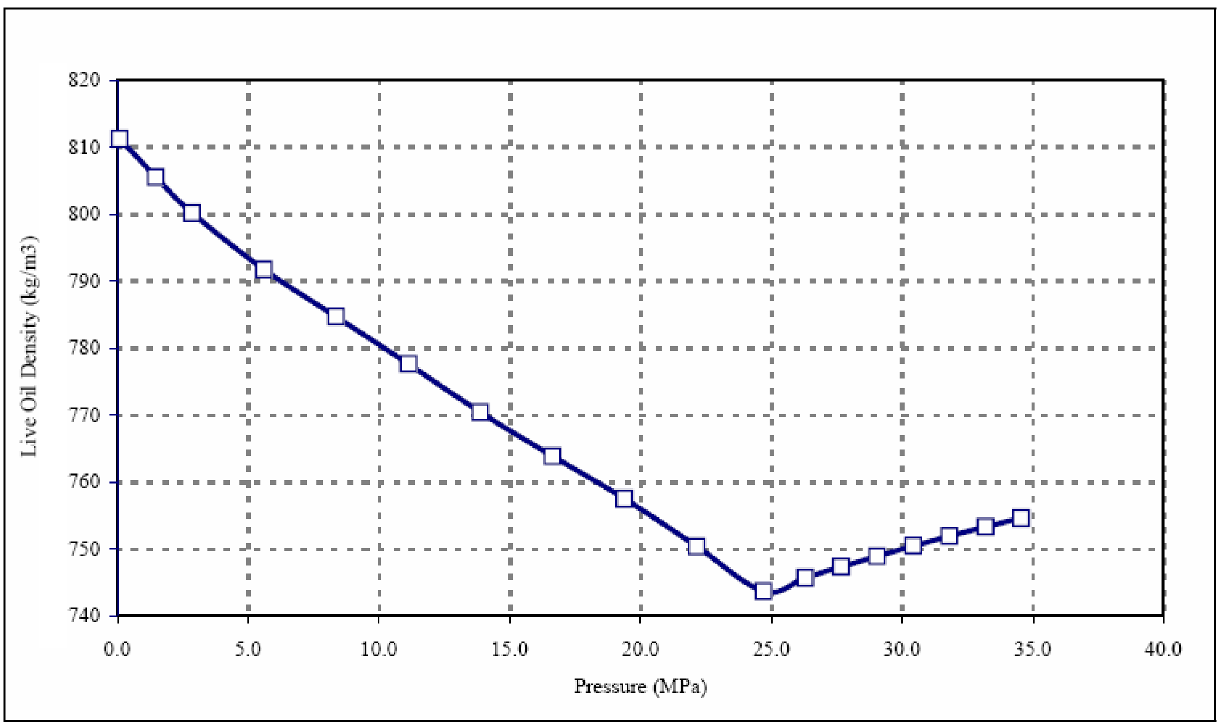


Figure 7.6 North Amethyst Hibernia E-17 Differential Liberation Oil Density @ 109 ^{0}C

Differential Liberation test results from the North Amethyst E-17 well were used to create the PVT data used in the Eclipse simulation model (Table 7.4).

Created from E-17 Differential Liberation Analysis on Sample 1200					
Pressure	Rs	Bo	Bg	Oil Visc	Gas Visc
Bar	sm^3/sm^3	m^3/sm^3	m^3/sm^3	cp	cp
0.88	0	1.0823	0.7555	2.078	0.01226
14.49	6.6	1.0981	0.0845	1.75	0.01359
28.1	12.27	1.1126	0.0443	1.568	0.01407
55.31	22.68	1.1357	0.0223	1.339	0.01472
82.52	33.77	1.1566	0.0148	1.189	0.01538
109.73	43.82	1.1769	0.011	1.067	0.01611
136.94	60.06	1.2026	0.0088	0.973	0.01692
164.15	71.3	1.2229	0.0074	0.886	0.01779
191.36	83.5	1.2473	0.0064	0.818	0.0187
218.57	93.3	1.2727	0.0057	0.741	0.01964
243.74	**104**	**1.2964**	**0.00491**	**0.694**	**0.0209**
259.39	104	1.293	0.00467	0.707	0.02168
272.99	104	1.2901	0.00448	0.718	0.02236
275.17	104	1.2895	0.00445	0.72	0.02247
286.6	104	1.2874	0.00432	0.728	0.02302
300.2	104	1.2848	0.00418	0.737	0.02368
307.01	104	1.2837	0.00412	0.741	0.024
313.81	104	1.2823	0.00405	0.745	0.02432
327.41	104	1.2799	0.00394	0.754	0.02495
341.02	104	1.2777	0.00384	0.763	0.02556

Table 7.4 North Amethyst Hibernia E-17 PVT Correlations for Eclipse Reservoir Simulation

Water compositional analysis was conducted on two of the water samples taken from the E-17 well in the Lower Hibernia. Table 7.5 summarizes the results of the E-17 water compositional analysis.

	E-17	E-17
Sample Type	Bottom Hole - MDT	Bottom Hole - MDT
Sample ID	3238 MPSR	1211 MPSR
Sample Depth (mMD)	2745.1	2745.1
Total Disolved Solids (mg/l)	39,500	39,200
pH	6.2	6.2
Cations / Anions	mg/l	mg/l
Na	13,800	15,300
K	232	225
Ca	536	534
Mg	98.5	97.1
Ba	1.52	1.82
Sr	83	85.7
Fe	0.01	0.01
Cl	22,000	22,000
HCO3	860	1000
SO4	200	204
CO3	0.4	0.4
OH	0.4	0.4

* Note water samples were taken from the Lower Hibernia zone.

Table 7.5 North Amethyst Hibernia E-17 Water Compositional Analysis

7.1.3 Special Core Analysis

At the time of building the North Amethyst Hibernia reservoir simulation model, the special core analysis study was ongoing. Therefore, the normalized relative permeability curves for the North Amethyst Ben Nevis/Avalon reservoir were used for the North Amethyst Hibernia reservoir simulation model. Using the North Amethyst Ben Nevis/Avalon relative permeability curves for the North Amethyst Hibernia pool is considered reasonable until the special core analysis study for the North Amethyst Hibernia pool is completed. Although the North Amethyst Ben Nevis/Avalon normalized relative permeability curves were used, the kr and Sw endpoints for the laminated rock type were adjusted to match the early results obtained from some of the E-17 Special Core Analysis testing. The endpoints for the bioturbated and shale rock types remain unchanged. The endpoints that were used in the North Amethyst Hibernia reservoir simulation model are summarized in Table 7.6 for the three rock types present.

	Laminated	Bioturbated	Shale
SWCR	0.1	0.25	0.25
SOWCR	0.236	0.27	0.27
SOGCR	0.338	0.392	0.392
KRWR	0.19	0.29	0.29
KRORW	0.492	0.708	0.708
KRGR	0.242	0.246	0.246
SGCR	0.04	0	0

Table 7.6 North Amethyst Relative Permeability Endpoints

7.2 Development Strategy

The reservoir management plan for the North Amethyst Hibernia will be incorporated into the existing criteria currently being used to manage the South Avalon and North Amethyst pools.

7.2.1 Displacement Strategy

The displacement strategy plan for the North Amethyst Hibernia includes secondary recovery by waterflood. Because the G-25 4 water injector is currently in place, voidage replacement can begin when production commences. The voidage replacement ratio will be optimized throughout the life of field to allow for maximum oil recovery. Seawater will be injected from the *SeaRose FPSO* and will be sourced and treated in the same manner as water that is currently being injected into the South Avalon and North Amethyst pools.

7.2.2 Development Scenario

The Hibernia formation will be accessed through the existing North Amethyst drill center (NADC). Development of the North Amethyst Hibernia Formation will not alter the existing depletion plan for the North Amethyst Ben Nevis/Avalon (BNA) Formation. The proposed development is intended to utilize spare drill slots in the NADC, and there are no anticipated alterations or additions required to the existing subsea infrastructures or the *SeaRose FPSO*.

The primary focus of the North Amethyst Hibernia development is the hydrocarbon column within the Basal Hibernia of the E-17 Block. Due to the limited aerial extent of the Basal Hibernia pool, it is anticipated that the development will consist of one production well and the lower interval of the existing water injection well (G-25 4). Husky will give consideration to delineating additional Hibernia Formation during drilling of the

Basal Hibernia producer. Should the information collected in the producer prove further potential, consideration will be given to additional wells.

7.2.3 G-25 4 Water Injector

As part of the ongoing depletion planning of the North Amethyst Hibernia Formation, the second North Amethyst BNA water injector (G-25 4) was determined to be an optimal location for water injection within the Basal Hibernia Formation, thereby providing the potential for a single water injector to support producers in both reservoirs. In 2010, Husky received approval to install a two zone intelligent completion in the North Amethyst G-25 4 water injection well allowing for water injection into both the BNA and Hibernia formations. The upper completion zone currently provides support for the G-25 3 BNA producer. The North Amethyst G-25 4 water injector was initially given a dual classification. The upper interval (BNA) is classified as development and the lower interval (Hibernia) is classified as delineation. Once the North Amethyst Hibernia development plan is approved, the delineation classification for the Hibernia portion of the well will be reclassified as development.

7.2.4 Full Field Considerations

There is spare capacity within the current production system to accommodate the proposed North Amethyst Hibernia depletion plan.

7.2.5 Gas Storage

Produced gas from the North Amethyst Hibernia will be re-injected into the Northern Drill Centre (NDC) for storage in the same manner that excess produced gas from the South Avalon, North Amethyst and West White Rose pools is currently being handled. The gas storage area capacity is currently under evaluation and the NDC has one spare drilling slot which is available for expansion. A gas storage strategy (NA-SST-RP-0049) was submitted to the C-NLOPB in June 2009.

7.3 Reservoir Simulation

7.3.1 Simulation Model

The North Amethyst eclipse simulation model was based on a single realization of the associated statistically populated Petrel geological model. Forecast runs were simulated using a single well pair, where, the producing well is placed in the model to intersect and contain perforations in both the upper and lower Basal sands. The existing G-25 4 water injector, which was drilled and completed in 2010, provides waterflood response for the Hibernia producer in the simulation model.

7.3.2 Reservoir Simulation Sensitivities

Several liquid rate sensitivities were conducted in the North Amethyst Hibernia simulation model. These include a high side specified liquid rate of 1500 m^3/d medium rate of 1000 m^3/d, and a low side rate of 800 m^3/d.

7.3.3 Production / Injection Constraints

Since the G-25 4 water injection well has been previously drilled and completed, it is assumed that voidage replacement can begin at the onset of production. Assumptions used in the simulation model for the production and water injection wells are as follows:

Producer:

- Three specified maximum liquid rates of 1500, 1000, and 800 sm^3/day;
- Bottom hole pressure limit of 200 bars;
- Tubing head pressure limit of 85 bars;
- Maximum gas lift rate of 200,000 sm^3/day

VFP tables were generated using Prosper software for production wells using proposed well trajectories and predicted production and pressure performance from Eclipse.

Injector (G-25 4):

- Specified maximum injection surface rate of 3970 sm^3/day;
- Bottom hole pressure limit of 500 bars;
- Tubing head pressure limit of 250 bars; and
- Group voidage replacement ratio (VRR) of 1

7.3.4 Simulation Production Performance

Figure 7.7 indicates production rates and cumulative volumes vs. time (in months) for the simulation model. As can be seen in the figure, the cumulative volumes and end of simulation production rates are approximately the same in all sensitivities. This result comes from the inability of the sensitivity rates to honor the initial specified liquid rate in the simulation. Hence, all sensitivities eventually result in approximately the same oil production rate and hence decline rate. As the reservoir model represents a single deterministic case the actual production rates will be based upon well performance at start up.

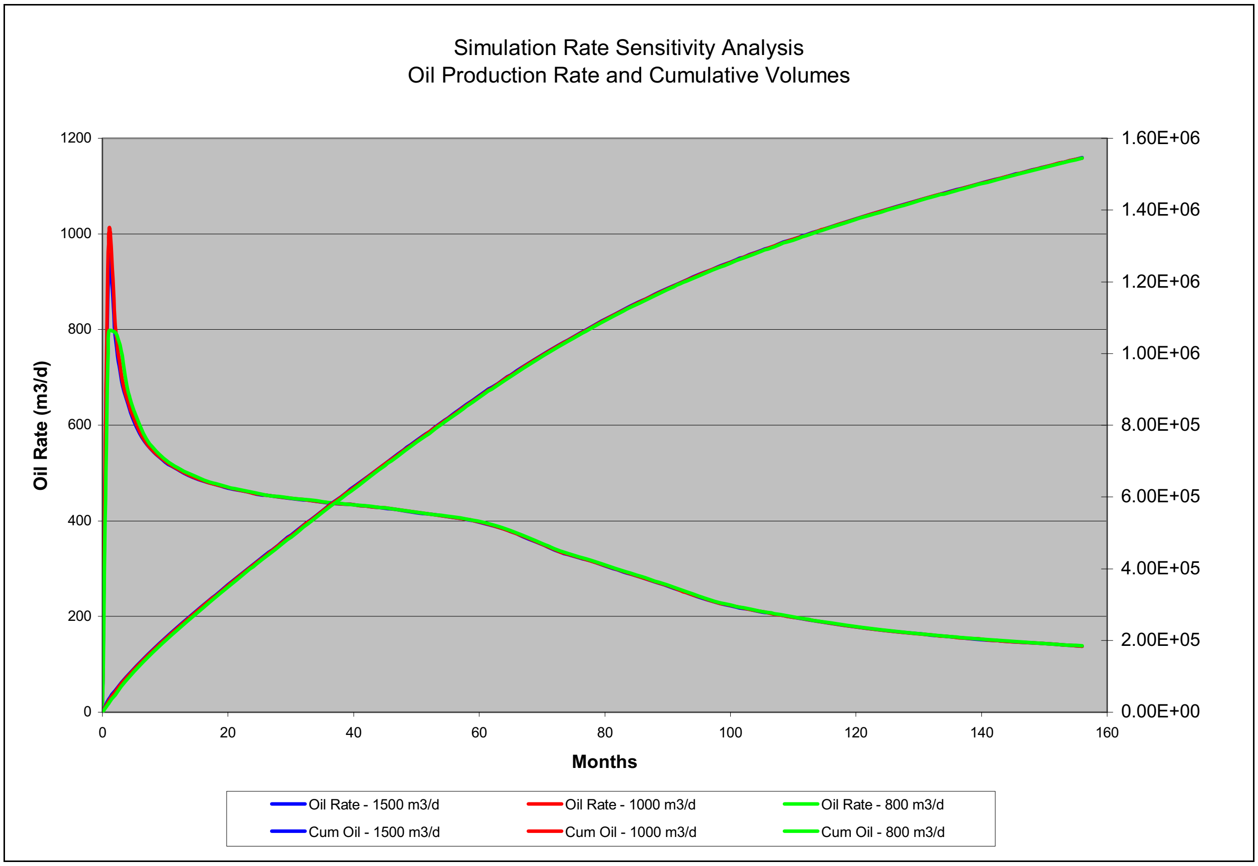


Figure 7.7 North Amethyst Hibernia model oil production rate and cumulative production

The simulation rate of 800 m^3/d a day was selected as the base case. Figure 7.8 shows gas-oil ratio, water-cut and recovery efficiency as a function of time (in months) for the E-17 block at the end of simulation time.

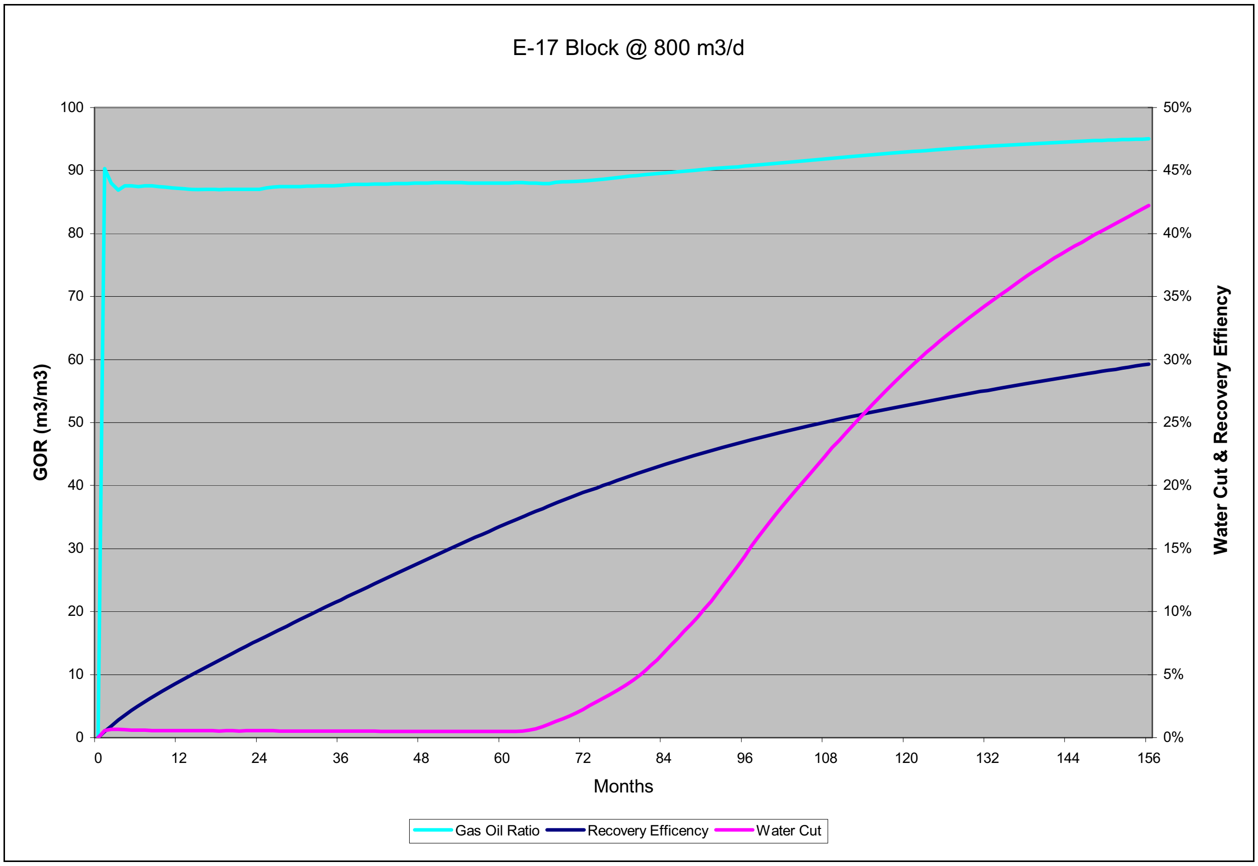


Figure 7.8 North Amethyst Hibernia model - Gas-Oil Ratio, Water-cut, and Recovery Efficiency

7.3.5 Simulation Recoverable Oil Estimate

It is important to note that the geological model and the associated simulation model is a single realization of the reservoir and represents approximately a P35 OOIP. The North Amethyst Hibernia simulation model's prediction of a 29.6% recovery factor for the Basal Hibernia of the E-17 block using 800 m3/d case equates to an anticipated recoverable oil of 1.54 million Sm^3 (9.69 million bbls). The recovery factor was calculated using the original oil in place number of 5.21 million sm^3 (32.7 millions bbls) from the geological. This recovery represents approximately a P40 volume when compared to the probabilistic recoverable distribution. The figure below shows the distribution of recoverable oil from the probabilistic study.

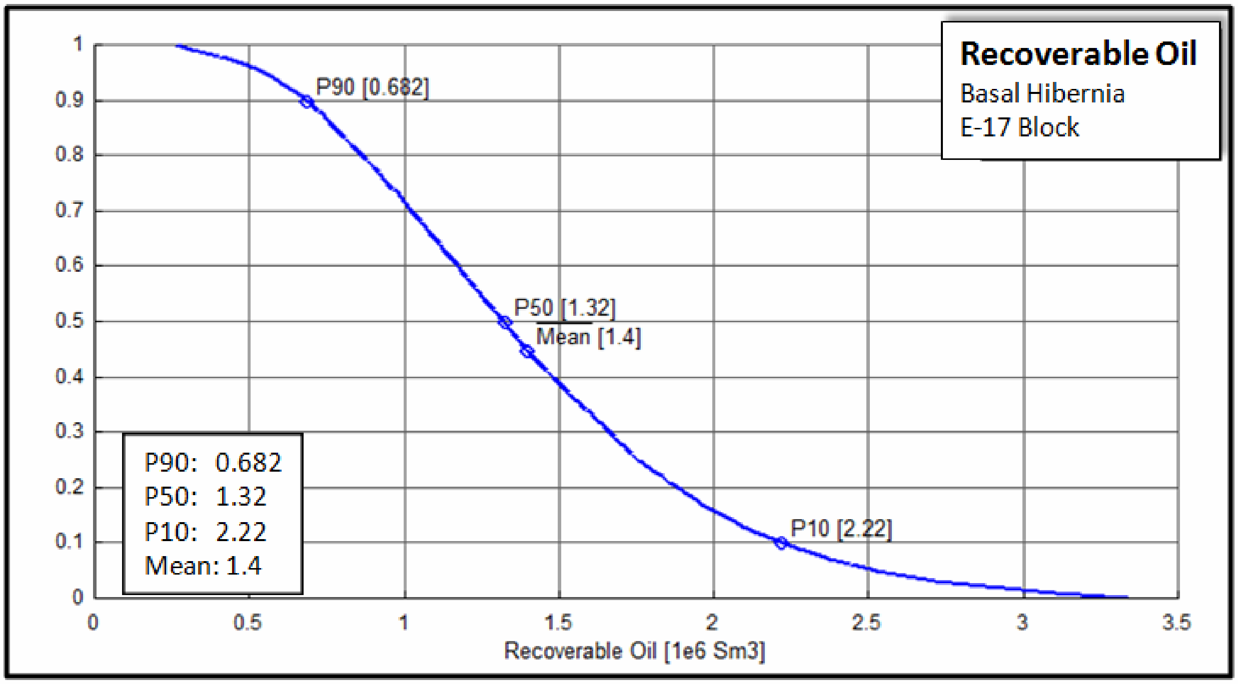


Figure 7.9 North Amethyst Basal Hibernia E-17 Block - Probabilistic Recoverable Range

8.0 Design Criteria

The NADC will be used to access the North Amethyst Hibernia Formation. This is an approved, operating drill centre within the White Rose field. The design criteria for the NADC was approved in the North Amethyst Development Application. The subsea equipment that will be installed for the proposed well pair (i.e. xmas tree, spool) will meet the design criteria outlined in North Amethyst Development Application.

8.1 Subsea Equipment Installation

The subsea equipment that will be installed in the NADC to support the North Amethyst Hibernia producing well will include a permanent guide base, xmas tree, and spool. This is the standard equipment used for wells in the NADC.

Procedures for installation of subsea facilities and subsequent operations for the North Amethyst Hibernia Formation will be the same as those currently employed for North Amethyst wells in the NADC.

8.2 Drilling and Completions

The North Amethyst Hibernia Formation development will utilize well templates and wellhead systems that are the same as those used for the other wells in the NADC. As noted above, the water injection well for this project has already been completed. It is anticipated that drilling and completion of the producing well will be carried out using existing White Rose and North Amethyst processes and systems. Final design of the drilling program for the producing well will be addressed in the Approval to Drill a Well (ADW) application. Details of the completion design and installation plan will be outlined in the completion program.

8.3 Production and Export Systems

Due to the location of the North Amethyst Hibernia Formation which underlies the producing Ben Nevis/Avalon formation, development of this reservoir through the NADC is the optimal approach.

The production and transportation system that will be used for the North Amethyst Hibernia Formation project will be the same as that employed for the existing White Rose and North Amethyst Developments. Specifically, oil produced from the North Amethyst Hibernia Formation wells will be transferred through flowlines from the NADC back to the *SeaRose FPSO* for processing and storage. The oil will be offloaded from the *SeaRose* to tankers for transport to market as is currently done with White Rose and North Amethyst oil.

8.4 Well Testing and Allocation

The North Amethyst Hibernia producer will be equipped with equivalent equipment as the current North Amethyst wells in the NADC i.e. down hole pressure and temperature gauge and tree pressure and temperature measurements upstream and downstream of the choke. The well will have an Idun model for well estimation and will have the ability to be routed to the test separator for routine well testing. A subsea multi-phase flow meter is also currently planned to be used on the North Amethyst Hibernia production well. The allocation model for the well will be equivalent to the existing NADC wells and therefore will operate within the approved White Rose Flow System Application (Reference document WR-O-99-J-RP-00001-001).

8.5 Production Temperatures

Flowing wellhead temperatures corresponding with the anticipated rates will be within the existing design limits of the NADC equipment.

8.6 FPSO Modifications

The water injection well for North Amethyst Hibernia will utilize smart well technology. This will require minor modifications to the ICSS and MCS software on the *SeaRose FPSO.* No additional modifications to the *SeaRose FPSO* are anticipated.

8.7 Operations and Maintenance

There will be no operational impacts related to the development of the North Amethyst Hibernia Formation. Production will continue from the NADC during drilling and completion operations. As well, the existing organizational structure (offshore and onshore) will not be impacted as a result of development of the North Amethyst Hibernia Formation. The existing Operating and Maintenance Procedures in place for North Amethyst will apply to development of the North Amethyst Hibernia Formation.

8.8 Decommissioning and Abandonment

The decommissioning and abandonment of the North Amethyst Hibernia wells will be in accordance with the established White Rose Decommissioning and Abandonment Plan.

8.9 Certification

Certifying Authority (CA) services will include activities during design, fabrication, installation, and commissioning of subsea equipment as required for activities related to the North Amethyst Hibernia Formation.

8.10 Safety Analysis

The *SeaRose FPSO* Safety Plan approved by the C-NLOPB details the approach to, and results of, the risk assessment process for the *SeaRose FPSO*. Activities associated with development of the North Amethyst Hibernia Formation will utilize Husky's existing systems and processes for assessing risks of planned operations, modifications or changes as required. These processes include the Husky Management of Change Process and the Husky East Coast Risk Management Process.

8.11 Quality Assurance and Quality Control

Quality assurance and quality control will be achieved utilizing existing processes for well development in NADC.

8.12 Environmental Criteria

As part of the current environmental effects monitoring (EEM) program, environmental data for the area around the NADC is collected. Any potential environmental effects of the North Amethyst Hibernia Formation wells in the NADC will be assessed through the current EEM program.

The development of the North Amethyst Hibernia Formation is not anticipated to result in an increase in the amount of flaring.

The environmental effects of the wells that will be developed within the NADC were assessed in the *Husky White Rose Development Project: New Drill Centre Construction and Operations Program Environmental Assessment* (Husky Document No. WR-HSE-RP-4003) and the *Husky White Rose Development Project: New Drill Centre Construction and Operations Program Environmental Assessment Addendum* (Husky Document No. WR-HSE-RP-0167), approved April 19, 2007. The North Amethyst Environmental Assessment considered 16 wells in the NADC, therefore development of the North Amethyst Hibernia Formation from the NADC is included in the 2007 Environmental Assessment approval noted above.

Husky has Environmental Protection and Compliance Monitoring Plans (EPCMPs) currently in use for ongoing operations on the *SeaRose FPSO* and for drilling operations on board the MODUs Henry Goodrich and GSF Grand Banks. There will be no updates or revisions required to these EPCMPs as a result of development of the North Amethyst Hibernia Formation.

8.13 Schedule

A high level preliminary conceptual schedule for development of the North Amethyst Hibernia Formation is provided in Figure 8.1

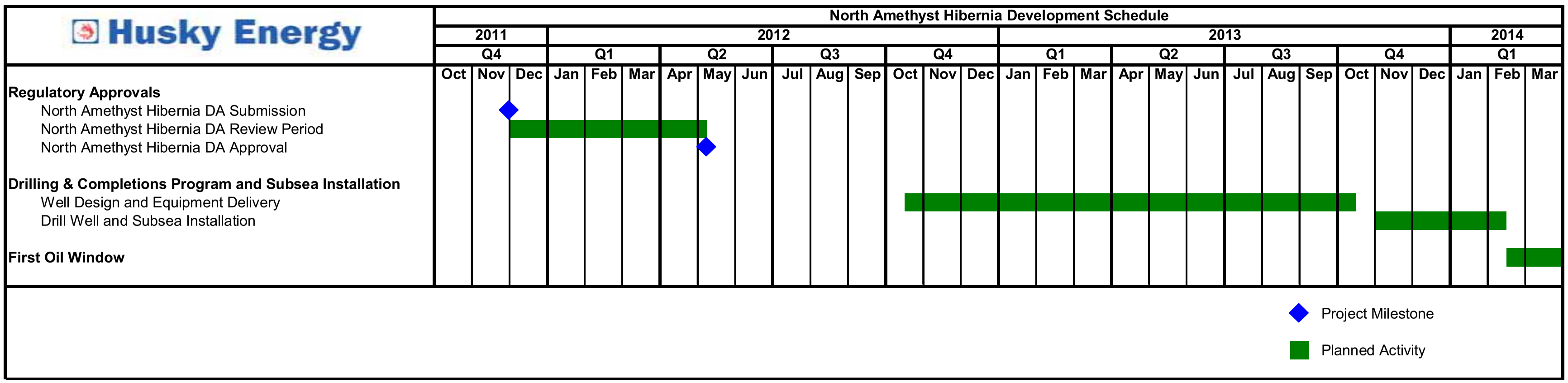


Figure 8.1 Preliminary Conceptual Development Schedule for the North Amethyst Hibernia Formation

9.0 Development Costs

9.1 Capital Cost Estimates

This section discusses the capital cost estimates for drilling and completions and subsea equipment for the North Amethyst Hibernia Formation. All costs presented are in 2011 Canadian dollars.

9.1.1 Assumptions for Capital Cost Estimates

The capital cost estimates have been prepared under the following set of assumptions:

- The reservoir parameters for the North Amethyst Hibernia reserves, technical basis, and scope of work are as described in this document.
- All facilities, goods, and services will be acquired on a competitive basis in accordance with the approved Canada-Newfoundland and Labrador Benefits Plan.
- Regulatory approval and Project Sanction will be achieved in accordance with the timelines set out herein.

9.1.2 Capital Cost Estimates

The capital cost estimate to bring the North Amethyst Hibernia pool to a producing status is approximately $168M. Please note that the estimated incremental cost to deepen and complete the G-25 4 well into Hibernia formation is included in this estimate, and execution of this portion of the development occurred in 2010. Cost estimates for the components are as follows:

- Drilling and Completions (2 wells) $150 M
- Subsea Equipment $18 M

(includes installation and commissioning)

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11.0 Acronyms

Term	***Description***
ADW	**Approval to Drill a Well**
API	**American Petroleum Institute**
ASME	**American Society of Mechanical Engineers**
bcf	**billion cubic feet**
Bbl/d	**barrels per day**
BN	**Ben Nevis**
BNA	**Ben Nevis-Avalon**
BRV	**bulk rock volume**
BS&W	**base sediment and water**
CA	**Certifying Authority**
CDC	**Central Drill Centre**
CMR	**combinable magnetic resonance tool**
C-NLOPB	**Canada-Newfoundland and Labrador Offshore Petroleum Board**
CSA	**Canadian Standards Association**
DA	**Development Application**
DGPS	**Differential Global Positioning System**
DNV	**Det Norske Veritas**
DST	**drill stem test**
EEM	**environmental effects monitoring**
EHMUX	**electro-hydraulic multiplex umbilical**
FA	**facies associations**
FEED	**Front End Engineering Design**
Fm	**formation**
FPSO	**Floating Production, Storage and Offloading Facility**
FVF	**formation volume factor**
GOR	**gas oil ratio**
GR	**gamma ray**
ISO	**International Standards Organization**
kPa	**kilopascals**
LWD	**logging while drilling**
Ma	**million years**
md	**millidarcies**
MDT	**modular dynamic formation tester**

MMbbls	**million barrels**
mmscf/d	**million standard cubic feet per day**
MODU	**Mobile Offshore Drilling Unit**
m/s	**metres per second**
mTVDss	**metres true vertical depth subsea**
NACE	**National Association of Corrosion Engineers**
NADC	**North Amethyst Drill Centre**
NDC	**Northern Drill Centre**
N:G	**net to gross ratio**
NPV	**net present value**
OGIP	**original gas in place**
OOIP	**original oil in place**
OWC	**oil/water contact**
PGB	**permanent guide base**
PVT	**pressure, volume, temperature**
Psi	**pounds per square inch**
ROV	**remotely operated vehicle**
Rs	**solution gas-oil ratio**
Rw	**resistivity of water**
RVP	**Reid vapour pressure**
s	**seconds**
SCAL	**special core analysis**
SDU	**subsea distribution unit**
SWRX	**South White Rose Extension Tie-back**
Sw	**water saturation**
TVD	**true vertical depth**
TGB	**temporary guide base**
UTA	**umbilical termination assembly**
VFP	**vertical flow performance**
WWRX	**West White Rose Extension**
XTree	**Christmas (xmas) tree**

Appendix A

Letter From C-NLOPB Advising of Ministerial Approval

000314

CANADA-NEWFOUNDLAND
and LABRADOR
OFFSHORE
PETROLEUM
BOARD

August 12, 2010

Paul J. McCloskey
Vice President, East Coast Operations
Suite 901, Scotia Centre
235 Water Street
A1C 1B6

Dear Mr. McCloskey:

RE: Husky Oil Operations Limited (Husky) request to Complete a Water Injection Well Interval in the North Amethyst Hibernia Formation

With respect to your letter dated June 11, 2010, I am pleased to inform you that Husky's request to complete a well to be drilled in the Hibernia Formation of the North Amethyst field was approved by both governments.

If you have any questions, I can be reached at 778-1456.

Sincerely,

Max Ruelokke

Max Ruelokke, P. Eng.
Chairman & CEO

Appendix B

E-17 Block Probabilistic Oil In Place Inputs and Results

1.0 Probabilistic Inputs E-17 Block

The probabilistic resource estimates for the Middle and Basal Hibernia of the North Amethyst Hibernia E-17 block were generated using GeoX software. In order to generate a probabilistic distribution ranges of bulk rock volume, porosity, net-to-gross, and water saturation had to be determined on consistent intervals within the formation.

In general, each parameter was assigned a distribution based on a most-likely value, an assigned maximum and minimum. BRV was addressed first followed by Net-to-Gross (N:G), Porosity (Phi), Water Saturation (Sw), Formation volume Factor (FVF), and Gas Oil Ratio (GOR).

1.1 Bulk Rock Volume

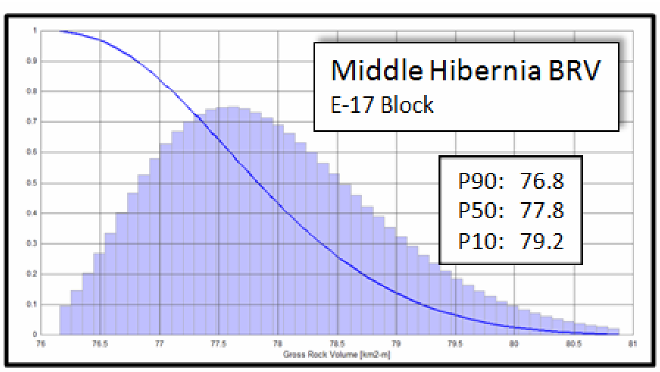
Low, high and most-likely case for the bulk rock volume distribution for North Amethyst Hibernia were created by varying the Oil Water contacts. Tables 1.1, 1.2, and Figure 1.1 illustrates the BRV distributions for the E-17 block used the GeoX simulation.

Table 1.1: Middle Hibernia BRV Parameters

Block	Case	OWC (m TVD ss)	Reason	BRV (m3)
E-17	Low Case	-2617	+ 5 m Log uncertainty	76,158,145
E-17	Base Case	-2620	Log & MDT Data	77,576,897
E-17	High Case	-2627	- 5 m Log uncertainty	80,875,709

Table 1.2: Basal Hibernia BRV Parameters

Block	Case	OWC (m TVD ss)	Reason	BRV (m3)
E-17	Low Case	-2885	20 m above MDT	119,570,154
E-17	Base Case	-2905	Fault Seal Juxtaposition (MDT @ 2902)	125,722,166
E-17	High Case	-2920	15 mTool/MDT error	130,321,030



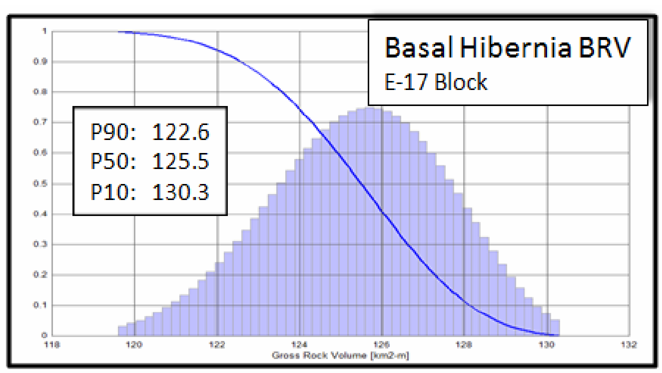


Figure 1-1: Bulk Rock Volume distributions for Middle Hibernia (Left) and Basal Hibernia (Right)

1.2 Net to Gross Distribution

The N:G distributions used in GeoX were generated for the Middle and Basal Hibernia by using data from the E-17, G-25 4, and G-25 1 wells and applying it to the E-17 Block. Reservoir quality in these wells may not be fully representative of this region.

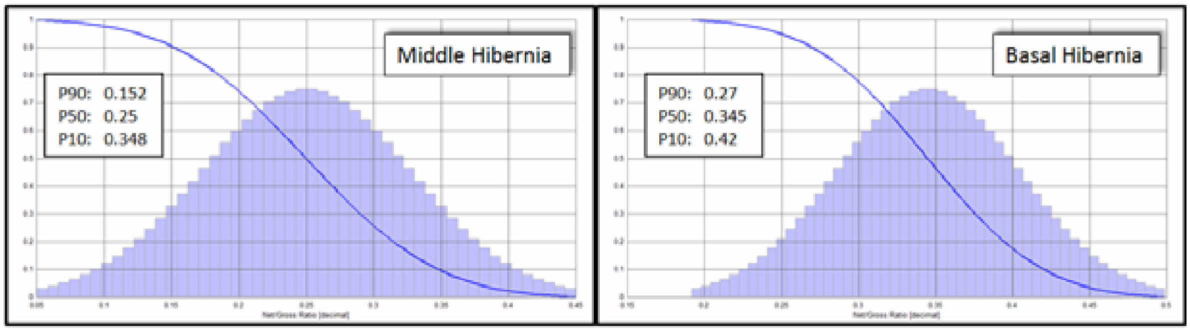


Figure 1-2: Net:Gross distributions for Middle Hibernia (Left) and Basal Hibernia (Right)

1.3 Porosity Distribution

The Porosity distribution used was generated for the Middle and Basal Hibernia by using data from the E-17, G-25 4, and G-25 1 wells and applying it to the E-17 Block. Reservoir quality in these wells may not be fully representative of the region. Figure 1.3 illustrates the porosity distributions for North Amethyst Hibernia.

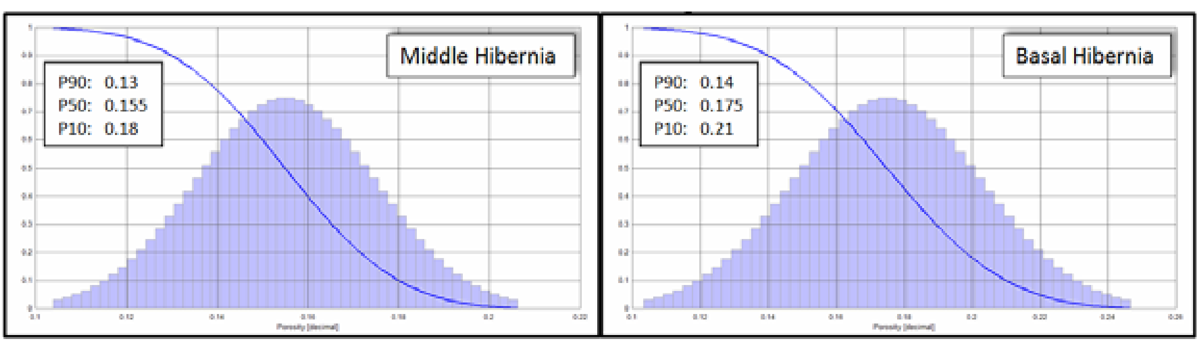


Figure 1-3: Porosity distributions for Middle Hibernia (Left) and Basal Hibernia (Right)

1.4 Oil Saturation

Oil Saturation used in the probabilistic analysis was generated for the Middle and Basal Hibernia by applying a range to the oil saturation data from the oil bearing intervals of the E-17 well. A medium positive correlation coefficient to porosity was also applied to the distribution. Figure 1.4 illustrates the oil saturation distributions for North Amethyst Hibernia.

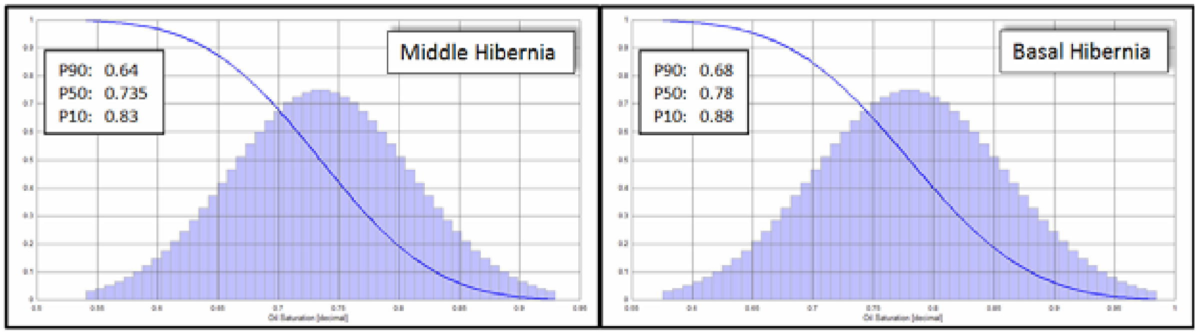


Figure 1-4: Oil Saturation distributions for the Middle Hibernia (Left) and Basal Hibernia (Right)

1.5 Formation Volume Factor

The Formation Volume Factor distribution used in the probabilistic analysis was generated for the Middle and Basal Hibernia by simulating varying bubble point pressures of the E-17 oil composition, applying a range to the Bo data from the oil bearing intervals of the E-17 well. Figure 1.5 illustrates the formation volume factor distributions for North Amethyst Hibernia.

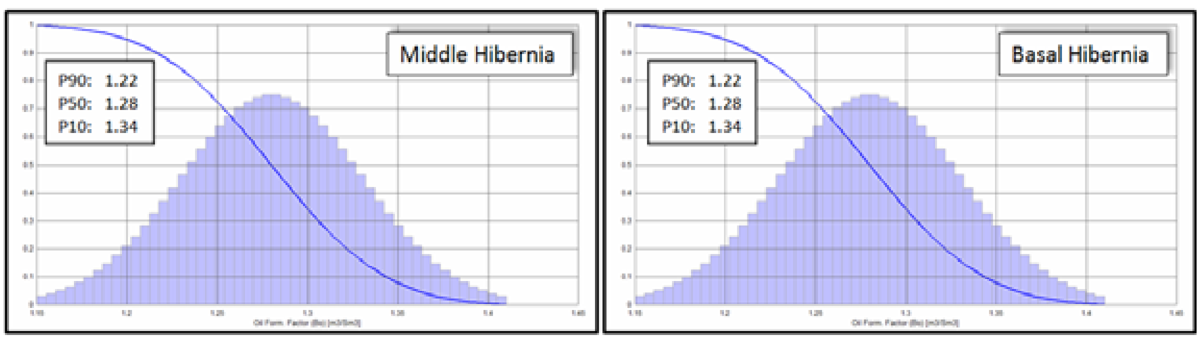


Figure 1-5: Formation Volume Factor distributions for the Middle Hibernia (Left) and Basal Hibernia (Right)

1.6 Gas Oil Ratio

The Gas Oil Ratio (GOR) data used in the probabilistic analysis was generated for the Middle and Basal Hibernia by simulating varying bubble point pressures of the E-17 oil composition. The probabilistic analysis used a strong correlation between GOR and Bo, and was applied. Figure 1.6 illustrates the gas oil ratio distributions for North Amethyst Hibernia.

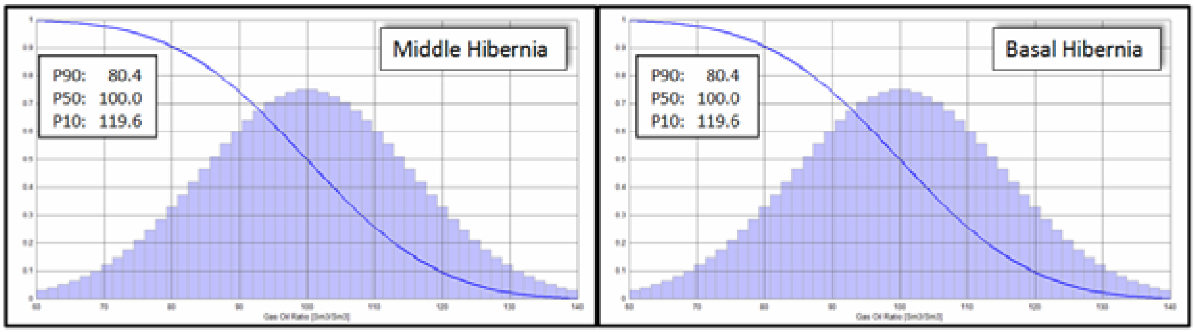


Figure 1-6: Gas Oil Ratio distributions for the Middle Hibernia (Left) and Basal Hibernia (Right)

2.0 Calculated Oil Resources

2.1 OOIP Distributions

Using the distributions defined in the previous section, a GeoX simulations were run for the oil-in-place calculation. Figures 2.1 to 2.3 are illustrate the distribution of North Amethyst Hibernia in E-17 block oil-in-place.

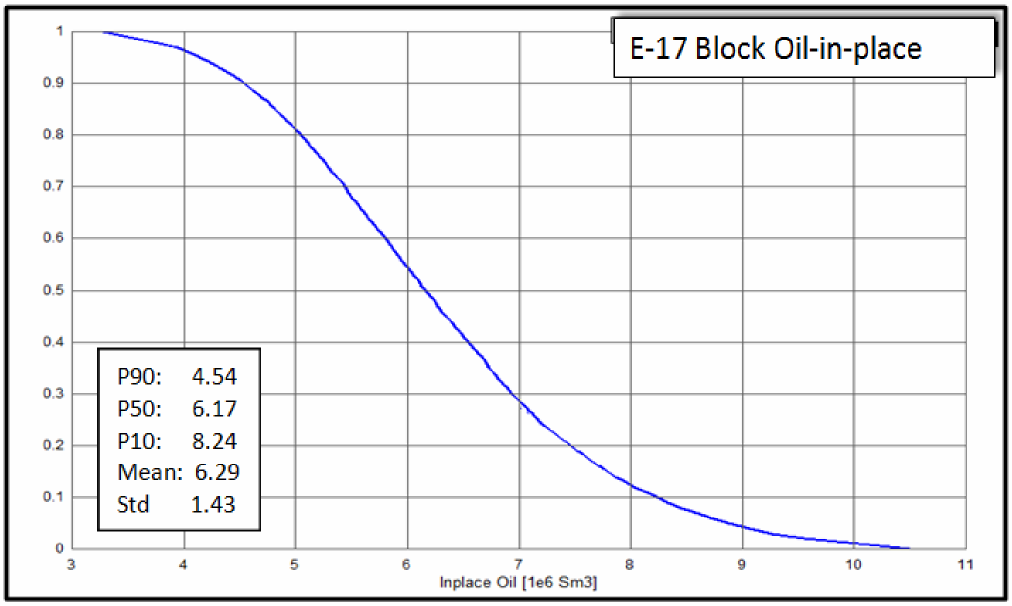


Figure 2.1 : Hibernia Oil-in-place distributions (10^6m^3) in the E-17 Block

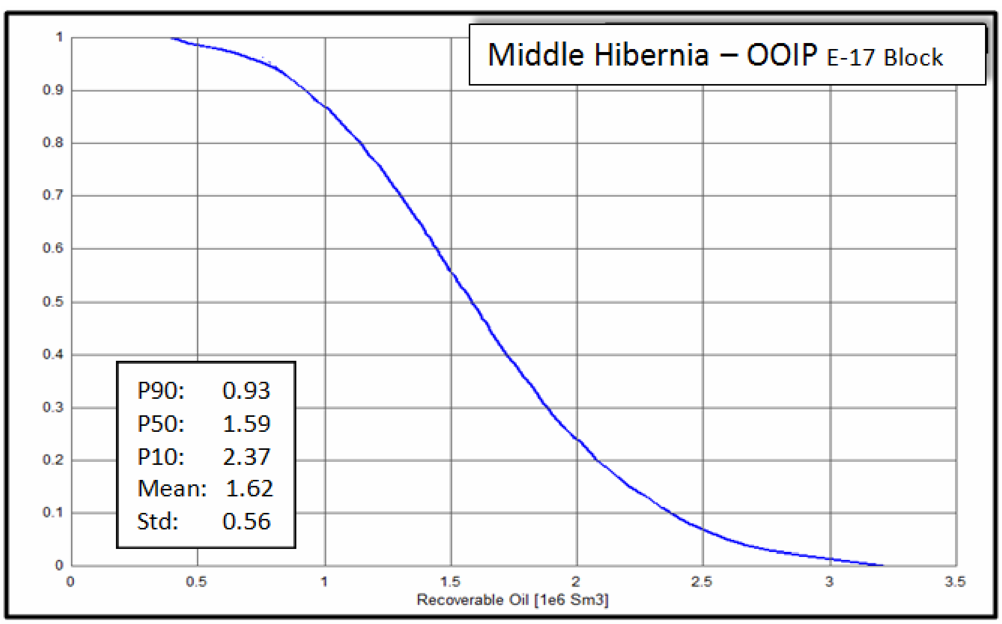


Figure 2.2 : Oil-in-place distributions ($10^6 m^3$) for E-17 Middle Hibernia

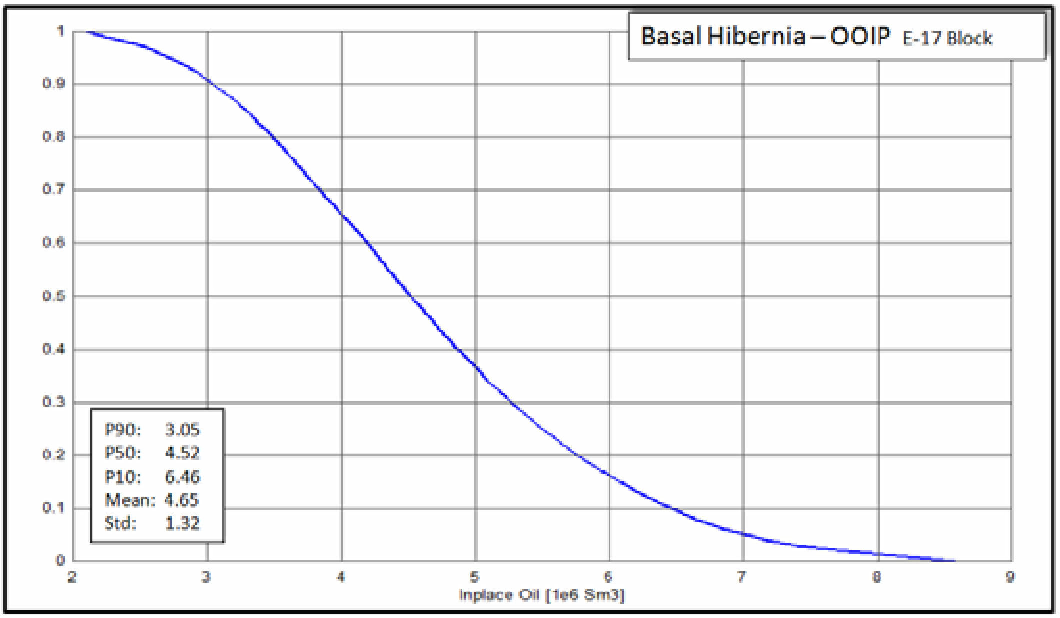


Figure 2.3 : Oil-in-place distributions ($10^6 m^3$) for E-17 Basal Hibernia

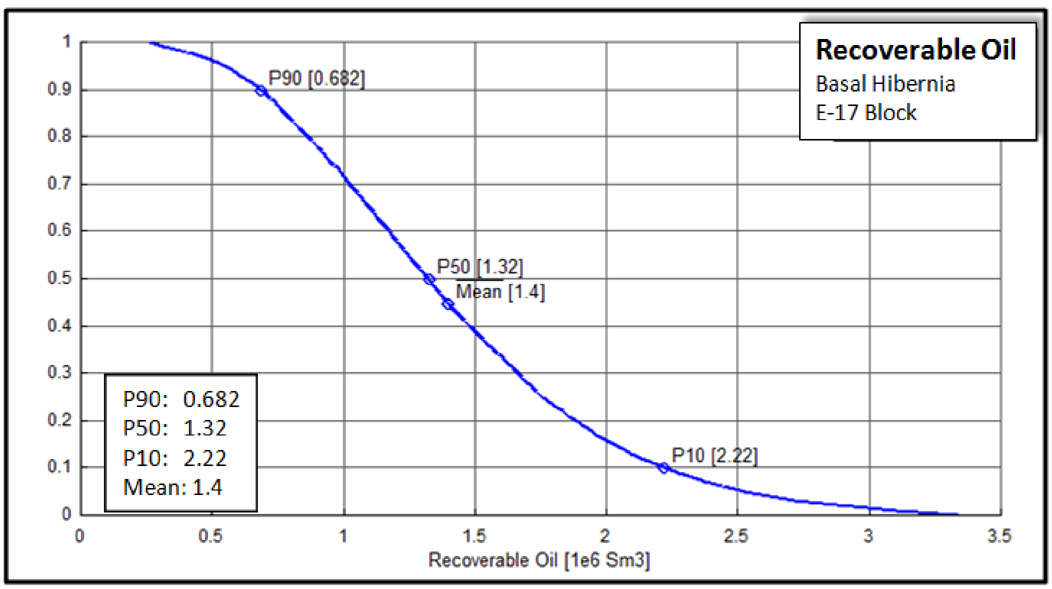


Figure 2.4 : Recoverable Oil distributions ($10^6 m^3$) for E-17 Basal Hibernia

2.2 Recovery Factor

Recovery factors used in the probabilistic analysis were generated for the Basal Hibernia by applying a stretched beta range (5-30-55) to the calculated OOIP distribution. Figure 1.7 illustrates the recovery factor distribution for North Amethyst Hibernia.

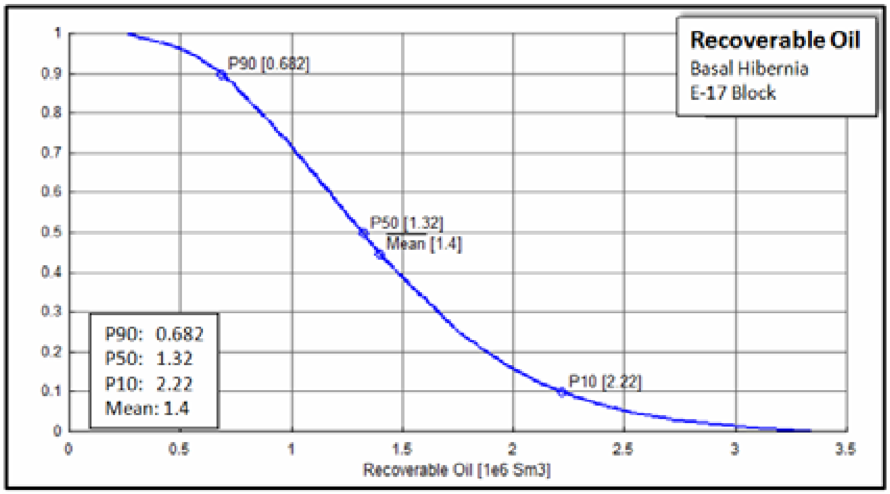


Figure 1-7: Recovery Factor distribution for the Basal Hibernia of the E-17 Block

3.0 Sensitivity Analysis

Net-to-gross, porosity, and Oil Saturation are the key sensitivities to the OOIP distribution. The Recovery Factor range applied to the Basal Hibernia Block also is a key sensitivity.

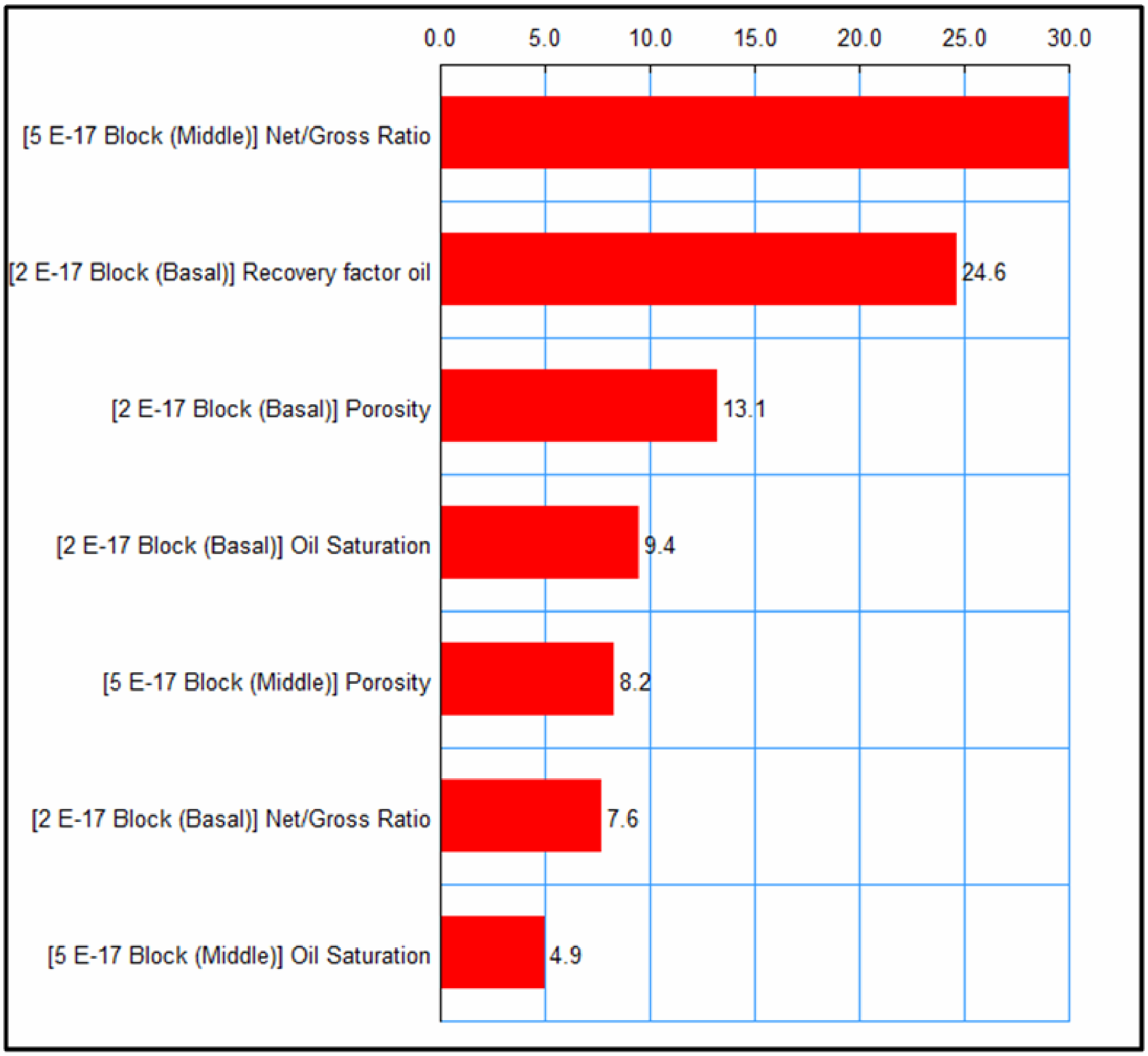


Figure 3-1: E-17 Block Hibernia OOIP sensitivity analysis

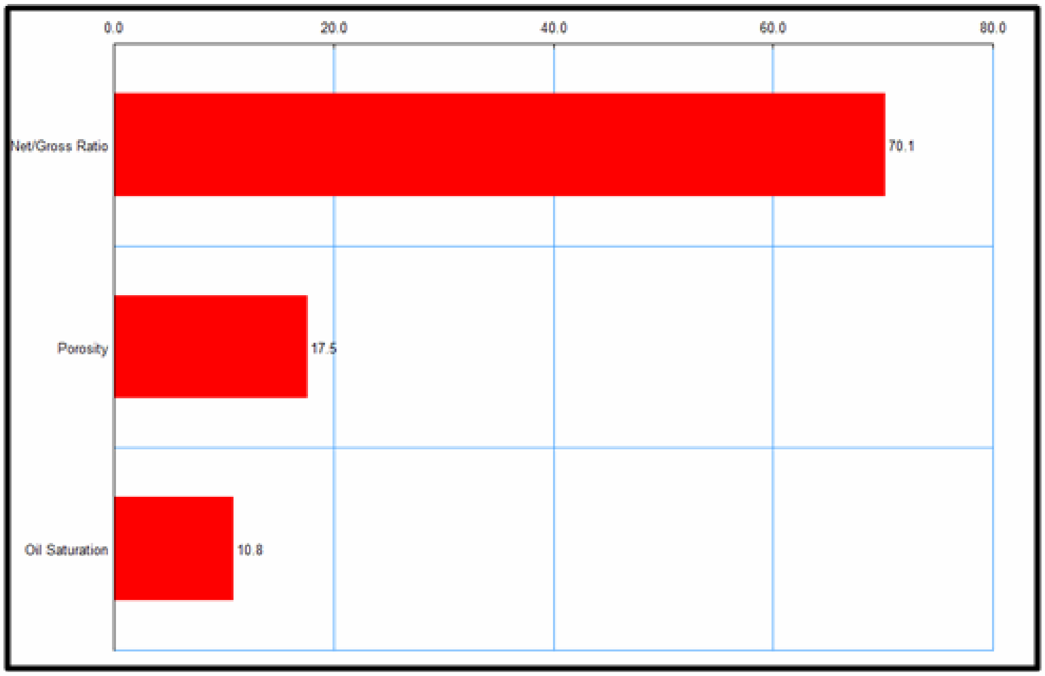


Figure 3-2: E-17 Middle Hibernia OOIP sensitivity analysis

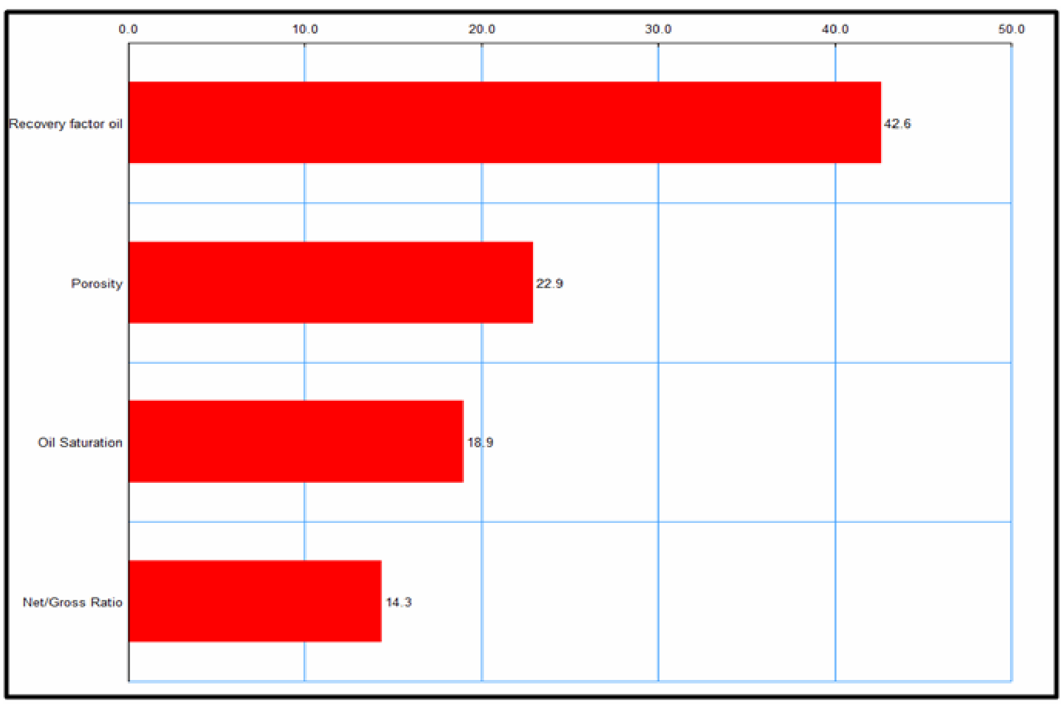


Figure 3-3: E-17 Basal Hibernia OOIP sensitivity analysis

Appendix C

North Amethyst Hibernia Reservoir Fluid Study

HUSKY ENERGY - EAST COAST
WHITE ROSE
RESERVOIR FLUID STUDY

F I N A L   R E P O R T

Prepared for

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May 29, 2009

RESERVOIR FLUID STUDY

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RESULTS AND DISCUSSION

The reservoir fluid study was conducted on a BOTTOMHOLE SAMPLE collected from Well E-17 of WHITE ROSE reservoir.

The sample collection data is provided in Table 1 and the sample validation data is given in Appendix A.

The PVT cell was charged with a portion of the live oil sample and a constant composition expansion experiment (CCE) was performed on the oil. Table 3 provides the CCE results of the average compressibility of the reservoir fluid at pressures above the bubblepoint. Table 4 contains the complete CCE results with the exception of the data already presented in Table 3. Figure 1 is the relative total volume (V/Vsat) data and Y-function.

Table 5 contains various property measurements made on the differentially liberated oil below the bubblepoint including live oil density, oil formation volume factor and gas-oil ratios, which are shown in Figures 2 through 4, respectively.

Table 6 contains a summary of the properties of the differentially liberated gas including gas gravities, deviation factors, gas formation volume factors and gas expansion factors. The gas deviation factor (Z), gas formation volume factor and gas expansion factor, and gas gravity are shown in Figures 5 through 7, respectively.

Table 7 provides the results of the reservoir fluid viscosity measurements. This data is represented by Figures 8 and 9. Gas phase viscosity was calculated using the compositional data and the Lee, Gonzalez, Eakin correlation.

Table 8 summarizes the effluent gas compositions from each pressure stage during the differential liberation experiment. Figures 10 shows this data plotted on semi-log co-ordinates. Table 9 presents the compositional analysis of the residual oil at completion of the experiment.

Table 10 provides the correlations of the measured PVT Data.

Appendix B contains the material balance check performed for this experiment. It is displayed as formation volume factors so that the balance can be checked on a point by point basis. Appendix C contains the compositional analyses of the liberated gases from the differential liberation test.

SUMMARY

HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
MAIN PVT RESULTS

INITIAL RESERVOIR CONDITIONS

Reservoir Pressure	4152	psia	28.63	MPa
Reservoir Temperature:	228.2	F	109	C

CONSTANT COMPOSITION EXPANSION @ 228.2 F (109.0 C)

Saturation Pressure	3583	psia	24.70	MPa
Compressibility @ Reservoir Pressure	1.05058E-05	$psia^{-1}$	1.523745E-03	MPa^{-1}
Compressibility @ Saturation Pressure	1.16558E-05	$psia^{-1}$	1.690531E-03	MPa^{-1}

DIFFERENTIAL LIBERATION @ 228.2 F (109.0 C)

At Saturation Pressure				
Oil Formation Volume Factor	1.2964	res.bbl/STB	1.2964	res.m^3/m^3
Solution Gas-Oil Ratio	583.94	scf/STB	104.00	m^3/m^3
Oil Density	0.7437	g/cm^3	743.7	kg/m^3
Oil Viscosity	0.694	cp	0.694	mPa.s
At Ambient Pressure				
Residual Oil Density	0.8112	g/cm^3	811.2	kg/m^3
Residual Oil Viscosity	2.078	cp	2.078	mPa.s
At Tank Conditions				
Residual Oil Density	0.8770	g/cm^3	877.0	kg/m^3
API Gravity	29.85		29.85	

SINGLE-STAGE SEPARATOR TEST

At Saturation Pressure				
Oil Formation Volume Factor	1.2792	res.bbl/STB	1.2792	res.m^3/m^3
Solution Gas-Oil Ratio	545.30	scf/STB	97.12	m3/m3
At Tank Conditions				
Residual Oil Density	0.8640	g/cm^3	864.0	kg/m^3
API Gravity	32.28		32.28	

TABLE 1
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
SAMPLE COLLECTION DATA

Project File:	2008-148			
Operator Name:	HUSKY ENERGY-EAST COAST			
Pool or Zone:	HIBERNIA			
Field or Area:	WHITE ROSE			
Well Location:	E-17			
Fluid Sample:	BOTTOMHOLE SAMPLE			
Sampling Company:	SLB			
Name of Sampler:	.			
Sampling Date:	29-Sep-08			
Sampling Point:	BOTTOMHOLE			
Sampling (Separator) Temperature:	210.2	F	99.0	C
Sampling (Separator) Pressure:	4152.0	psia	28.63	MPa
Reservoir Temperature:	228.2	F	109.0	C
Reservoir Pressure:	4152.0	psia	28.63	MPa
Initial Reservoir Pressure (Pi)	N/A	psia	N/A	MPa
Depth of Reported Pi	N/A	mMD	N/A	mss

TABLE 2
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

Boiling Point (K)			Mole Fraction	Mass Fraction	Calculated Properties	
77.4	Nitrogen	N2	0.0041	0.0009	**Total Sample**	
194.6	Carbon Dioxide	CO2	0.0159	0.0056		
212.8	Hydrogen Sulphide	H2S	0.0000	0.0000	Molecular Weight	124.44
111.5	Methane	C1	0.4779	0.0616		
184.3	Ethane	C2	0.0244	0.0059		
231.0	Propane	C3	0.0117	0.0042	**C6+ Fraction**	
261.5	i-Butane	i-C4	0.0026	0.0012		
272.6	n-Butane	n-C4	0.0064	0.0030	Molecular Weight	253.00
301.0	i-Pentane	i-C5	0.0032	0.0018	Mole Fraction	0.4491
309.3	n-Pentane	n-C5	0.0048	0.0028	Density (g/cc)	0.8752
309.3 - 342	Hexanes	C6	0.0090	0.0062		
342 - 371.4	Heptanes	C7	0.0113	0.0091		
371.4 - 398.8	Octanes	C8	0.0231	0.0212	**C7+ Fraction**	
398.8 - 423.8	Nonanes	C9	0.0205	0.0211		
423.8 - 447	Decanes	C10	0.0221	0.0253	Molecular Weight	256.86
447 - 469.3	Undecanes	C11	0.0254	0.0300	Mole Fraction	0.4390
469.3 - 488.2	Dodecanes	C12	0.0252	0.0326	Density (g/cc)	0.8770
488.2 - 508.2	Tridecanes	C13	0.0254	0.0358		
508.2 - 525.4	Tetradecanes	C14	0.0265	0.0405		
525.4 - 543.8	Pentadecanes	C15	0.0192	0.0319	**C12+ Fraction**	
543.8 - 560.9	Hexadecanes	C16	0.0180	0.0321		
	Heptadecanes	C17	0.0164	0.0311	Molecular Weight	315.66
564.8 - 590.4	Octadecanes	C18	0.0164	0.0332	Mole Fraction	0.3063
590.4 - 603.2	Nonadecanes	C19	0.0151	0.0318	Density (g/cc)	0.8968
603.2 - 617.5	Eicosanes	C20	0.0133	0.0295		
617.5 - 630.4	Heneicosanes	C21	0.0111	0.0260		
630.4 - 642.5	Docosanes	C22	0.0099	0.0243		
642.5 - 653.2	Tricosanes	C23	0.0084	0.0215		
653.2 - 664.3	Tetracosanes	C24	0.0084	0.0223		
664.3 - 674.9	Pentacosanes	C25	0.0084	0.0234		
674.9 - 685.4	Hexacosanes	C26	0.0071	0.0203		
685.4 - 695.4	Heptacosanes	C27	0.0068	0.0204		
695.4 - 704.9	Octacosanes	C28	0.0066	0.0205		
704.9 - 714.3	Nonacosanes	C29	0.0063	0.0203		
Above 714.3	Tricontanes Plus	C30+	0.0577	0.2795		
322.0	Cyclopentane	C5H10	0.0011	0.0006		
345.4	Methylcyclopentane	C6H12	0.0054	0.0037		
354.3	Cyclohexane	C6H12	0.0052	0.0035		
374.3	Methylcyclohexane	C7H14	0.0071	0.0056		
353.2	Benzene	C6H6	0.0058	0.0037		
383.8	Toluene	C7H8	0.0003	0.0002		
409.3 - 412	Ethylbenzene & p,m-Xylene	C8H10	0.0024	0.0021		
417.5	o-Xylene	C8H10	0.0014	0.0012		
442.0	1, 2, 4-Trimethylbenzene	C9H12	0.0027	0.0026		
Total			**1.0000**	**1.0000**		

TABLE 3
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
OIL COMPRESSIBILITY @ 228.2 F (109.0 C)

Pressure Range From (psia)	Pressure Range To (psia)		Average Compressibility (psi^{-1})
5013	4813		8.8661E-06
4813	4613		9.2046E-06
4613	4413		9.6658E-06
4413	4213		1.0132E-05
4213	4013		1.0506E-05
4013	3813		1.1088E-05
3813	**3583**	**Psat**	**1.1656E-05**

Pressure Range From (MPa)	Pressure Range To (MPa)		Average Compressibility (MPa^{-1})
34.56	33.18		1.2859E-03
33.18	31.80		1.3350E-03
31.80	30.42		1.4019E-03
30.42	29.05		1.4695E-03
29.05	27.67		1.5237E-03
27.67	26.29		1.6082E-03
26.29	**24.70**	**Psat**	**1.6905E-03**

Psat - Saturation Pressure

TABLE 4
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
CONSTANT COMPOSITION EXPANSION @ 228.2 F (109.0 C)

Pressure (psia)	Pressure (MPa)	RelativeVolume [1]	Y-Function [2]	Fluid Density (g/cc)
5013	34.56	0.985517		0.7546
4813	33.18	0.987268		0.7533
4613	31.80	0.989089		0.7519
4413	30.42	0.991004		0.7505
4213	29.05	0.993017		0.7489
4013	27.67	0.995108		0.7474
3813	26.29	0.997319		0.7457
3583 Psat	**24.70**	**1.000000**		**0.7437**
3536	24.38	1.004499	2.9546	
3433	23.67	1.014814	2.9496	
3351	23.10	1.023505	2.9456	
3272	22.56	1.032312	2.9418	
3122	21.52	1.050323	2.9345	
2530	17.44	1.143248	2.9057	
2193	15.12	1.219391	2.8894	
1948	13.43	1.291723	2.8775	
1604	11.06	1.431345	2.8607	
1373	9.46	1.564968	2.8495	
1205	8.31	1.694677	2.8413	
993	6.84	1.921519	2.8310	
819	5.65	2.195992	2.8226	
706	4.87	2.447020	2.8171	
554	3.82	2.946741	2.8097	

[1] Volume at indicated pressure per volume at saturation pressure
[2] Y Function = ((Psat-P)/P)/(Relative Volume - 1)
Psat - Saturation Pressure

TABLE 5
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION OIL PROPERTIES @ 228.2 F (109.0 C)

Pressure (psia)	Pressure (MPa)	Oil Density (g/cm^3)	Oil Formation Volume Factor [1]	Total Formation Volume Factor [2]	Gas-Oil Ratio Solution (scf/STB)	Gas-Oil Ratio Liberated (scf/STB)	Gas-Oil Ratio Solution (m^3/m^3)	Gas-Oil Ratio Liberated (m^3/m^3)
5013	34.56	0.7546	1.2777	1.2777	583.94	0.00	104.00	0.00
4813	33.18	0.7533	1.2799	1.2799	583.94	0.00	104.00	0.00
4613	31.80	0.7519	1.2823	1.2823	583.94	0.00	104.00	0.00
4413	30.42	0.7505	1.2848	1.2848	583.94	0.00	104.00	0.00
4213	29.05	0.7489	1.2874	1.2874	583.94	0.00	104.00	0.00
4013	27.67	0.7474	1.2901	1.2901	583.94	0.00	104.00	0.00
3813	26.29	0.7457	1.2930	1.2930	583.94	0.00	104.00	0.00
3583 Psat	**24.70**	**0.7437**	**1.2964**	**1.2964**	**583.94**	**0.00**	**104.00**	**0.00**
3213	22.15	0.7504	1.2727	1.3334	523.87	60.07	93.30	10.70
2813	19.39	0.7575	1.2473	1.3782	468.85	115.09	83.50	20.50
2413	16.64	0.7639	1.2229	1.4643	400.31	183.63	71.30	32.71
2013	13.88	0.7704	1.2026	1.5903	337.24	246.70	60.06	43.94
1613	11.12	0.7777	1.1769	1.8407	246.03	337.91	43.82	60.18
1213	8.36	0.7846	1.1566	2.1951	189.63	394.32	33.77	70.23
813	5.61	0.7917	1.1357	2.9513	127.35	456.60	22.68	81.32
413	2.85	0.8001	1.1126	5.1724	68.87	515.07	12.27	91.73
213	1.47	0.8055	1.0981	9.3298	37.08	546.86	6.60	97.40
13	0.09	0.8112	1.0823	79.6546	0.00	583.94	0.00	104.00

Density of Residual Oil = 0.8770 g/cm3 (877.0 kg/m3) @ 60 F (288.7K)

[1] Barrels (Cubic meters) of oil at indicated pressure and temperature per barrel (cubic meter) of residual oil @ 60 F (288.7 K).
[2] Total barrels (cubic meters) of oil and liberated gas at the indicated pressure and temperature per barrel (cubic meter) of residual oil @ 60 F (288.7 K).
Psat - Saturation Pressure
- Tank conditions: 60 F (288.7 K) @ 13 psia (0.0896 MPa); Standard conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa).

TABLE 6
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS PROPERTIES @ 228.2 F (109.0 C)

Pressure		Gas Gravity		Gas Density	Gas Deviation Factor	Gas Formation Volume Factor	Gas Expansion Factor
(psia)	(MPa)	Incremental (Air = 1)	Cumulative (Air = 1)	(g/cm^3)	(-)	[1]	[2]
5013	34.56						
4813	33.18						
4613	31.80						
4413	30.42						
4213	29.05						
4013	27.67						
3813	26.29						
3583 Psat	**24.70**						
3213	22.15	0.6306	0.6306	0.1355	0.9396	0.0057	176.471
2813	19.39	0.6342	0.6323	0.1209	0.9276	0.0064	156.598
2413	16.64	0.6373	0.6342	0.1050	0.9205	0.0074	135.467
2013	13.88	0.6406	0.6358	0.0882	0.9189	0.0088	113.329
1613	11.12	0.6500	0.6397	0.0715	0.9218	0.0110	90.657
1213	8.36	0.6580	0.6423	0.0538	0.9317	0.0148	67.624
813	5.61	0.6712	0.6462	0.0362	0.9476	0.0223	44.790
413	2.85	0.7086	0.6533	0.0190	0.9682	0.0443	22.596
213	1.47	0.7702	0.6601	0.0105	0.9802	0.0845	11.832
13	0.09	1.0483	0.6847	0.0009	0.9977	0.7555	1.324

[1] Cubic feet (meters) of gas at indicated pressure and temperature per cubic feet (meter) @ standard conditions

Psat - Saturation pressure
- Standard conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa)

TABLE 7
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION FLUID VISCOSITY @ 228.2 F (109.0 C)

Pressure (psia)	Pressure (MPa)	Oil Viscosity (cp=mPa.s)	Gas Viscosity (cp=mPa.s)	Oil - Gas Viscosity Ratio
5013	34.56	0.763		
4513	31.12	0.741		
4045	27.89	0.720		
3583 **Psat**	24.70	0.694		
3213	22.15	0.741	0.01964	37.73
2813	19.39	0.818	0.01870	43.72
2413	16.64	0.886	0.01779	49.81
2013	13.88	0.973	0.01692	57.49
1613	11.12	1.067	0.01611	66.23
1213	8.36	1.189	0.01538	77.34
813	5.60	1.339	0.01472	90.96
413	2.85	1.568	0.01407	111.44
213	1.47	1.750	0.01359	128.74
13	0.09	2.078	0.01226	169.48

Psat - Saturation Pressure

TABLE 8
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
COMPOSITIONAL ANALYSIS OF LIBERATED GAS @ 228.2 F (109.0 C)

Component	Differential Liberation Stage Pressure (psia/MPa)									
	3213	2813	2413	2013	1613	1213	813	413	213	13
	22.15	19.39	16.64	13.88	11.12	8.36	5.61	2.85	1.47	0.09
N2	0.0026	0.0023	0.0021	0.0021	0.0019	0.0018	0.0017	0.0014	0.0013	0.0010
CO2	0.0222	0.0236	0.0248	0.0254	0.0278	0.0298	0.0321	0.0378	0.0457	0.0560
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C1	0.9258	0.9222	0.9191	0.9165	0.9075	0.8985	0.8851	0.8479	0.7842	0.5344
C2	0.0257	0.0274	0.0287	0.0289	0.0329	0.0370	0.0440	0.0599	0.0864	0.1598
C3	0.0085	0.0090	0.0096	0.0106	0.0116	0.0133	0.0148	0.0224	0.0376	0.1147
i-C4	0.0016	0.0016	0.0015	0.0016	0.0018	0.0020	0.0023	0.0036	0.0061	0.0235
n-C4	0.0033	0.0031	0.0030	0.0031	0.0034	0.0038	0.0045	0.0070	0.0120	0.0491
i-C5	0.0011	0.0011	0.0011	0.0011	0.0012	0.0012	0.0013	0.0020	0.0034	0.0124
n-C5	0.0013	0.0014	0.0014	0.0014	0.0015	0.0015	0.0017	0.0026	0.0042	0.0144
C6	0.0016	0.0016	0.0016	0.0016	0.0016	0.0017	0.0020	0.0023	0.0032	0.0081
C7+	0.0064	0.0068	0.0071	0.0077	0.0087	0.0093	0.0105	0.0131	0.0160	0.0268
Total	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**

Calculated Properties of Total Sample @ Standard Conditions

MW (g/mol)	18.26	18.37	18.46	18.56	18.83	19.06	19.44	20.52	22.31	30.36
Gravity (Air=1.0)	0.6306	0.6342	0.6373	0.6406	0.6500	0.6580	0.6712	0.7086	0.7702	1.0483

Calculated Properties of C7+ @ Standard Conditions

MW (g/mol)	96.87	97.92	98.19	97.29	98.13	96.58	97.26	97.64	96.99	96.73
Density (g/cc)	0.7238	0.7258	0.7264	0.7245	0.7262	0.7231	0.7245	0.7252	0.7240	0.7235

TABLE 9
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
COMPOSITIONAL ANALYSIS OF RESIDUAL OIL

Boiling Point (K)			Mole Fraction	Mass Fraction	Calculated Properties	
77.4	Nitrogen	N2	0.0000	0.0000	**Total Sample**	
194.6	Carbon Dioxide	CO2	0.0000	0.0000		
212.8	Hydrogen Sulphide	H2S	0.0000	0.0000	Molecular Weight	247.27
111.5	Methane	C1	0.0000	0.0000		
184.3	Ethane	C2	0.0000	0.0000		
231.0	Propane	C3	0.0010	0.0002	**C6+ Fraction**	
261.5	i-Butane	i-C4	0.0009	0.0002		
272.6	n-Butane	n-C4	0.0033	0.0008	Molecular Weight	249.78
301.0	i-Pentane	i-C5	0.0031	0.0009	Mole Fraction	0.9863
309.3	n-Pentane	n-C5	0.0054	0.0016	Density (g/cc)	0.8732
309.3 - 342	Hexanes	C6	0.0136	0.0048		
342 - 371.4	Heptanes	C7	0.0211	0.0086		
371.4 - 398.8	Octanes	C8	0.0495	0.0229	**C7+ Fraction**	
398.8 - 423.8	Nonanes	C9	0.0474	0.0246		
423.8 - 447	Decanes	C10	0.0505	0.0290	Molecular Weight	252.40
447 - 469.3	Undecanes	C11	0.0575	0.0342	Mole Fraction	0.9710
469.3 - 488.2	Dodecanes	C12	0.0621	0.0404	Density (g/cc)	0.8745
488.2 - 508.2	Tridecanes	C13	0.0665	0.0471		
508.2 - 525.4	Tetradecanes	C14	0.0685	0.0526		
525.4 - 543.8	Pentadecanes	C15	0.0487	0.0406	**C12+ Fraction**	
543.8 - 560.9	Hexadecanes	C16	0.0444	0.0398		
	Heptadecanes	C17	0.0400	0.0383	Molecular Weight	305.17
564.8 - 590.4	Octadecanes	C18	0.0381	0.0387	Mole Fraction	0.6892
590.4 - 603.2	Nonadecanes	C19	0.0339	0.0361	Density (g/cc)	0.8934
603.2 - 617.5	Eicosanes	C20	0.0292	0.0325		
617.5 - 630.4	Heneicosanes	C21	0.0236	0.0277		
630.4 - 642.5	Docosanes	C22	0.0203	0.0251		
642.5 - 653.2	Tricosanes	C23	0.0167	0.0215		
653.2 - 664.3	Tetracosanes	C24	0.0159	0.0212		
664.3 - 674.9	Pentacosanes	C25	0.0151	0.0211		
674.9 - 685.4	Hexacosanes	C26	0.0122	0.0177		
685.4 - 695.4	Heptacosanes	C27	0.0106	0.0160		
695.4 - 704.9	Octacosanes	C28	0.0098	0.0154		
704.9 - 714.3	Nonacosanes	C29	0.0086	0.0140		
Above 714.3	Tricontanes Plus	C30+	0.1251	0.3048		
322.0	Cyclopentane	C5H10	0.0017	0.0005		
345.4	Methylcyclopentane	C6H12	0.0057	0.0019		
354.3	Cyclohexane	C6H12	0.0095	0.0032		
374.3	Methylcyclohexane	C7H14	0.0147	0.0058		
353.2	Benzene	C6H6	0.0106	0.0033		
383.8	Toluene	C7H8	0.0006	0.0002		
409.3 - 412	Ethylbenzene & p,m-Xylene	C8H10	0.0054	0.0023		
417.5	o-Xylene	C8H10	0.0033	0.0014		
442.0	1, 2, 4-Trimethylbenzene	C9H12	0.0061	0.0030		
Total			**1.0000**	**1.0000**		

TABLE 10
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
CORRELATIONS OF MEASURED PVT LABORATORY DATA

CONSTANT COMPOSITION EXPANSION @ 228.2 F (109.0 C)

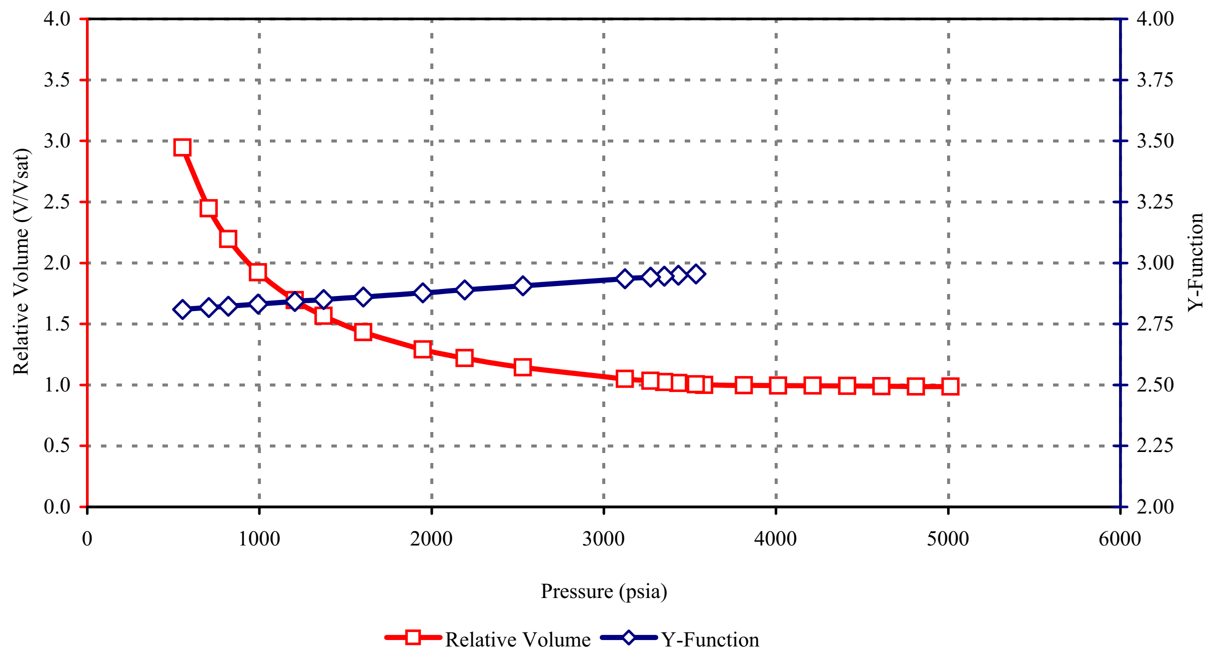
Relative Volume (V/Vsat)	(P >= Psat)	y=(-0.004190*x^2 + 1.768633*x + 1.270431)/(1.782436*x + 1.252190)
		R Squared = 0.997602
Relative Volume (V/Vsat)	(P <= Psat)	y=(1.095270*x^2 + 5.062247*x + 1.488811)/(7.795418*x + -0.162343)
		R Squared = 0.992338

DIFFERENTIAL LIBERATION @ 228.2 F (109.0 C)

Live Oil Density (g/cc)	(P >= Psat)	y=(0.002951*x^2 + 1.779682*x + 1.246665)/(1.818432*x + 1.291608)
		R Squared = 0.999928
Live Oil Density (g/cc)	(P <= Psat)	y=(-0.069577*x^2 + 13.003823*x + 14.754091)/(13.588876*x + 14.837473)
		R Squared = 0.996493
Oil FVF [1]	(P >= Psat)	y=(-0.003860*x^2 + 2.352661*x + 1.687412)/(2.296841*x + 1.624582)
		R Squared = 0.999851
Oil FVF [1]	(P <= Psat)	y=(-0.069930*x^2 + -1.885254*x + 3.984162)/(-2.009379*x + 3.980774)
		R Squared = 0.996372
GOR (vol/vol)	(P <= Psat)	y=(6.741310*x^2 + -1.217505*x + 0.023568)/(0.752863*x + -0.117439)
		R Squared = 0.998789
Oil Viscosity (cp=mPa.s)	(P >= Psat)	y=(-602.133406*x^2 + 3,521.047076*x + 1,594.890389)/(0.069824*x + 0.488675)
		R Squared = 0.999631
Oil Viscosity (cp=mPa.s)	(P <= Psat)	y=(19.282392*x^2 + -42.722783*x + 34.797611)/(-0.000627*x + 0.002035)
		R Squared = 0.986896

y is the measured parameter and x = P/Psat, dimensionless
[1] Barrels (Cubic meters) of oil at indicated pressure and temperature per barrel (cubic meter) of residual oil @ 60 F (288.7 K).
[2] Cubic feet (meters) of gas at indicated pressure and temperature per cubic feet (meter) @ standard conditions

FIGURE 1
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
CONSTANT COMPOSITION EXPANSION @ 228.2 F (109.0 C)



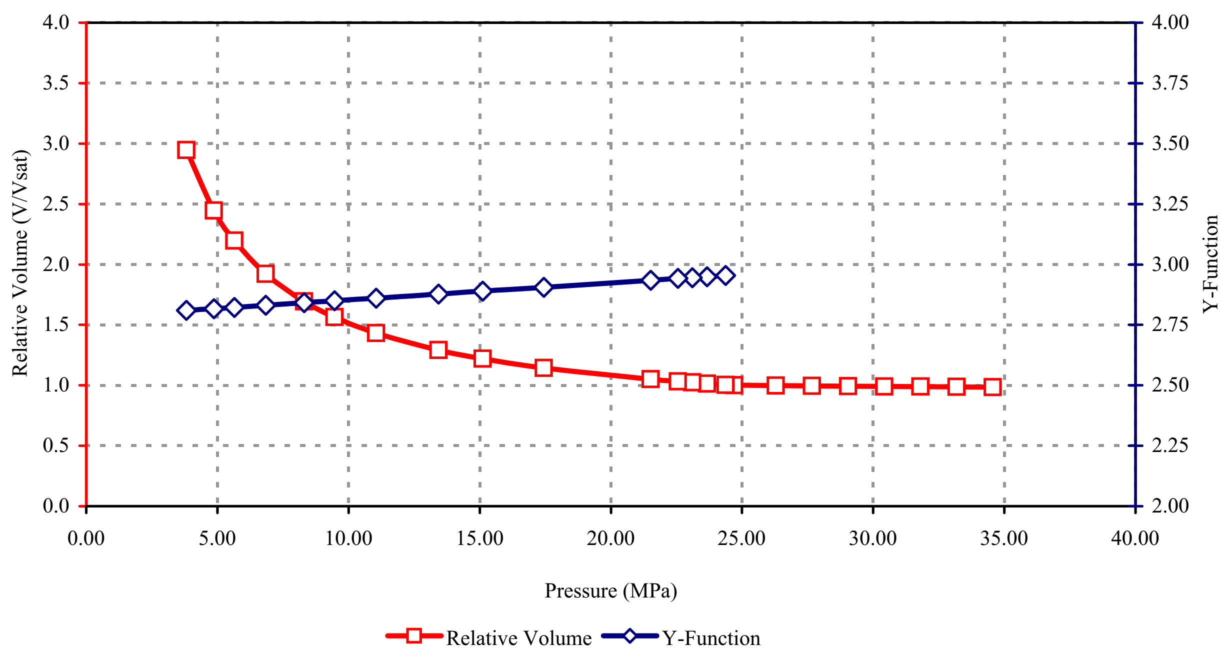
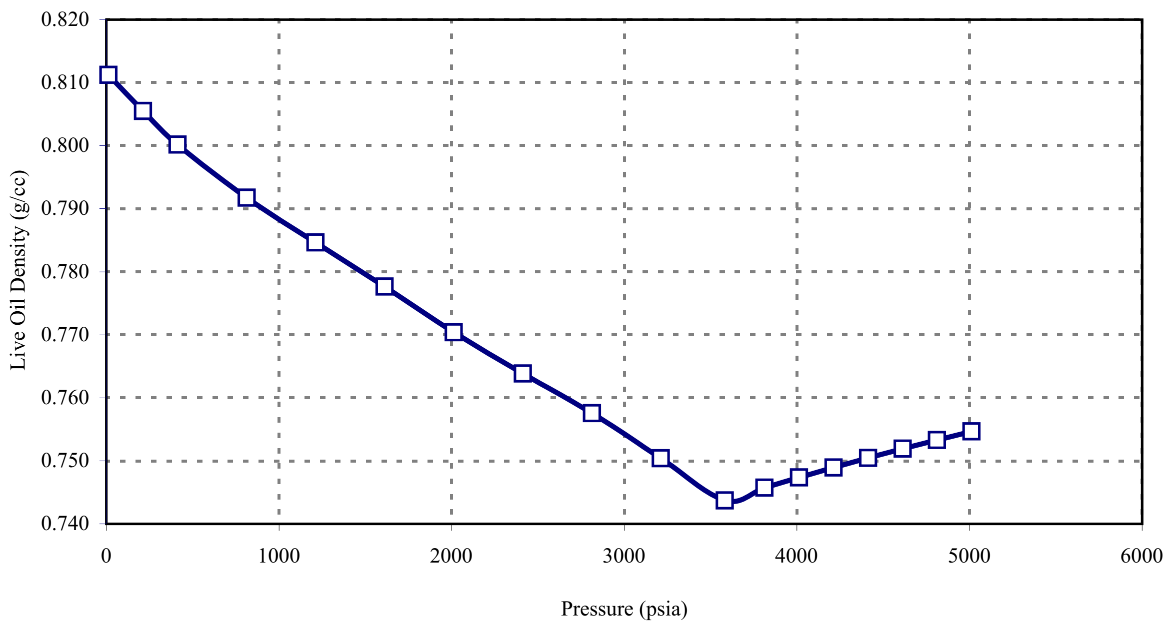


FIGURE 2
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION OIL DENSITY @ 228.2 F (109.0 C)



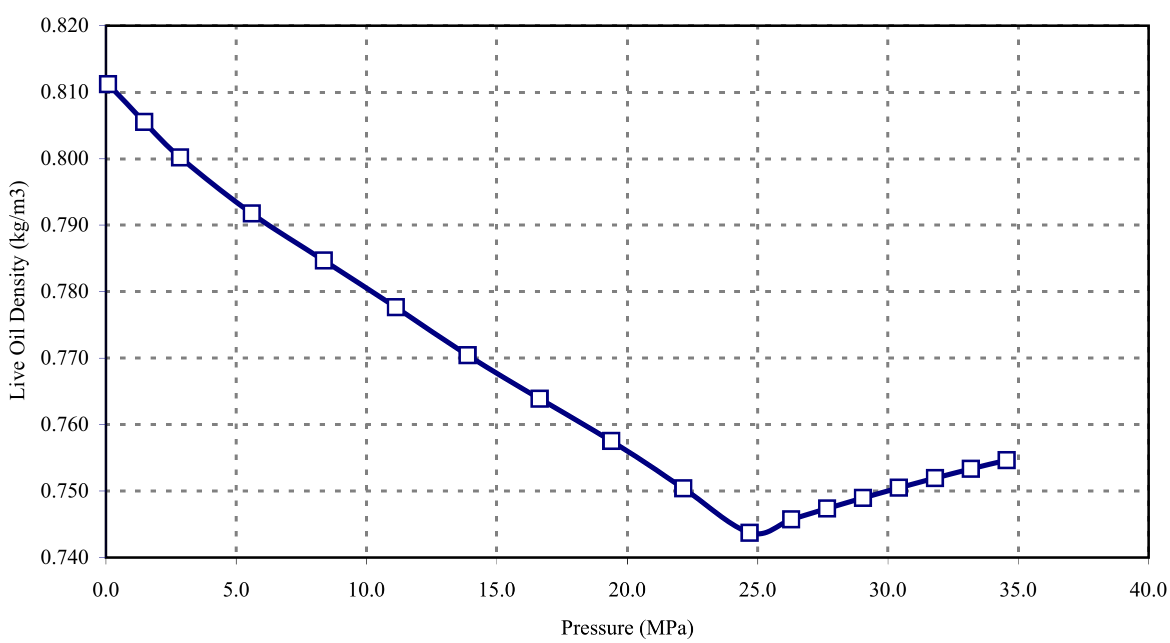
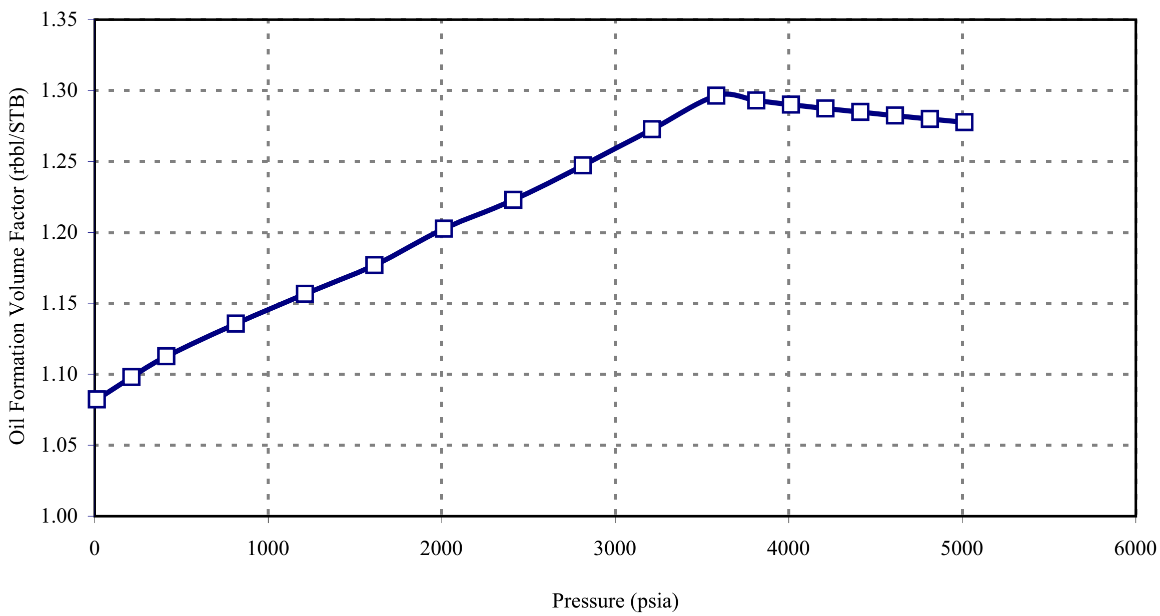


FIGURE 3
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION OIL FORMATION VOLUME FACTOR @ 228.2 F (109.0 C)



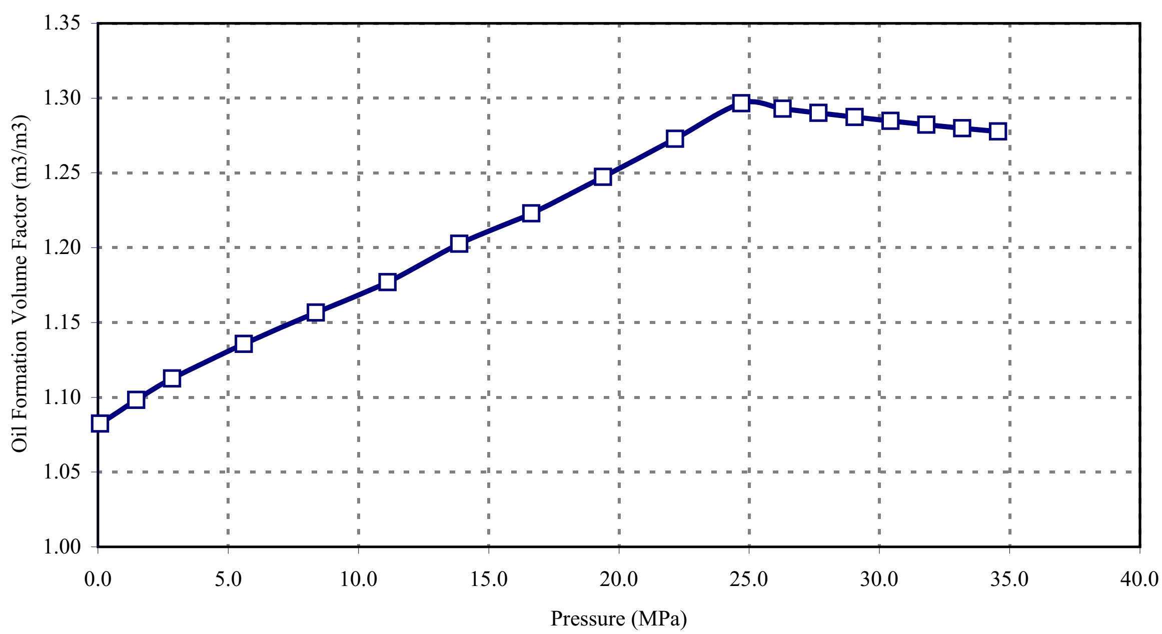
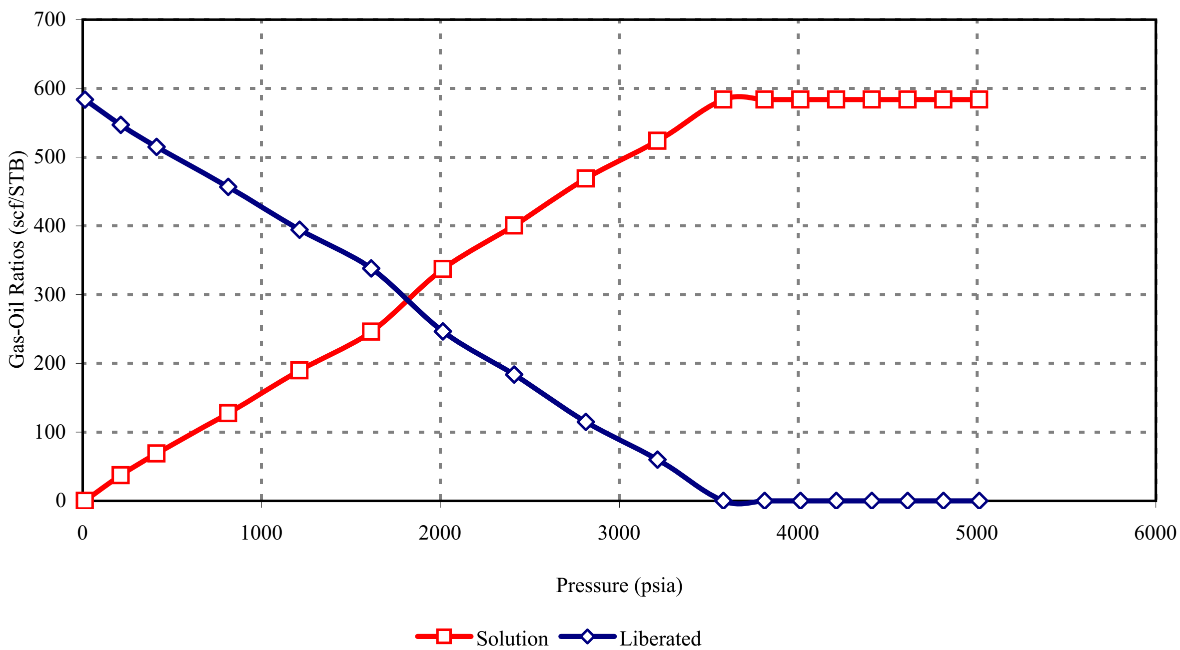


FIGURE 4
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS-OIL RATIOS @ 228.2 F (109.0 C)



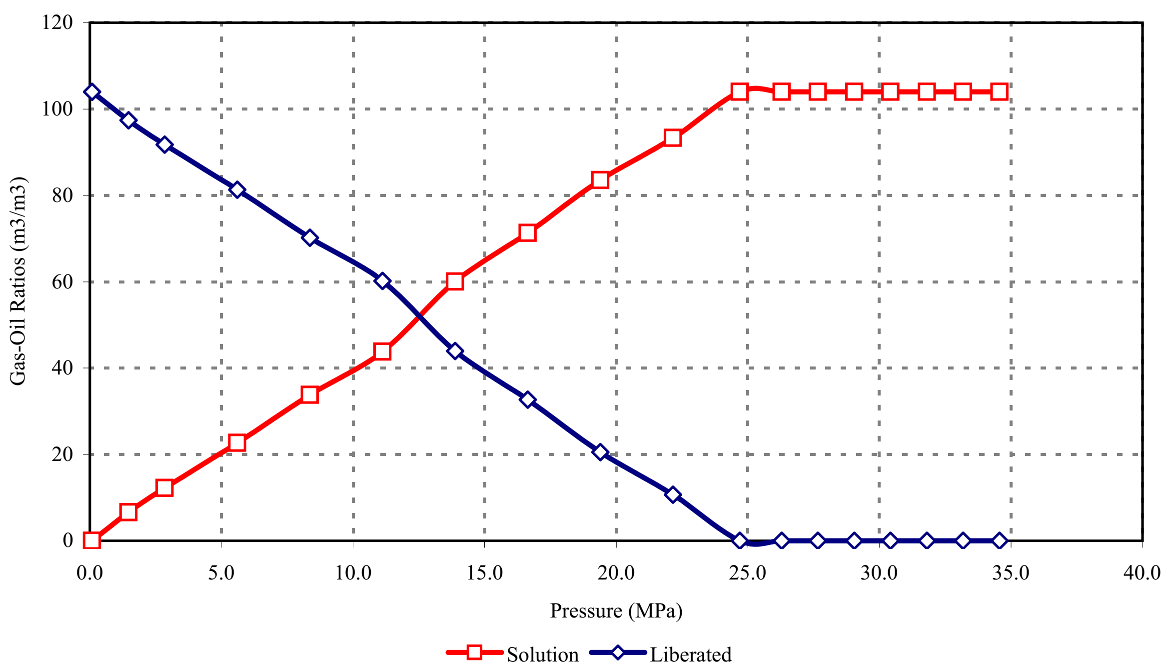
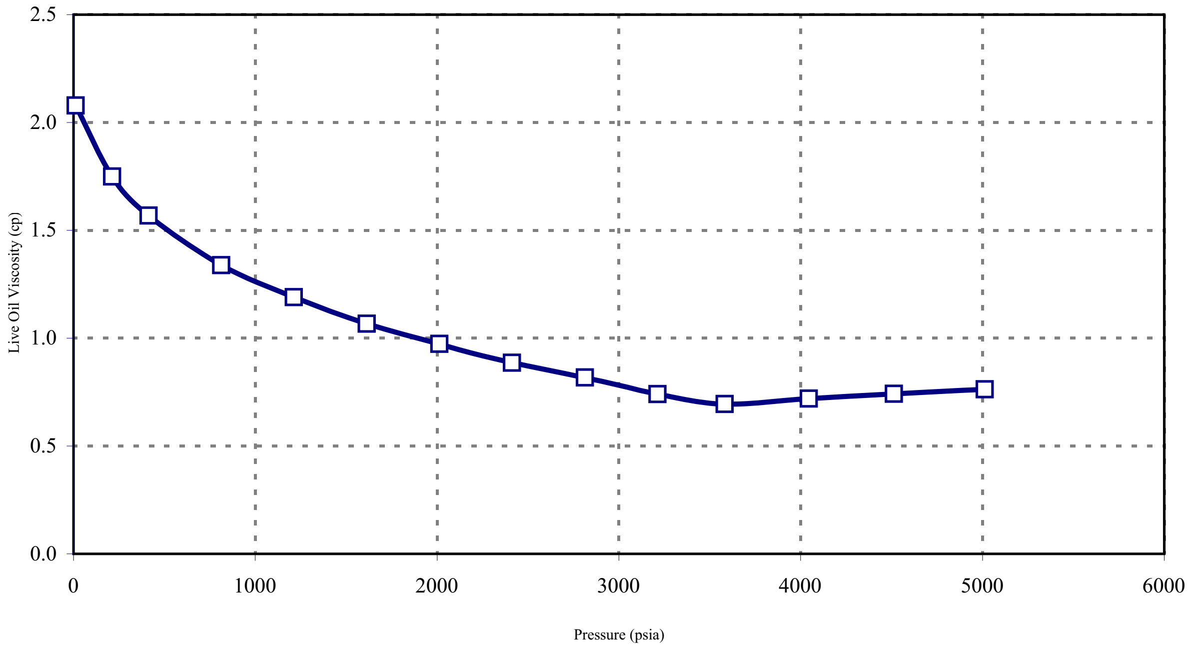


FIGURE 5
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION OIL VISCOSITY @ 228.2 F (109.0 C)



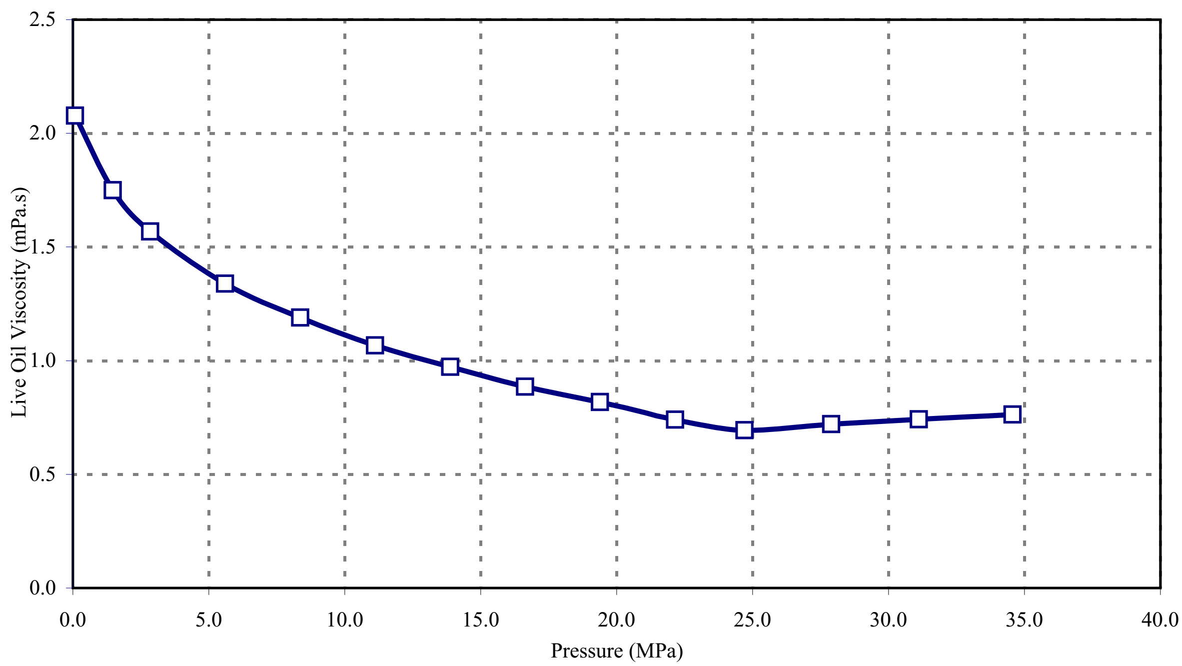
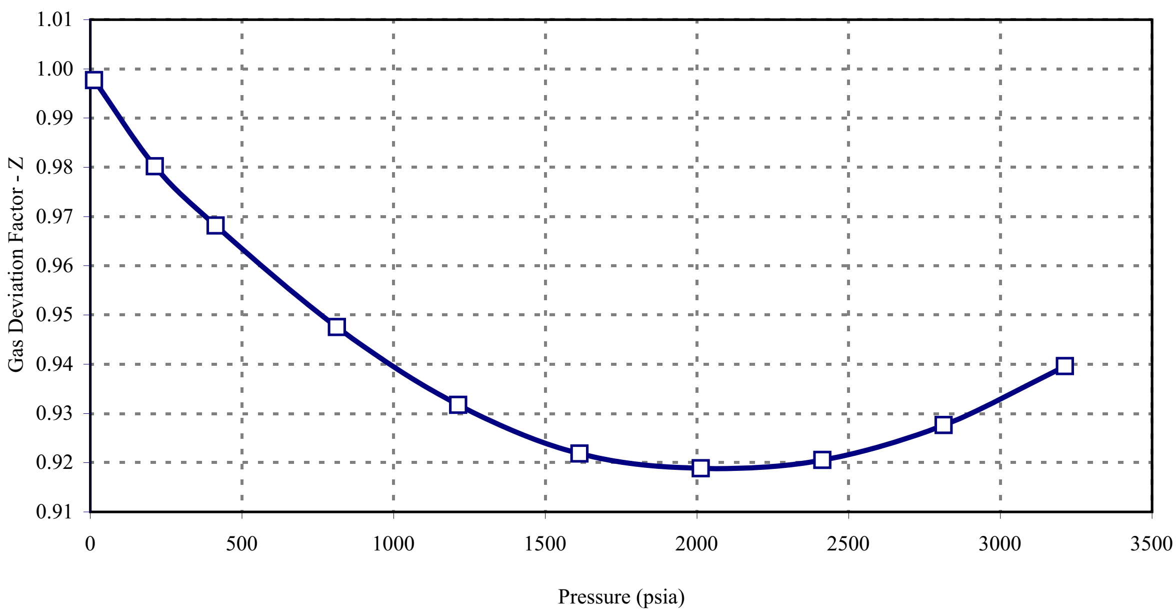


FIGURE 6
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS DEVIATION FACTOR @ 228.2 F (109.0 C)



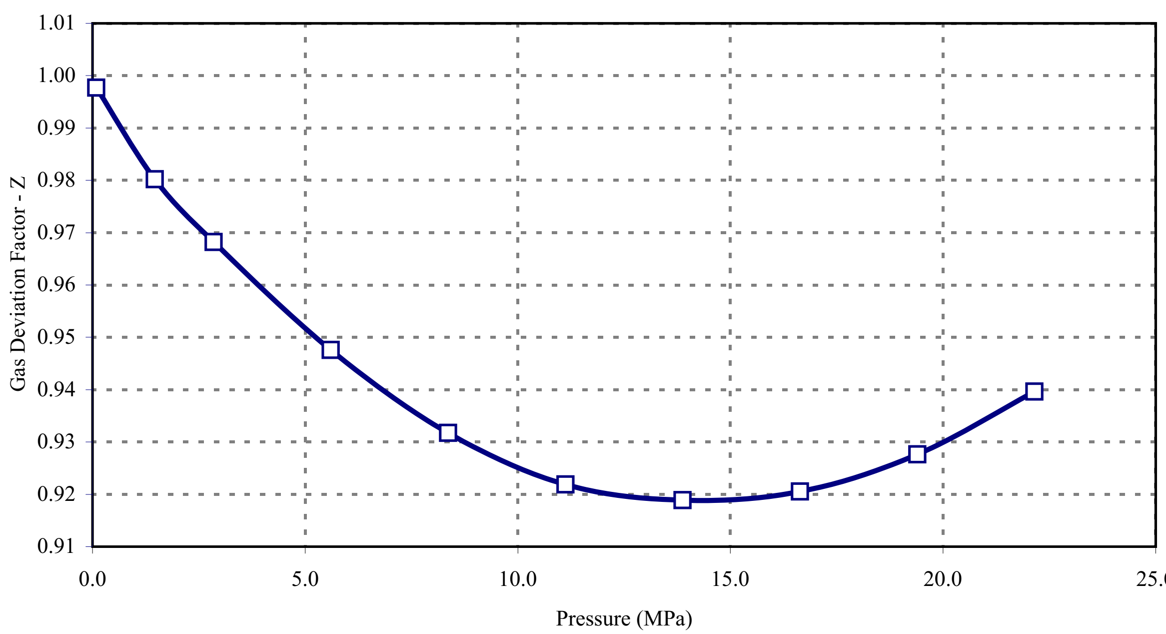
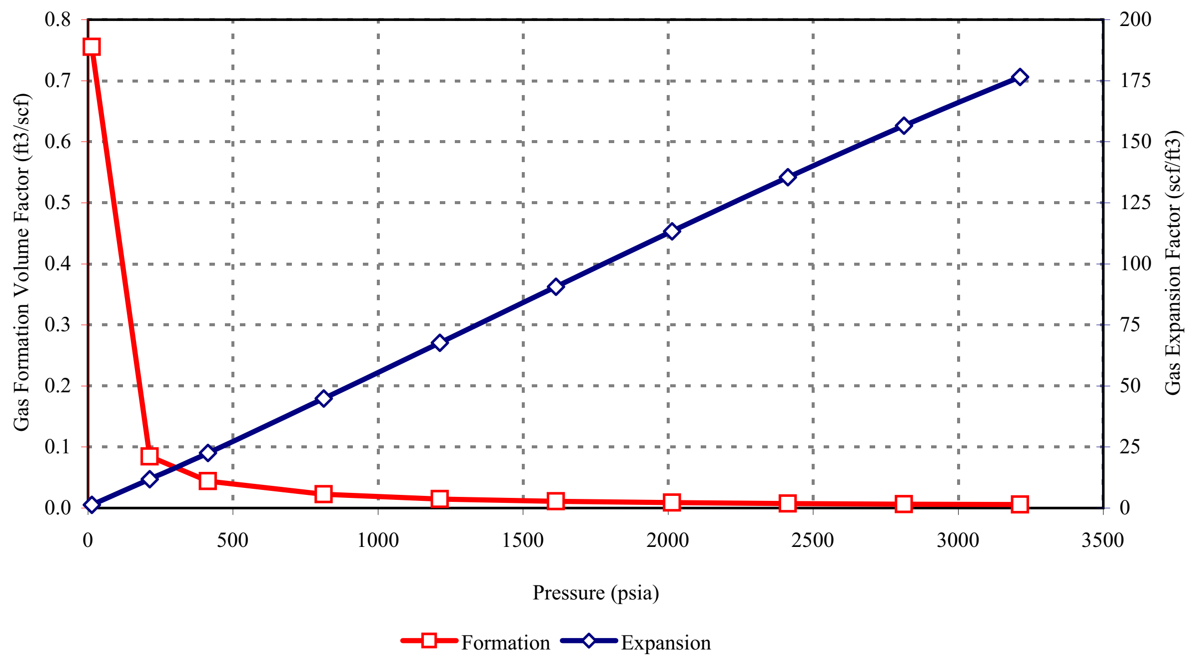


FIGURE 7
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS VOLUME FACTORS @ 228.2 F (109.0 C)



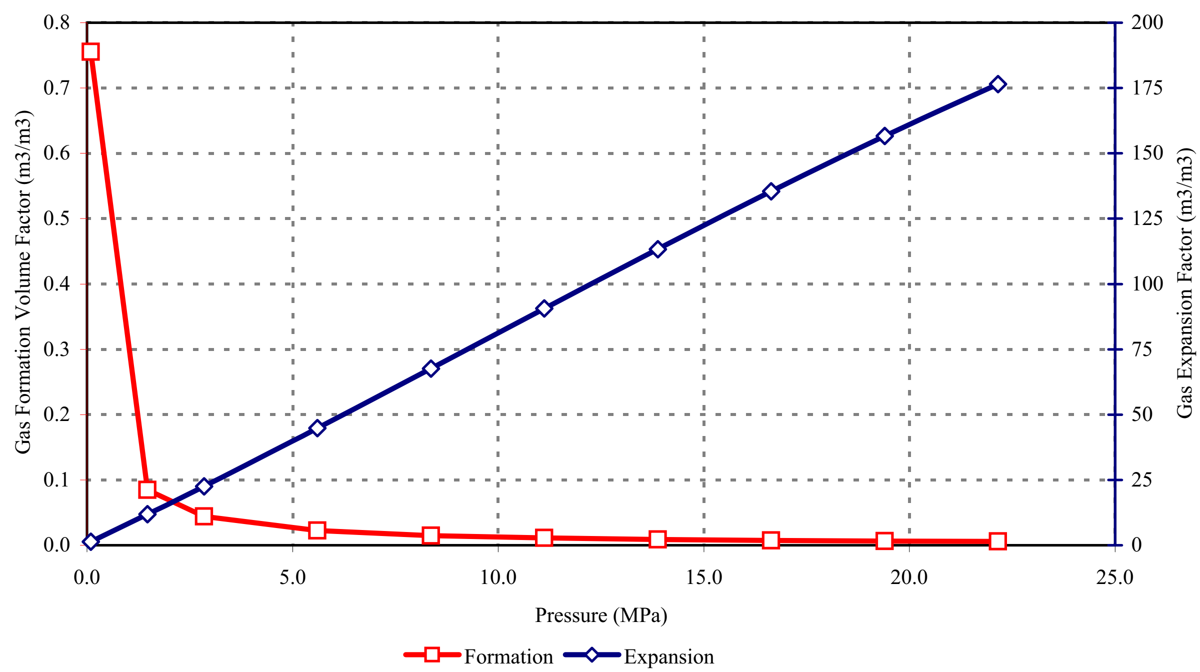
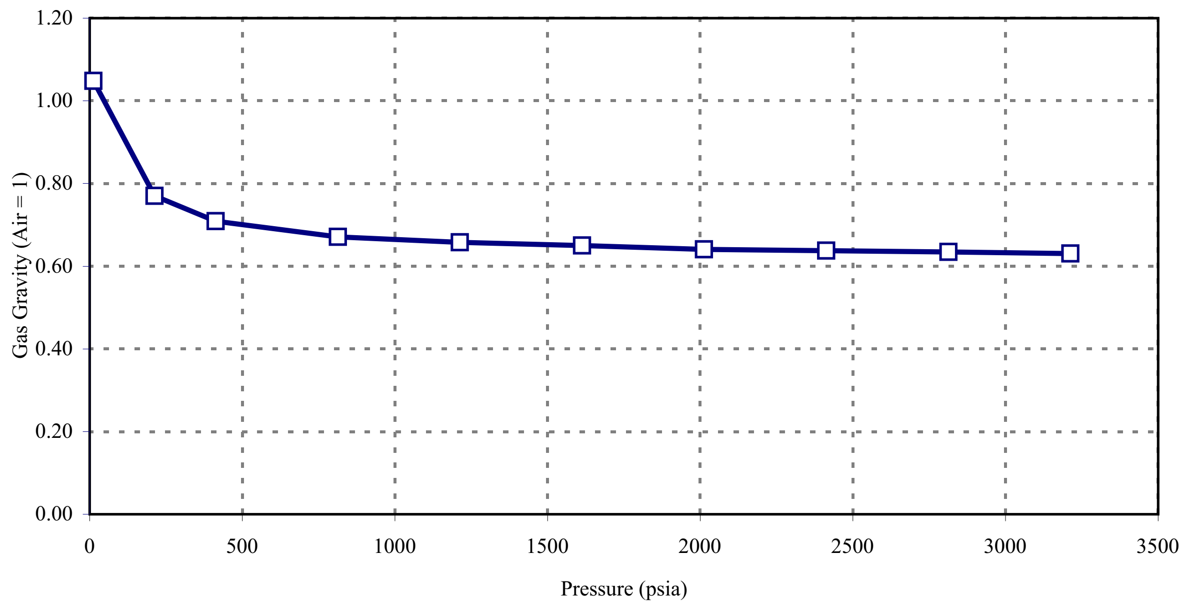


FIGURE 8
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS GRAVITY @ 228.2 F (109.0 C)



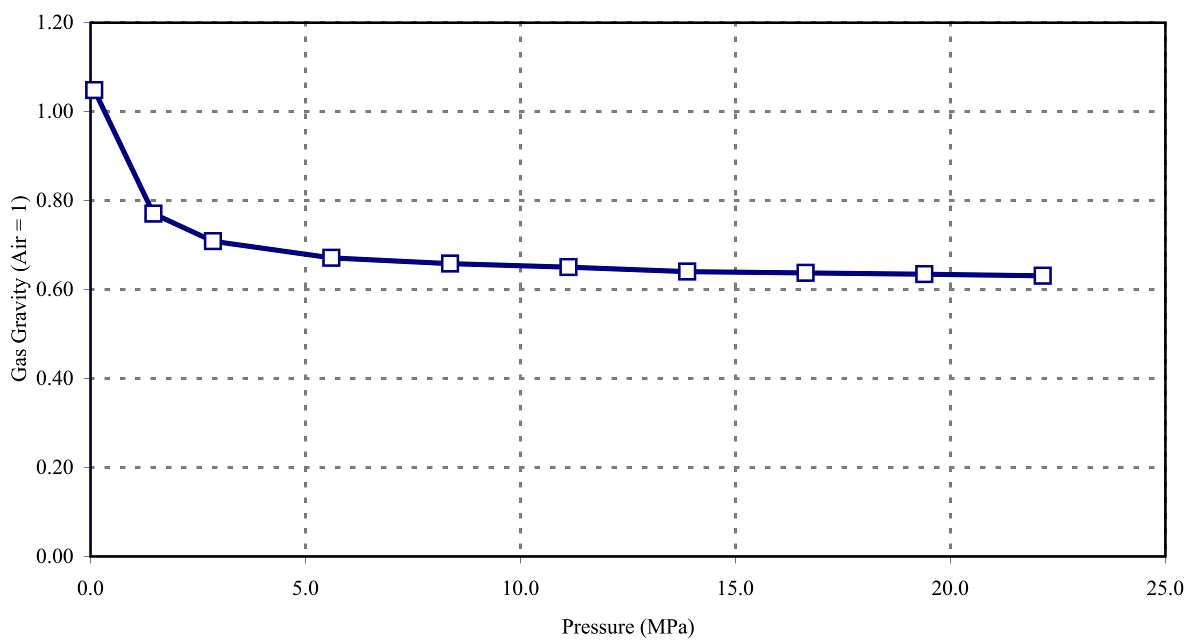
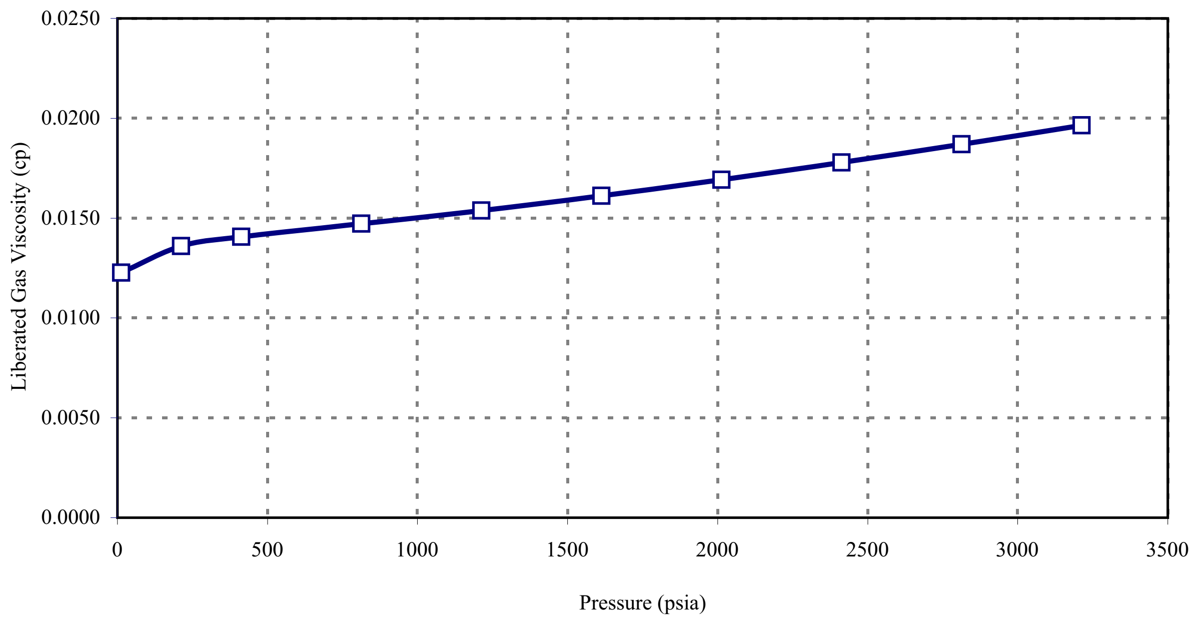


FIGURE 9
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS VISCOSITY @ 228.2 F (109.0 C)



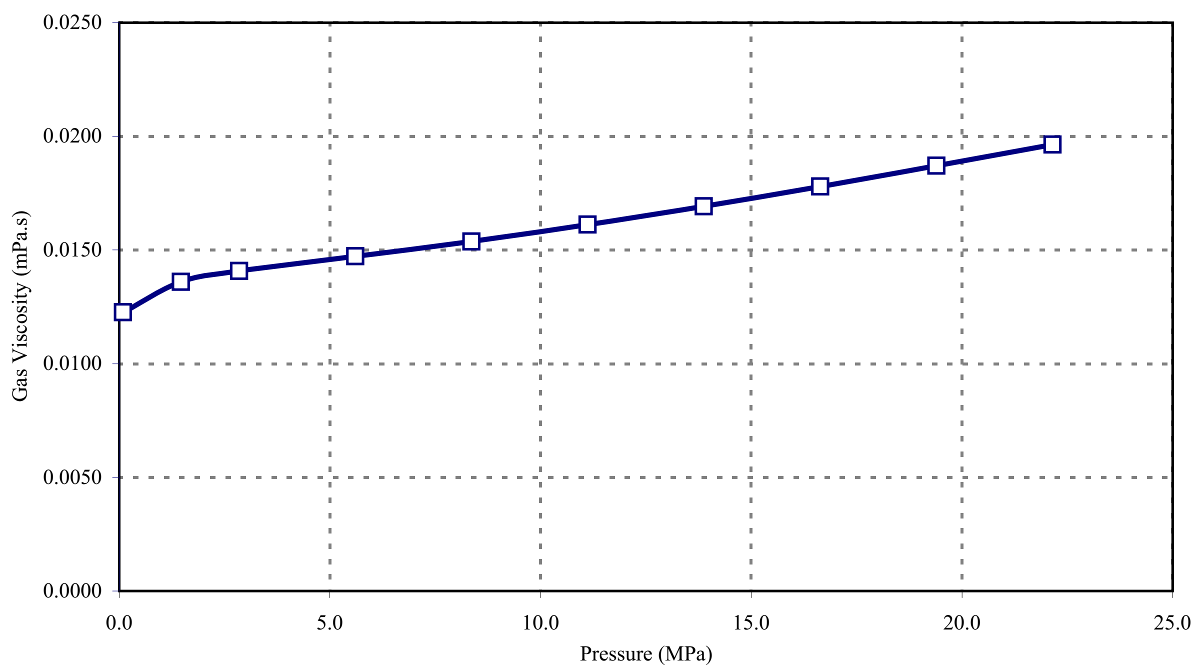
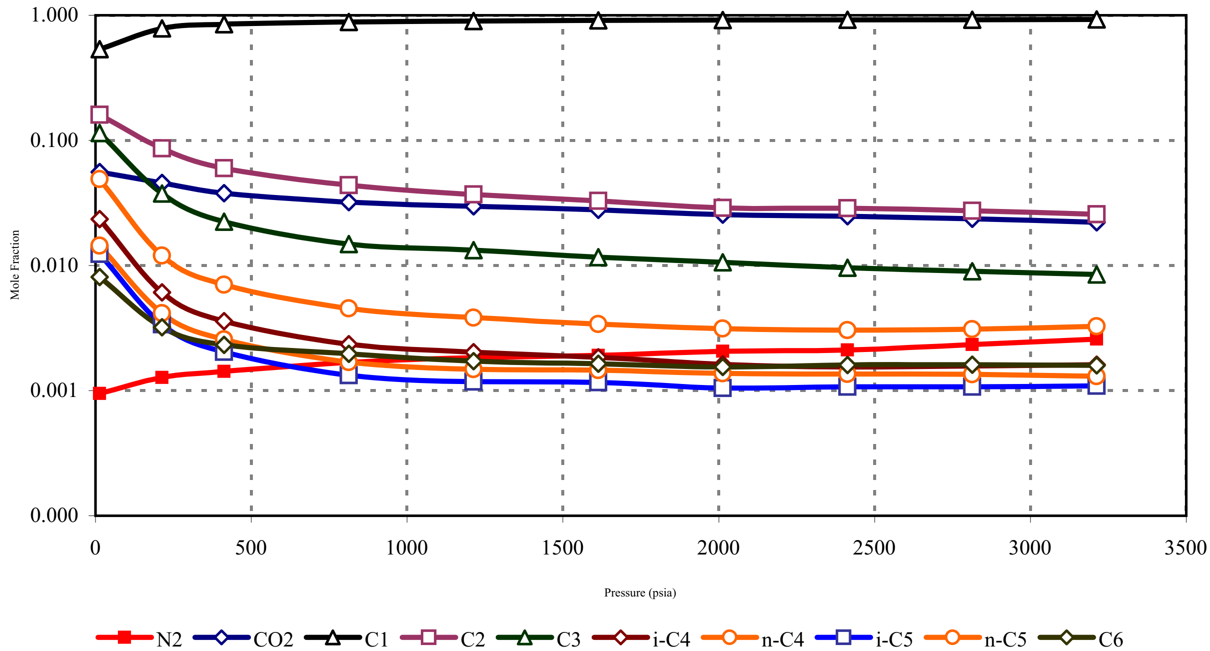
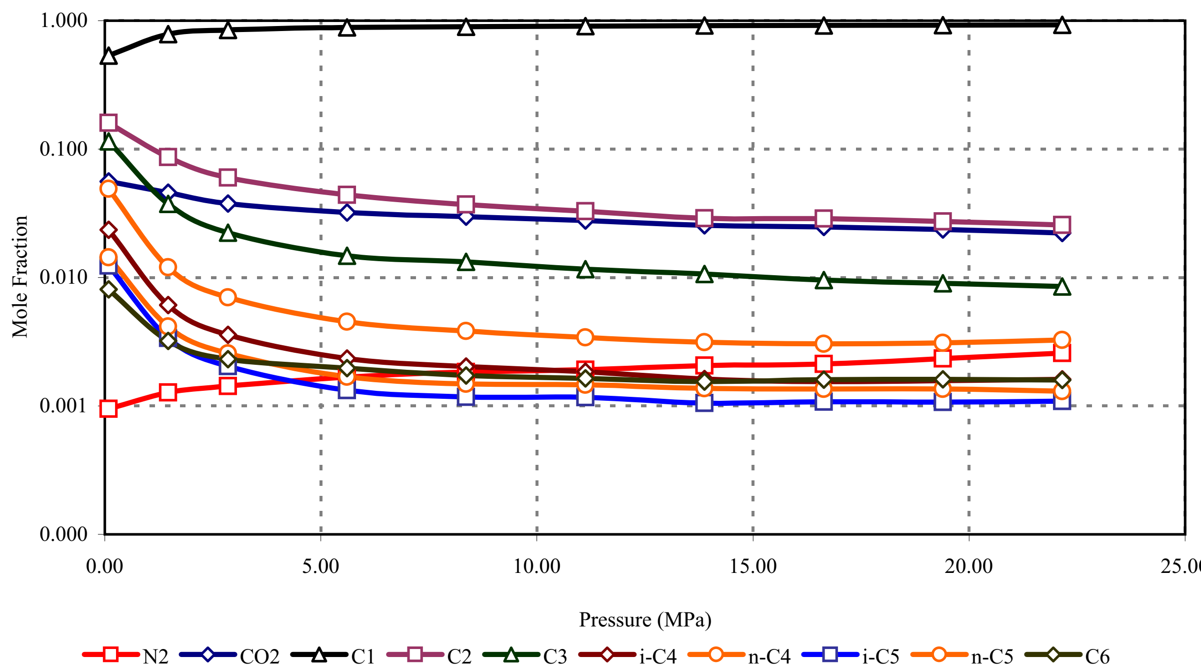


FIGURE 10
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
LIBERATED GAS COMPOSITION PROFILE @ 228.2 F (109.0 C)





APPENDIX A

SAMPLE VALIDATION

TABLE A1
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
COMPOSITIONAL ANALYSIS OF RESERVOIR FLUID

Boiling Point (F)	Component Name	Chemical Symbol	Mole Fraction	Mass Fraction
-320.4	Nitrogen	N_2	0.0041	0.0009
-109.3	Carbon Dioxide	CO_2	0.0159	0.0056
-76.6	Hydrogen Sulphide	H_2S	0.0000	0.0000
-259.1	Methane	C_1	0.4779	0.0616
-128.0	Ethane	C_2	0.0244	0.0059
-44.0	Propane	C_3	0.0117	0.0042
10.9	i-Butane	$i\text{-}C_4$	0.0026	0.0012
30.9	n-Butane	$n\text{-}C_4$	0.0064	0.0030
82.0	i-Pentane	$i\text{-}C_5$	0.0032	0.0018
97.0	n-Pentane	$n\text{-}C_5$	0.0048	0.0028
97 - 156	Hexanes	C_6	0.0090	0.0062
156 - 208.9	Heptanes	C_7	0.0113	0.0091
208.9 - 258.1	Octanes	C_8	0.0231	0.0212
258.1 - 303.1	Nonanes	C_9	0.0205	0.0211
303.1 - 345	Decanes	C_{10}	0.0221	0.0253
345 - 385	Undecanes	C_{11}	0.0254	0.0300
385 - 419	Dodecanes	C_{12}	0.0252	0.0326
419 - 455	Tridecanes	C_{13}	0.0254	0.0358
455 - 486	Tetradecanes	C_{14}	0.0265	0.0405
486 - 519.1	Pentadecanes	C_{15}	0.0192	0.0319
519.1 - 550	Hexadecanes	C_{16}	0.0180	0.0321
	Heptadecanes	C_{17}	0.0164	0.0311
557 - 603	Octadecanes	C_{18}	0.0164	0.0332
603 - 626	Nonadecanes	C_{19}	0.0151	0.0318
626 - 651.9	Eicosanes	C_{20}	0.0133	0.0295
651.9 - 675	Heneicosanes	C_{21}	0.0111	0.0260
675 - 696.9	Docosanes	C_{22}	0.0099	0.0243
696.9 - 716	Tricosanes	C_{23}	0.0084	0.0215
716 - 736	Tetracosanes	C_{24}	0.0084	0.0223
736 - 755.1	Pentacosanes	C_{25}	0.0084	0.0234
755.1 - 774	Hexacosanes	C_{26}	0.0071	0.0203
774.1 - 792	Heptacosanes	C_{27}	0.0068	0.0204
792.1 - 809.1	Octacosanes	C_{28}	0.0066	0.0205
809.1 - 826	Nonacosanes	C_{29}	0.0063	0.0203
Above 826	Tricontanes Plus	C_{30+}	0.0577	0.2795
	NAPHTHENES			
120.0	Cyclopentane	C_5H_{10}	0.0011	0.0006
162.0	Methylcyclopentane	C_6H_{12}	0.0054	0.0037
178.0	Cyclohexane	C_6H_{12}	0.0052	0.0035
214.0	Methylcyclohexane	C_7H_{14}	0.0071	0.0056
	AROMATICS			
176.0	Benzene	C_6H_6	0.0058	0.0037
231.1	Toluene	C_7H_8	0.0003	0.0002
277 - 282	Ethylbenzene & p,m-Xylene	C_8H_{10}	0.0024	0.0021
291.9	o-Xylene	C_8H_{10}	0.0014	0.0012
336.0	1, 2, 4-Trimethylbenzene	C_9H_{12}	0.0027	0.0026
Total			**1.0000**	**1.0000**

Calculated Properties

Total Sample	
Molecular Weight	124.44
Density (g/cc)	0.7715

C_{6+} Fraction	
Molecular Weight	253.00
Mole Fraction	0.4491
Density (g/cc)	0.8752

C_{7+} Fraction	
Molecular Weight	256.86
Mole Fraction	0.4390
Density (g/cc)	0.8770

C_{12+} Fraction	
Molecular Weight	315.66
Mole Fraction	0.3063
Density (g/cc)	0.8968

C_{30+} Fraction	
Molecular Weight	602.59
Mole Fraction	0.0577
Density (g/cc)	0.9863

Recombination Parameters	
Gas-Oil Ratio (cc/cc)	97.12
Dead Oil Density (g/cc)	0.8640
Dead Oil MW (g/mol)	248.88

Note: Physical Properties calculated based GPA 2145-00 physical constants

TABLE A2
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
COMPOSITIONAL ANALYSIS OF FLASHED OIL

Boiling Point (F)	Component Name	Chemical Symbol	Mole Fraction	Mass Fraction	Calculated Properties	
-320.4	Nitrogen	N_2	0.0000	0.0000	**Total Sample**	
-109.3	Carbon Dioxide	CO_2	0.0000	0.0000		
-76.6	Hydrogen Sulphide	H_2S	0.0000	0.0000	Molecular Weight	248.88
-259.1	Methane	C_1	0.0000	0.0000	Density (g/cc)	0.8726
-128.0	Ethane	C_2	0.0000	0.0000		
-44.0	Propane	C_3	0.0046	0.0008	**C_{6+} Fraction**	
10.9	i-Butane	i-C_4	0.0025	0.0006		
30.9	n-Butane	n-C_4	0.0080	0.0019	Molecular Weight	254.48
82.0	i-Pentane	i-C_5	0.0055	0.0016	Mole Fraction	0.9707
97.0	n-Pentane	n-C_5	0.0088	0.0025	Density (g/cc)	0.8757
97 - 156	Hexanes	C_6	0.0180	0.0062		
156 - 208.9	Heptanes	C_7	0.0237	0.0096	**C_{7+} Fraction**	
208.9 - 258.1	Octanes	C_8	0.0504	0.0231		
258.1 - 303.1	Nonanes	C_9	0.0446	0.0230	Molecular Weight	258.13
303.1 - 345	Decanes	C_{10}	0.0482	0.0276	Mole Fraction	0.9504
345 - 385	Undecanes	C_{11}	0.0553	0.0327	Density (g/cc)	0.8773
385 - 419	Dodecanes	C_{12}	0.0550	0.0356		
419 - 455	Tridecanes	C_{13}	0.0555	0.0390	**C_{12+} Fraction**	
455 - 486	Tetradecanes	C_{14}	0.0579	0.0442		
486 - 519.1	Pentadecanes	C_{15}	0.0420	0.0347	Molecular Weight	315.66
519.1 - 550	Hexadecanes	C_{16}	0.0392	0.0350	Mole Fraction	0.6681
	Heptadecanes	C_{17}	0.0357	0.0340	Density (g/cc)	0.8968
557 - 603	Octadecanes	C_{18}	0.0359	0.0362		
603 - 626	Nonadecanes	C_{19}	0.0329	0.0347	**C_{30+} Fraction**	
626 - 651.9	Eicosanes	C_{20}	0.0291	0.0321		
651.9 - 675	Heneicosanes	C_{21}	0.0242	0.0283	Molecular Weight	602.59
675 - 696.9	Docosanes	C_{22}	0.0216	0.0265	Mole Fraction	0.1259
696.9 - 716	Tricosanes	C_{23}	0.0184	0.0235	Density (g/cc)	0.9863
716 - 736	Tetracosanes	C_{24}	0.0183	0.0243		
736 - 755.1	Pentacosanes	C_{25}	0.0184	0.0255		
755.1 - 774	Hexacosanes	C_{26}	0.0154	0.0222		
774.1 - 792	Heptacosanes	C_{27}	0.0148	0.0222		
792.1 - 809.1	Octacosanes	C_{28}	0.0144	0.0224		
809.1 - 826	Nonacosanes	C_{29}	0.0137	0.0221		
Above 826	Tricontanes Plus	C_{30+}	0.1259	0.3048		
	NAPHTHENES					
120.0	Cyclopentane	C_5H_{10}	0.0023	0.0006		
162.0	Methylcyclopentane	C_6H_{12}	0.0069	0.0023		
178.0	Cyclohexane	C_6H_{12}	0.0107	0.0036		
214.0	Methylcyclohexane	C_7H_{14}	0.0153	0.0060		
	AROMATICS					
176.0	Benzene	C_6H_6	0.0124	0.0039		
231.1	Toluene	C_7H_8	0.0006	0.0002		
277 - 282	Ethylbenzene & p,m-Xylene	C_8H_{10}	0.0053	0.0022		
291.9	o-Xylene	C_8H_{10}	0.0031	0.0013		
336.0	1, 2, 4-Trimethylbenzene	C_9H_{12}	0.0059	0.0028		
Total			**1.0000**	**1.0000**		

Note: Physical Properties calculated based GPA 2145-00 physical constants

TABLE A3
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
COMPOSITIONAL ANALYSIS OF FLASHED GAS

Component Name	Chemical Symbol	Mole Fraction As Analyzed	Mole Fraction Acid Gas Free	Liquid Volume STB/MMscf	Liquid Volume mL/m3
Nitrogen	N_2	0.0076	0.0079		
Carbon Dioxide	CO_2	0.0293	0.0000		
Hydrogen Sulphide	H_2S	0.0000	0.0000		
Methane	C_1	0.8825	0.9091		
Ethane	C_2	0.0450	0.0463		
Propane	C_3	0.0178	0.0183	11.624	65.264
i-Butane	i-C_4	0.0027	0.0028	2.125	11.929
n-Butane	n-C_4	0.0051	0.0053	3.836	21.535
i-Pentane	i-C_5	0.0012	0.0012	1.034	5.805
n-Pentane	n-C_5	0.0014	0.0014	1.207	6.779
Hexanes	C_6	0.0014	0.0014	1.321	7.417
Heptanes	C_7	0.0056	0.0058	6.137	34.453
Octanes	C_8	0.0004	0.0004	0.441	2.478
Nonanes	C_9	0.0000	0.0000	0.040	0.223
Decanes	C_{10}	0.0000	0.0000	0.004	0.020
Undecane	C_{11}	0.0000	0.0000	0.003	0.018
Dodecanes Plus	C_{12+}	0.0000	0.0000	0.004	0.021
Total		**1.0000**	**1.0000**	**27.771**	**155.921**
Propanes Plus	C_{3+}	0.0356	0.0367	27.775	155.943
Butanes Plus	C_{4+}	0.0178	0.0184	16.151	90.679
	C_{5+}	0.0100	0.0103	10.191	57.215

Calculated Gas Properties @ Standard Conditions			Calculated Pseudocritical Properties		
Molecular Weight	19.14 kg/kmol	19.14 lb/lb-mol	Ppc	675.8 psia	4.66 MPa
Specific Gravity	0.6608 (Air = 1)	0.6608 (Air = 1)	Tpc	372.3 R	206.8 K
MW of C7+	0.58 kg/kmol	0.58 lb/lbmol	Ppc*	667.4 psia	4.60 MPa
Density of C7+	0.7237 g/cc	723.7 kg/m3	Tpc*	367.7 R	204.3 K

Calculated Gross Heating Value @ Standard Conditions			Calculated Net Heating Value @ Standard Conditions		
Dry	1,091.3 Btu/scf	40.74 MJ/m3	Dry	986.4 Btu/scf	36.82 MJ/m3
Wet	1,072.3 Btu/scf	40.03 MJ/m3	Wet	969.2 Btu/scf	36.18 MJ/m3

Standard Conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa)

GC No.: 1388

APPENDIX B

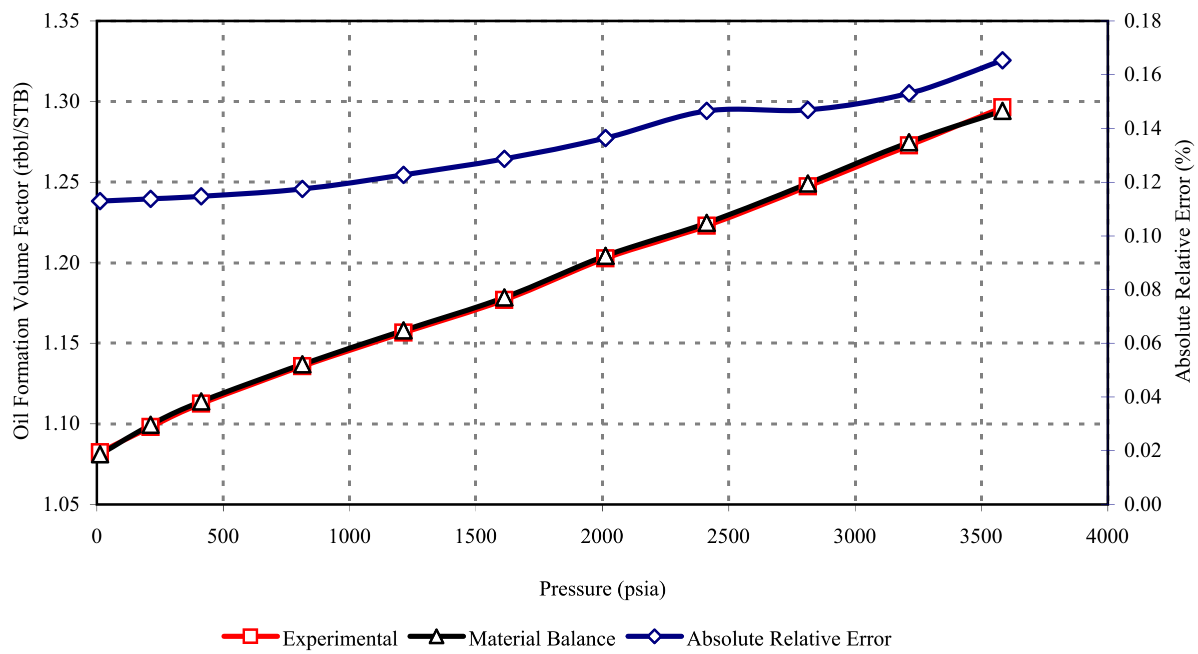
DIFFERENTIAL LIBERATION - MATERIAL BALANCE

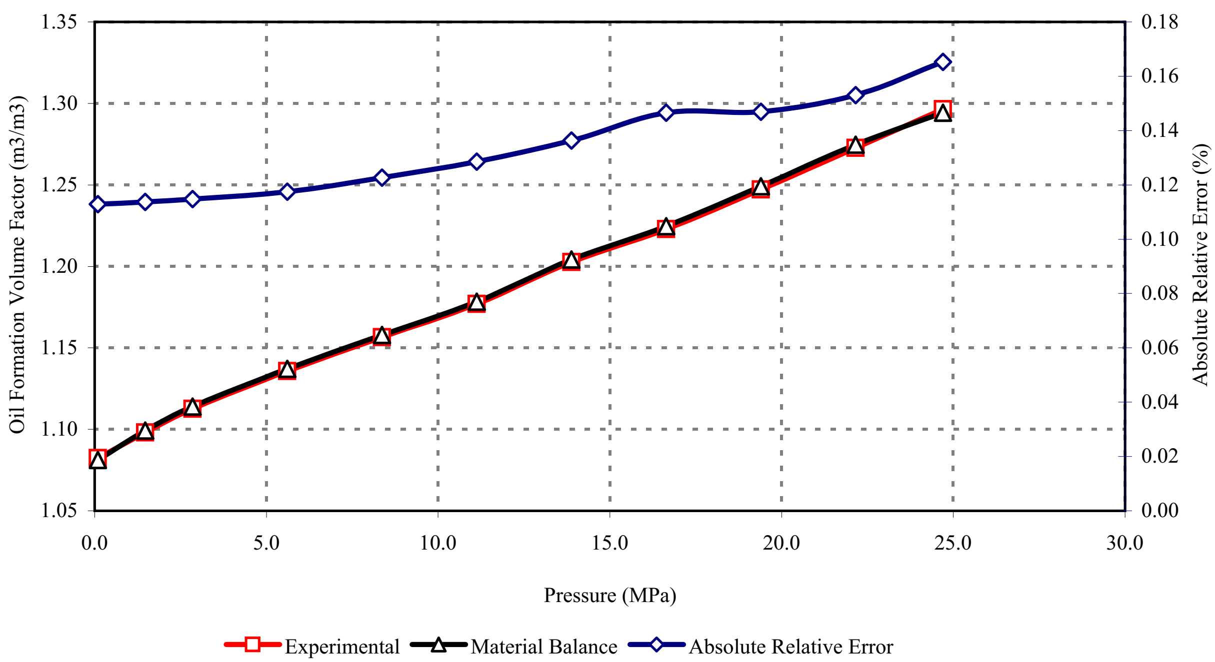
TABLE B1
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION @ 228.2 F (109.0 C) - MATERIAL BALANCE

Pressure (psia)	Pressure (MPa)	Measured Oil FVF [1]	Calculated Oil FVF [1]	Absolute Relative Error (%)
3583 Psat	**24.70**	**1.2964**	**1.2943**	**0.1653**
3213	22.15	1.2727	1.2747	0.1530
2813	19.39	1.2473	1.2491	0.1469
2413	16.64	1.2229	1.2247	0.1466
2013	13.88	1.2026	1.2042	0.1364
1613	11.12	1.1769	1.1784	0.1286
1213	8.36	1.1566	1.1580	0.1227
813	5.61	1.1357	1.1370	0.1175
413	2.85	1.1126	1.1139	0.1147
213	1.47	1.0981	1.0993	0.1138
13	0.09	1.0823	1.0811	0.1129

[1] (res bbl/STB) (res m3/m3)
Psat - Saturation Pressure
- Tank conditions: 60 F (288.7 K) @ 13 psia (0.09 MPa)

FIGURE B1
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION @ 228.2 F (109.0 C) - MATERIAL BALANCE





APPENDIX C

DIFFERENTIAL LIBERATION - LIBERATED GAS ANALYSES

TABLE C1
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS COMPOSITION @ 3,213 psia (22.15 MPa)

Component Name	Chemical Symbol	Mole Fraction As Analyzed	Mole Fraction Acid Gas Free	Liquid Volume STB/MMscf	Liquid Volume mL/m3
Nitrogen	N_2	0.0026	0.0026		
Carbon Dioxide	CO_2	0.0222	0.0000		
Hydrogen Sulphide	H_2S	0.0000	0.0000		
Methane	C_1	0.9258	0.9468		
Ethane	C_2	0.0257	0.0263		
Propane	C_3	0.0085	0.0087	5.546	31.139
i-Butane	$i\text{-}C_4$	0.0016	0.0016	1.251	7.026
n-Butane	$n\text{-}C_4$	0.0033	0.0033	2.443	13.715
i-Pentane	$i\text{-}C_5$	0.0011	0.0011	0.949	5.328
n-Pentane	$n\text{-}C_5$	0.0013	0.0013	1.119	6.283
Hexanes	C_6	0.0016	0.0016	1.554	8.727
Heptanes	C_7	0.0059	0.0061	6.510	36.552
Octanes	C_8	0.0005	0.0005	0.584	3.280
Nonanes	C_9	0.0000	0.0000	0.018	0.102
Decanes	C_{10}	0.0000	0.0000	0.000	0.000
Undecane	C_{11}	0.0000	0.0000	0.000	0.000
Dodecanes Plus	C_{12+}	0.0000	0.0000	0.000	0.000
Total		**1.0000**	**1.0000**	**19.975**	**112.152**
Propanes Plus	C_{3+}	0.0238	0.0243	19.975	112.152
Butanes Plus	C_{4+}	0.0153	0.0157	14.429	81.013
	C_{5+}	0.0104	0.0107	10.735	60.273

Calculated Gas Properties @ Standard Conditions			Calculated Pseudocritical Properties		
Molecular Weight	18.26 kg/kmol	18.26 lb/lb-mol	Ppc	673.7 psia	4.65 MPa
Specific Gravity	0.6306 (Air = 1)	0.6306 (Air = 1)	Tpc	363.5 R	202.0 K
MW of C7+	96.87 kg/kmol	96.87 lb/lbmol	Ppc*	667.0 psia	4.60 MPa
Density of C7+	0.7238 g/cc	723.8 kg/m3	Tpc*	359.9 R	200.0 K

Calculated Gross Heating Value @ Standard Conditions			Calculated Net Heating Value @ Standard Conditions		
Dry	1,070.5 Btu/scf	39.96 MJ/m3	Dry	966.6 Btu/scf	36.08 MJ/m3
Wet	1,051.9 Btu/scf	39.27 MJ/m3	Wet	949.8 Btu/scf	35.45 MJ/m3

Standard Conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa)

GC No.: 1716

TABLE C2
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS COMPOSITION @ 2,813 psia (19.39 MPa)

Component	Chemical	Mole Fraction		Liquid Volume	
Name	Symbol	As Analyzed	Acid Gas Free	STB/MMscf	mL/m3
Nitrogen	N_2	0.0023	0.0024		
Carbon Dioxide	CO_2	0.0236	0.0000		
Hydrogen Sulphide	H_2S	0.0000	0.0000		
Methane	C_1	0.9222	0.9445		
Ethane	C_2	0.0274	0.0280		
Propane	C_3	0.0090	0.0092	5.875	32.983
i-Butane	$i\text{-}C_4$	0.0016	0.0016	1.221	6.853
n-Butane	$n\text{-}C_4$	0.0031	0.0032	2.316	13.003
i-Pentane	$i\text{-}C_5$	0.0011	0.0011	0.932	5.232
n-Pentane	$n\text{-}C_5$	0.0014	0.0014	1.162	6.526
Hexanes	C_6	0.0016	0.0017	1.574	8.839
Heptanes	C_7	0.0058	0.0059	6.312	35.441
Octanes	C_8	0.0009	0.0009	1.126	6.322
Nonanes	C_9	0.0001	0.0001	0.153	0.858
Decanes	C_{10}	0.0000	0.0000	0.000	0.000
Undecane	C_{11}	0.0000	0.0000	0.000	0.000
Dodecanes Plus	C_{12+}	0.0000	0.0000	0.000	0.000
Total		**1.0000**	**1.0000**	**20.671**	**116.058**
Propanes Plus	C_{3+}	0.0245	0.0251	20.671	116.058
Butanes Plus	C_{4+}	0.0155	0.0159	14.796	83.074
	C_{5+}	0.0108	0.0111	11.260	63.219

Calculated Gas Properties @ Standard Conditions			Calculated Pseudocritical Properties		
Molecular Weight	18.37 kg/kmol	18.37 lb/lb-mol	Ppc	674.3 psia	4.65 MPa
Specific Gravity	0.6342 (Air = 1)	0.6342 (Air = 1)	Tpc	364.6 R	202.5 K
MW of C7+	97.92 kg/kmol	97.92 lb/lbmol	Ppc*	667.2 psia	4.60 MPa
Density of C7+	0.7258 g/cc	725.8 kg/m3	Tpc*	360.8 R	200.4 K

Calculated Gross Heating Value @ Standard Conditions			Calculated Net Heating Value @ Standard Conditions		
Dry	1,073.0 Btu/scf	40.05 MJ/m3	Dry	969.0 Btu/scf	36.17 MJ/m3
Wet	1,054.4 Btu/scf	39.36 MJ/m3	Wet	952.1 Btu/scf	35.54 MJ/m3

Standard Conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa)

GC No.: 1732

TABLE C3
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS COMPOSITION @ 2,413 psia (16.64 MPa)

Component Name	Chemical Symbol	Mole Fraction		Liquid Volume	
		As Analyzed	Acid Gas Free	STB/MMscf	mL/m3
Nitrogen	N_2	0.0021	0.0022		
Carbon Dioxide	CO_2	0.0248	0.0000		
Hydrogen Sulphide	H_2S	0.0000	0.0000		
Methane	C_1	0.9191	0.9424		
Ethane	C_2	0.0287	0.0294		
Propane	C_3	0.0096	0.0098	6.252	35.103
i-Butane	$i\text{-}C_4$	0.0015	0.0016	1.198	6.728
n-Butane	$n\text{-}C_4$	0.0030	0.0031	2.273	12.764
i-Pentane	$i\text{-}C_5$	0.0011	0.0011	0.935	5.251
n-Pentane	$n\text{-}C_5$	0.0014	0.0014	1.165	6.539
Hexanes	C_6	0.0016	0.0016	1.566	8.790
Heptanes	C_7	0.0059	0.0060	6.444	36.183
Octanes	C_8	0.0011	0.0011	1.293	7.260
Nonanes	C_9	0.0002	0.0002	0.206	1.159
Decanes	C_{10}	0.0000	0.0000	0.000	0.000
Undecane	C_{11}	0.0000	0.0000	0.000	0.000
Dodecanes Plus	C_{12+}	0.0000	0.0000	0.000	0.000
Total		**1.0000**	**1.0000**	**21.333**	**119.776**
Propanes Plus	C_{3+}	0.0253	0.0259	21.333	119.776
Butanes Plus	C_{4+}	0.0157	0.0161	15.081	84.673
	C_{5+}	0.0111	0.0114	11.609	65.181

Calculated Gas Properties @ Standard Conditions			Calculated Pseudocritical Properties		
Molecular Weight	18.46 kg/kmol	18.46 lb/lb-mol	Ppc	674.7 psia	4.65 MPa
Specific Gravity	0.6373 (Air = 1)	0.6373 (Air = 1)	Tpc	365.5 R	203.0 K
MW of C7+	98.19 kg/kmol	98.19 lb/lbmol	Ppc*	667.4 psia	4.60 MPa
Density of C7+	0.7264 g/cc	726.4 kg/m3	Tpc*	361.5 R	200.8 K

Calculated Gross Heating Value @ Standard Conditions			Calculated Net Heating Value @ Standard Conditions		
Dry	1,075.2 Btu/scf	40.13 MJ/m3	Dry	971.0 Btu/scf	36.25 MJ/m3
Wet	1,056.5 Btu/scf	39.43 MJ/m3	Wet	954.1 Btu/scf	35.61 MJ/m3

Standard Conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa)

GC No.: 1735

TABLE C4
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS COMPOSITION @ 2,013 psia (13.88 MPa)

Component Name	Chemical Symbol	Mole Fraction As Analyzed	Mole Fraction Acid Gas Free	Liquid Volume STB/MMscf	Liquid Volume mL/m3
Nitrogen	N_2	0.0021	0.0021		
Carbon Dioxide	CO_2	0.0254	0.0000		
Hydrogen Sulphide	H_2S	0.0000	0.0000		
Methane	C_1	0.9165	0.9404		
Ethane	C_2	0.0289	0.0297		
Propane	C_3	0.0106	0.0109	6.938	38.954
i-Butane	$i\text{-}C_4$	0.0016	0.0017	1.258	7.062
n-Butane	$n\text{-}C_4$	0.0031	0.0032	2.350	13.195
i-Pentane	$i\text{-}C_5$	0.0011	0.0011	0.913	5.127
n-Pentane	$n\text{-}C_5$	0.0014	0.0014	1.178	6.614
Hexanes	C_6	0.0016	0.0016	1.514	8.498
Heptanes	C_7	0.0070	0.0072	7.659	43.000
Octanes	C_8	0.0006	0.0006	0.712	3.996
Nonanes	C_9	0.0001	0.0001	0.190	1.067
Decanes	C_{10}	0.0000	0.0000	0.000	0.000
Undecane	C_{11}	0.0000	0.0000	0.000	0.000
Dodecanes Plus	C_{12+}	0.0000	0.0000	0.000	0.000
Total		**1.0000**	**1.0000**	**22.711**	**127.513**
Propanes Plus	C_{3+}	0.0271	0.0278	22.711	127.513
Butanes Plus	C_{4+}	0.0165	0.0169	15.773	88.559
	C_{5+}	0.0117	0.0120	12.165	68.302

Calculated Gas Properties @ Standard Conditions			Calculated Pseudocritical Properties		
Molecular Weight	18.56 kg/kmol	18.56 lb/lb-mol	Ppc	674.8 psia	4.65 MPa
Specific Gravity	0.6406 (Air = 1)	0.6406 (Air = 1)	Tpc	366.4 R	203.6 K
MW of C7+	97.29 kg/kmol	97.29 lb/lbmol	Ppc*	667.3 psia	4.60 MPa
Density of C7+	0.7245 g/cc	724.5 kg/m3	Tpc*	362.3 R	201.3 K

Calculated Gross Heating Value @ Standard Conditions			Calculated Net Heating Value @ Standard Conditions		
Dry	1,078.9 Btu/scf	40.27 MJ/m3	Dry	974.5 Btu/scf	36.38 MJ/m3
Wet	1,060.1 Btu/scf	39.57 MJ/m3	Wet	957.6 Btu/scf	35.74 MJ/m3

Standard Conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa)

GC No.: 1749

TABLE C5
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS COMPOSITION @ 1,613 psia (11.12 MPa)

Component Name	Chemical Symbol	Mole Fraction As Analyzed	Mole Fraction Acid Gas Free	Liquid Volume STB/MMscf	Liquid Volume mL/m3
Nitrogen	N_2	0.0019	0.0020		
Carbon Dioxide	CO_2	0.0278	0.0000		
Hydrogen Sulphide	H_2S	0.0000	0.0000		
Methane	C_1	0.9075	0.9335		
Ethane	C_2	0.0329	0.0338		
Propane	C_3	0.0116	0.0120	7.600	42.671
i-Butane	$i\text{-}C_4$	0.0018	0.0019	1.433	8.046
n-Butane	$n\text{-}C_4$	0.0034	0.0035	2.554	14.339
i-Pentane	$i\text{-}C_5$	0.0012	0.0012	1.015	5.700
n-Pentane	$n\text{-}C_5$	0.0015	0.0015	1.253	7.032
Hexanes	C_6	0.0016	0.0017	1.598	8.971
Heptanes	C_7	0.0073	0.0075	7.971	44.755
Octanes	C_8	0.0012	0.0012	1.447	8.124
Nonanes	C_9	0.0002	0.0002	0.272	1.529
Decanes	C_{10}	0.0000	0.0000	0.011	0.063
Undecane	C_{11}	0.0000	0.0000	0.000	0.000
Dodecanes Plus	C_{12+}	0.0000	0.0000	0.000	0.000
Total		**1.0000**	**1.0000**	**25.154**	**141.229**
Propanes Plus	C_{3+}	0.0298	0.0307	25.154	141.229
Butanes Plus	C_{4+}	0.0182	0.0187	17.554	98.558
	C_{5+}	0.0129	0.0133	13.567	76.174

Calculated Gas Properties @ Standard Conditions			Calculated Pseudocritical Properties		
Molecular Weight	18.83 kg/kmol	18.83 lb/lb-mol	Ppc	675.5 psia	4.66 MPa
Specific Gravity	0.6500 (Air = 1)	0.6500 (Air = 1)	Tpc	369.1 R	205.0 K
MW of C7+	98.13 kg/kmol	98.13 lb/lbmol	Ppc*	667.5 psia	4.60 MPa
Density of C7+	0.7262 g/cc	726.2 kg/m3	Tpc*	364.7 R	202.6 K

Calculated Gross Heating Value @ Standard Conditions			Calculated Net Heating Value @ Standard Conditions		
Dry	1,088.0 Btu/scf	40.61 MJ/m3	Dry	983.1 Btu/scf	36.70 MJ/m3
Wet	1,069.1 Btu/scf	39.91 MJ/m3	Wet	966.0 Btu/scf	36.06 MJ/m3

Standard Conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa)
Standard Conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa)

GC No.: 1761

TABLE C6
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS COMPOSITION @ 1,213 psia (8.36 MPa)

Component Name	Chemical Symbol	Mole Fraction As Analyzed	Mole Fraction Acid Gas Free	Liquid Volume STB/MMscf	Liquid Volume mL/m3
Nitrogen	N_2	0.0018	0.0019		
Carbon Dioxide	CO_2	0.0298	0.0000		
Hydrogen Sulphide	H_2S	0.0000	0.0000		
Methane	C_1	0.8985	0.9261		
Ethane	C_2	0.0370	0.0381		
Propane	C_3	0.0133	0.0137	8.675	48.705
i-Butane	i-C_4	0.0020	0.0021	1.572	8.828
n-Butane	n-C_4	0.0038	0.0040	2.867	16.099
i-Pentane	i-C_5	0.0012	0.0012	1.024	5.748
n-Pentane	n-C_5	0.0015	0.0015	1.278	7.176
Hexanes	C_6	0.0017	0.0018	1.680	9.435
Heptanes	C_7	0.0089	0.0092	9.767	54.838
Octanes	C_8	0.0004	0.0004	0.455	2.552
Nonanes	C_9	0.0000	0.0000	0.061	0.343
Decanes	C_{10}	0.0000	0.0000	0.000	0.000
Undecane	C_{11}	0.0000	0.0000	0.000	0.000
Dodecanes Plus	C_{12+}	0.0000	0.0000	0.005	0.025
Total		**1.0000**	**1.0000**	**27.384**	**153.749**
Propanes Plus	C_{3+}	0.0329	0.0339	27.384	153.749
Butanes Plus	C_{4+}	0.0196	0.0202	18.709	105.044
	C_{5+}	0.0137	0.0142	14.270	80.118

Calculated Gas Properties @ Standard Conditions			Calculated Pseudocritical Properties		
Molecular Weight	19.06 kg/kmol	19.06 lb/lb-mol	Ppc	676.1 psia	4.66 MPa
Specific Gravity	0.6580 (Air = 1)	0.6580 (Air = 1)	Tpc	371.5 R	206.4 K
MW of C7+	96.58 kg/kmol	96.58 lb/lbmol	Ppc*	667.7 psia	4.60 MPa
Density of C7+	0.7231 g/cc	723.1 kg/m3	Tpc*	366.9 R	203.8 K

Calculated Gross Heating Value @ Standard Conditions			Calculated Net Heating Value @ Standard Conditions		
Dry	1,095.9 Btu/scf	40.91 MJ/m3	Dry	990.5 Btu/scf	36.97 MJ/m3
Wet	1,076.8 Btu/scf	40.20 MJ/m3	Wet	973.3 Btu/scf	36.33 MJ/m3

Standard Conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa)

GC No.: 1766

TABLE C7
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS COMPOSITION @ 813 psia (5.61 MPa)

Component Name	Chemical Symbol	Mole Fraction As Analyzed	Mole Fraction Acid Gas Free	Liquid Volume STB/MMscf	Liquid Volume mL/m3
Nitrogen	N_2	0.0017	0.0017		
Carbon Dioxide	CO_2	0.0321	0.0000		
Hydrogen Sulphide	H_2S	0.0000	0.0000		
Methane	C_1	0.8851	0.9145		
Ethane	C_2	0.0440	0.0454		
Propane	C_3	0.0148	0.0153	9.677	54.332
i-Butane	$i\text{-}C_4$	0.0023	0.0024	1.819	10.211
n-Butane	$n\text{-}C_4$	0.0045	0.0047	3.395	19.059
i-Pentane	$i\text{-}C_5$	0.0013	0.0014	1.153	6.473
n-Pentane	$n\text{-}C_5$	0.0017	0.0017	1.449	8.133
Hexanes	C_6	0.0020	0.0020	1.918	10.766
Heptanes	C_7	0.0095	0.0098	10.372	58.231
Octanes	C_8	0.0008	0.0008	0.996	5.594
Nonanes	C_9	0.0002	0.0002	0.207	1.162
Decanes	C_{10}	0.0000	0.0000	0.011	0.063
Undecane	C_{11}	0.0000	0.0000	0.000	0.000
Dodecanes Plus	C_{12+}	0.0000	0.0000	0.000	0.000
Total		**1.0000**	**1.0000**	**30.996**	**174.025**
Propanes Plus	C_{3+}	0.0371	0.0384	30.996	174.025
Butanes Plus	C_{4+}	0.0223	0.0231	21.319	119.693
	C_{5+}	0.0154	0.0159	16.105	90.423

Calculated Gas Properties @ Standard Conditions			Calculated Pseudocritical Properties		
Molecular Weight	19.44 kg/kmol	19.44 lb/lb-mol	Ppc	676.7 psia	4.67 MPa
Specific Gravity	0.6712 (Air = 1)	0.6712 (Air = 1)	Tpc	375.4 R	208.6 K
MW of C7+	97.26 kg/kmol	97.26 lb/lbmol	Ppc*	667.8 psia	4.60 MPa
Density of C7+	0.7245 g/cc	724.5 kg/m3	Tpc*	370.5 R	205.8 K

Calculated Gross Heating Value @ Standard Conditions			Calculated Net Heating Value @ Standard Conditions		
Dry	1,110.8 Btu/scf	41.46 MJ/m3	Dry	1,004.5 Btu/scf	37.50 MJ/m3
Wet	1,091.5 Btu/scf	40.74 MJ/m3	Wet	987.1 Btu/scf	36.84 MJ/m3

Standard Conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa)

GC No.: 1777

TABLE C8
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS COMPOSITION @ 413 psia (2.85 MPa)

Component Name	Chemical Symbol	Mole Fraction As Analyzed	Mole Fraction Acid Gas Free	Liquid Volume STB/MMscf	Liquid Volume mL/m3
Nitrogen	N_2	0.0014	0.0015		
Carbon Dioxide	CO_2	0.0378	0.0000		
Hydrogen Sulphide	H_2S	0.0000	0.0000		
Methane	C_1	0.8479	0.8811		
Ethane	C_2	0.0599	0.0623		
Propane	C_3	0.0224	0.0233	14.620	82.086
i-Butane	$i\text{-}C_4$	0.0036	0.0037	2.781	15.611
n-Butane	$n\text{-}C_4$	0.0070	0.0073	5.243	29.435
i-Pentane	$i\text{-}C_5$	0.0020	0.0021	1.772	9.951
n-Pentane	$n\text{-}C_5$	0.0026	0.0027	2.203	12.371
Hexanes	C_6	0.0023	0.0024	2.261	12.692
Heptanes	C_7	0.0115	0.0120	12.591	70.694
Octanes	C_8	0.0014	0.0015	1.718	9.643
Nonanes	C_9	0.0002	0.0002	0.294	1.649
Decanes	C_{10}	0.0000	0.0000	0.018	0.103
Undecane	C_{11}	0.0000	0.0000	0.000	0.000
Dodecanes Plus	C_{12+}	0.0000	0.0000	0.000	0.000
Total		**1.0000**	**1.0000**	**43.501**	**244.236**
Propanes Plus	C_{3+}	0.0530	0.0551	43.501	244.236
Butanes Plus	C_{4+}	0.0307	0.0319	28.881	162.151
	C_{5+}	0.0201	0.0209	20.857	117.104

Calculated Gas Properties @ Standard Conditions			Calculated Pseudocritical Properties		
Molecular Weight	20.52 kg/kmol	20.52 lb/lb-mol	Ppc	677.7 psia	4.67 MPa
Specific Gravity	0.7086 (Air = 1)	0.7086 (Air = 1)	Tpc	386.6 R	214.8 K
MW of C7+	97.64 kg/kmol	97.64 lb/lbmol	Ppc*	667.8 psia	4.60 MPa
Density of C7+	0.7252 g/cc	725.2 kg/m3	Tpc*	381.0 R	211.6 K

Calculated Gross Heating Value @ Standard Conditions			Calculated Net Heating Value @ Standard Conditions		
Dry	1,155.9 Btu/scf	43.15 MJ/m3	Dry	1,046.7 Btu/scf	39.07 MJ/m3
Wet	1,135.8 Btu/scf	42.39 MJ/m3	Wet	1,028.5 Btu/scf	38.39 MJ/m3

Standard Conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa)

GC No.: 1779

TABLE C9
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS COMPOSITION @ 213 psia (1.47 MPa)

Component Name	Chemical Symbol	Mole Fraction As Analyzed	Mole Fraction Acid Gas Free	Liquid Volume STB/MMscf	Liquid Volume mL/m3
Nitrogen	N_2	0.0013	0.0013		
Carbon Dioxide	CO_2	0.0457	0.0000		
Hydrogen Sulphide	H_2S	0.0000	0.0000		
Methane	C_1	0.7842	0.8218		
Ethane	C_2	0.0864	0.0905		
Propane	C_3	0.0376	0.0394	24.532	137.732
i-Butane	i-C_4	0.0061	0.0064	4.744	26.637
n-Butane	n-C_4	0.0120	0.0126	8.976	50.396
i-Pentane	i-C_5	0.0034	0.0035	2.934	16.474
n-Pentane	n-C_5	0.0042	0.0044	3.569	20.036
Hexanes	C_6	0.0032	0.0034	3.129	17.570
Heptanes	C_7	0.0148	0.0155	16.184	90.866
Octanes	C_8	0.0011	0.0011	1.298	7.289
Nonanes	C_9	0.0002	0.0002	0.201	1.129
Decanes	C_{10}	0.0000	0.0000	0.013	0.071
Undecane	C_{11}	0.0000	0.0000	0.000	0.000
Dodecanes Plus	C_{12+}	0.0000	0.0000	0.000	0.000
Total		**1.0000**	**1.0000**	**65.580**	**368.199**
Propanes Plus	C_{3+}	0.0824	0.0864	65.580	368.199
Butanes Plus	C_{4+}	0.0449	0.0470	41.048	230.467
	C_{5+}	0.0267	0.0280	27.328	153.434

Calculated Gas Properties @ Standard Conditions			Calculated Pseudocritical Properties		
Molecular Weight	22.31 kg/kmol	22.31 lb/lb-mol	Ppc	678.8 psia	4.68 MPa
Specific Gravity	0.7702 (Air = 1)	0.7702 (Air = 1)	Tpc	405.5 R	225.3 K
MW of C7+	96.99 kg/kmol	96.99 lb/lbmol	Ppc*	667.7 psia	4.60 MPa
Density of C7+	0.7240 g/cc	724.0 kg/m3	Tpc*	398.9 R	221.6 K

Calculated Gross Heating Value @ Standard Conditions			Calculated Net Heating Value @ Standard Conditions		
Dry	1,232.6 Btu/scf	46.01 MJ/m3	Dry	1,118.6 Btu/scf	41.75 MJ/m3
Wet	1,211.1 Btu/scf	45.21 MJ/m3	Wet	1,099.1 Btu/scf	41.03 MJ/m3

Standard Conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa) GC No.: 1785

TABLE C10
HUSKY ENERGY-EAST COAST - WHITE ROSE
WELL E-17 - HIBERNIA - SAMPLE BOTTOMHOLE SAMPLE
RESERVOIR FLUID STUDY
DIFFERENTIAL LIBERATION GAS COMPOSITION @ 13 psia (0.09 MPa)

Component Name	Chemical Symbol	Mole Fraction As Analyzed	Mole Fraction Acid Gas Free	Liquid Volume STB/MMscf	Liquid Volume mL/m3
Nitrogen	N_2	0.0010	0.0010		
Carbon Dioxide	CO_2	0.0560	0.0000		
Hydrogen Sulphide	H_2S	0.0000	0.0000		
Methane	C_1	0.5344	0.5661		
Ethane	C_2	0.1598	0.1692		
Propane	C_3	0.1147	0.1215	74.917	420.622
i-Butane	$i\text{-}C_4$	0.0235	0.0249	18.217	102.282
n-Butane	$n\text{-}C_4$	0.0491	0.0520	36.735	206.250
i-Pentane	$i\text{-}C_5$	0.0124	0.0131	10.752	60.367
n-Pentane	$n\text{-}C_5$	0.0144	0.0152	12.366	69.429
Hexanes	C_6	0.0081	0.0086	7.890	44.297
Heptanes	C_7	0.0253	0.0268	27.671	155.360
Octanes	C_8	0.0013	0.0014	1.624	9.118
Nonanes	C_9	0.0002	0.0002	0.241	1.352
Decanes	C_{10}	0.0000	0.0000	0.016	0.088
Undecane	C_{11}	0.0000	0.0000	0.000	0.000
Dodecanes Plus	C_{12+}	0.0000	0.0000	0.000	0.000
Total		**1.0000**	**1.0000**	**190.429**	**1069.165**
Propanes Plus	C_{3+}	0.2489	0.2637	190.429	1069.165
Butanes Plus	C_{4+}	0.1342	0.1422	115.512	648.543
	C_{5+}	0.0616	0.0653	60.559	340.011

Calculated Gas Properties @ Standard Conditions			Calculated Pseudocritical Properties		
Molecular Weight	30.36 kg/kmol	30.36 lb/lb-mol	Ppc	667.7 psia	4.60 MPa
Specific Gravity	1.0483 (Air = 1)	1.0483 (Air = 1)	Tpc	489.3 R	271.8 K
MW of C7+	96.73 kg/kmol	96.73 lb/lbmol	Ppc*	657.1 psia	4.53 MPa
Density of C7+	0.7235 g/cc	723.5 kg/m3	Tpc*	481.5 R	267.5 K

Calculated Gross Heating Value @ Standard Conditions			Calculated Net Heating Value @ Standard Conditions		
Dry	1,641.7 Btu/scf	61.28 MJ/m3	Dry	1,500.6 Btu/scf	56.01 MJ/m3
Wet	1,613.1 Btu/scf	60.21 MJ/m3	Wet	1,474.5 Btu/scf	55.04 MJ/m3

Standard Conditions: 60 F (288.7 K) @ 14.696 psia (0.101325 MPa)

GC No.: 1790