CANADA-NEWFOUNDLAND and LABRADOR OFFSHORE PETROLEUM BOARD

STAFF ANALYSIS
OF THE
HIBERNIA DEVELOPMENT PLAN
AMENDMENT APPLICATION
2009-08-07

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Preface

It was anticipated that the Proponent would have submitted an Application for the Hibernia Southern Extension as it had in 2006. The Proponent, instead, has filed an Application based on development of the Hibernia B Pool oil reserves that are confined to the AA Block and within PL l 001, and which can be developed using existing facilities. The remaining undeveloped oil reserves that made up the remainder of the Hibernia Southern Extension are now part of the Hibernia South Unit. This portion of the field will be subject to a subsequent Development Plan Amendment Application.

1.0 EXECUTIVE SUMMARY

On June 5, 2009, Hibernia Management and Development Company Ltd. (the Proponent) submitted the document "Hibernia Development Plan Amendment, June 2009" (the Document) to the Canada-Newfoundland and Labrador Offshore Petroleum Board (Board) on behalf of interest owners in Production Licence (PL) 1001 (Figure 2.1).

The Proponent proposes, in the Document, to develop the Hibernia AA Block utilizing existing oil reserves and support infrastructure. This proposal represents a change to the approved Hibernia reservoir depletion scheme as contemplated in the existing Hibernia Development Plan as the AA Block was expected to be water-bearing at that time. As there is no approved plan for depletion of the oil reserves contained in the AA Block, their development constitutes an amendment to the Hibernia Development Plan, and is considered a Development Plan Amendment Application.

The Board's staff reviewed the Document for completeness and requested additional information from the Proponent. This supplementary information was provided on June 30, 2009 and was reviewed by staff. Staff considers the Document and the supplementary information to constitute the "Application".

The Board's staff conducted a review of the Benefits, Resource Management, Operations and Safety, and Environmental aspects of the Application.

With respect to Benefits, Board staff notes that the proposed development of the AA Block from the existing facility and infrastructure will not require an amendment to the existing Hibernia Benefits Plan. However, a Benefits Plan Amendment will be required, including plans for R&D and Affirmative Action, prior to development of the Hibernia South Unit. Should the Proponent decide to drill subsea wells for the AA Block, a Benefits Plan Amendment (including plans for R&D and Affirmative Action) will be required to be submitted and approved by the Board.

With respect to Resource Management, the Board's staff focused its review on the proposed depletion plan for the Hibernia AA Block area. This area is contained within PL 1001 (See Figure 2.1) and is considered to be part of the Hibernia Field.

As shown in the distribution of oil reserves in Table 1.1, the Proponent's "most likely" reserves for the Hibernia B Pool contained in the AA Block is 48.4 million barrels. Peak oil production from the AA Block will reach 25,000 bbls/d (4000 Sm^3/d). It will provide wells that initially produce at high oil rates with low gas content and no water.

Table 1.1 Field Oil Recovery Range (Source: HMDC)

Area	Field Oil Recovery Range					
	Downside		**Most Likely**		**Upside**	
	Millions Barrels	**Millions M^3**	**Millions Barrels**	**Millions M^3**	**Millions Barrels**	**Millions M^3**
Hibernia B Pool	820.6	130.5	868.1	138.0	905.7	144.0
AA Block	37.0	5.9	48.4	7.7	69.8	11.1
Ben Nevis Avalon	104.8	16.7	123.5	19.6	239.6	38.1
Hibernia A Pool	4.1	0.7	8.4	1.3	14.1	2.2
NGL's	38.1	6.1	45.3	27.3	56.0	8.9
Total Proposed DPA	**1004.6**	**159.9**	**1093.7**	**173.8**	**1285.2**	**204.3**
Hibernia South Unit	63.0	10.0	171.8	27.3	280.2	44.60
Catalina	0.0	0.0	0.0	0.0	5.9	0.90
Cape Island	0.0	0.0	0.0	0.0	0.2	0.03
Total with Deferred Development	**1067.6**	**169.9**	**1265.3**	**201.1**	**1571.5**	**249.8**

Based on a review of geologic, petrophysics and reservoir engineering data, the Board's staff is in agreement with the Proponent's strategy of utilizing water flood of the AA Block with a depletion plan consisting of four wells (2 oil producers and 2 water injectors) drilled entirely from the GBS.

According to the Application, there are well slots available to drill the AA Block. The Board's staff believes that the drilling plan contained in the Application is reasonable.

The Hibernia AA Block is considered isolated and cross flow of fluids from other blocks is unlikely.

Development of the AA Block is timely as it will offset Hibernia field decline and optimize facility utilization. No significant facility modifications are required to accommodate the development of Hibernia AA Block. Proposed development of the Block at this time will not affect recoveries from existing production and deferred developments such as the Hibernia South Unit.

The Proponent notes that the existing commercial arrangements among the interest holders are sufficient for AA Block development. The other potential development areas, such as the Hibernia South Unit, will be the subject of future Development Plan Amendment application(s).

With respect to the assessment of the Operations and Safety aspects of the Application, the Board's Chief Safety Officer (CSO) concluded that there are no significant impacts on equipment, processes or training from the wells that are drilled from the platform to the targets in the AA Block. However, it is noted that the Proponent is evaluating the possibility of using gas lift to support oil production from AA Block. Currently the facility is not set-up for gas lift operations, nor does the Safety Plan address gas lift. The Proponent also notes that modifications to the facility would be necessary to accommodate such operations. The Proponent will therefore be required to submit, to the satisfaction of the CSO, an amendment to the Safety Plan to address the scope of the facilities modifications. Furthermore, the Proponent will be required to engage the Certifying Authority to obtain approval prior to any facility modifications for gas lift operations.

It is proposed that the development of AA Block and the Hibernia South Unit will extend the facility life from 2027 to 2036. The facility life has not been approved beyond 2027. The Proponent will be required to submit for consideration by the CSO, within the last five years of the current design life, an analysis regarding the appropriateness of extending the life of the facility beyond 2027.

With respect to the Board's staff review of the Environmental considerations of the Application, Staff concluded that the Application does not require additional environmental assessment pursuant to the *Canadian Environmental Assessment Act*, including the particular cases of produced water and drilling discharges.

Recommendation

Board staff recommends that the Application be approved by the Board.

2.0 BACKGROUND

2.1 The Application

On June 5, 2009, Hibernia Management and Development Company Ltd. (the Proponent) submitted the document "Hibernia Development Plan Amendment June 2009" (the Document) to the Canada-Newfoundland and Labrador Offshore Petroleum Board (Board) on behalf of interest owners in Production Licence (PL) 1001 (Figure 2.1).

The Proponent proposes, in the Document, to develop the Hibernia reservoir located in the AA Block utilizing existing oil reserves and support infrastructure. This proposal represents a change to the approved Hibernia reservoir depletion scheme as the AA Block was expected to have been water-bearing in the original plan. Section 6 of the *Newfoundland Offshore Area Petroleum Production and Conservation Regulations* states that an amendment to the Development Plan will be required when an Operator proposes a depletion plan which differs from that set out in the approved Development Plan. As there is no approved plan for depletion of AA Block oil reserves, their development constitutes an amendment to the Hibernia Development Plan and is considered a Development Plan Amendment Application.

The Board reviewed the Document and the Proponent was advised in a letter dated June 19, 2009, that additional information was necessary. On June 30, 2009, the Proponent provided this additional information. Board staff reviewed this supplementary information, and in a letter dated July 10, 2009, the Proponent was advised that the Application was complete. The Document, and the supplementary documents provided by the Proponent, constituted the "Application" and was the subject of this analysis by the Board's staff.

2.2 History

The Hibernia Field is located on the northeastern Grand Banks, approximately 315 km south-southeast of St. John's, Newfoundland and Labrador. The field was discovered in 1979 by drilling of the Chevron *et al.* Hibernia P-15 well.

On September 15, 1985, Mobil, on behalf of the Hibernia partners, filed the *Hibernia Benefits Plan* and *Hibernia Development Plan* with the Federal and Provincial governments. Subsequent to the appointment of the Board in December 1985, these plans were referred to the Board for review and decision. The Board conditionally approved the Proponent's plans in June 1986 in *Decision 86.01*. Since approval of *Hibernia Development Plan*, the Board has conditionally approved six amendments to this plan.

Since approval of the *Hibernia Development Plan*, development and exploitation of the field has progressed significantly. The Hibernia Field began production in November 1997. As of June 2009, cumulative oil production from the field totalled 641 million barrels (102 million Sm^3).

The Proponent states in the Application that recent drilling and reservoir performance confirm that the Hibernia Field contains more oil reserves than originally estimated. Much of this increase resulted from a determination that additional reserves are located in fault blocks in the southern part of the field. These blocks, in particular AA Block, were previously not expected to contain oil (*Decision Report 2003.01*), and therefore were not considered part of the approved Development Plan. However, further development drilling revealed a deeper oil-water contact in the Hibernia reservoir resulting in an expansion to the southern extent of the field. This implies that the Hibernia reservoir oil accumulation extends into the AA1, AA2, GG1, GG2, MM and NN fault blocks (Figure 2.1).

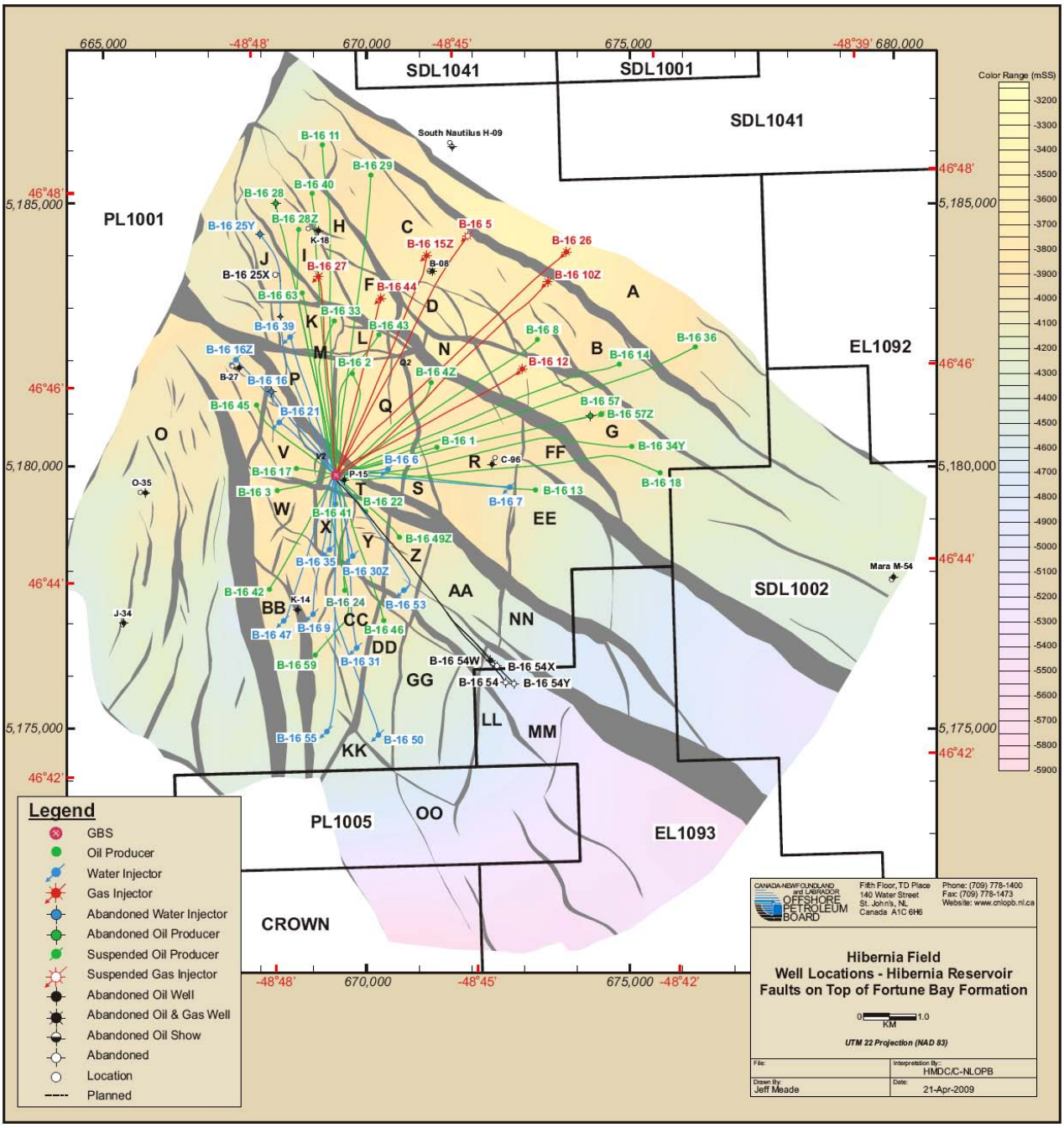

Figure 2. 1: Hibernia Field (Source: C-NLOPB)

Integration of drilling and production data acquired from the Hibernia Field since production began in 1997, has contributed to a number of revisions of recoverable reserve estimates for the field. Table 2.1 presents the most likely reserve estimates provided by the Proponent as well as the reserve estimates reported by the Board. From Table 2.1, it is evident that there has been a steady increase in the Proponent's reserve estimates.

Table 2. 1: Hibernia Field: Summary of Most Likely* Oil Reserve Estimates

Year	**Oil Reserves Millions Barrels (Millions Sm^3)**	
	Proponent	**C-NLOPB**
1986	522 (83)	711 (113)
1996	616 (98)	666 (105)
2000	750 (119)	884 (140)
2002	780 (124)	865 (138)
2006	1203 (191)	1244 (198)
2009	***1265.3 (201)***	***1244 (198)***

*There has been considerable variation in terminology used in relation to reserves. The most likely reserve estimate is comparable to base case reserves, proven plus probable (2P) reserves and P50 reserves developed by statistical analysis.

Numerous factors have contributed to the increasing oil reserve estimates for the Hibernia Field. Acquisition of additional information from drilling and production activities has contributed to a better understanding of the field. This information enables the Proponent to construct improved geologic and reservoir simulation models that allow the Proponent:

- to better estimate the oil-in-place and gas-in-place volumes;
- to assess performance of the water flood and gas flood exploitation schemes; and,
- to assess the merits of alternate exploitation schemes.

The 2009 reserve estimates are discussed later in the Resource Management section of this report.

The Hibernia Field is currently producing from the Hibernia reservoir (B Pool that contains a gas flood and a water flood region along with Hibernia A Pool) and Ben Nevis-Avalon reservoir. To date, the field has produced 641 million barrels (June 2009) with 95% of the oil production coming from the Hibernia reservoir. For the month of June 2009, the field averaged a daily rate of 98,202 barrels per day (15,612 m^3/d). The field has been in decline since late 2003 (Figure 2.2). Currently, there are 56 wells active out of the 64 GBS slots.

A summary of the current Hibernia Field production and operations is provided in Appendix A1.

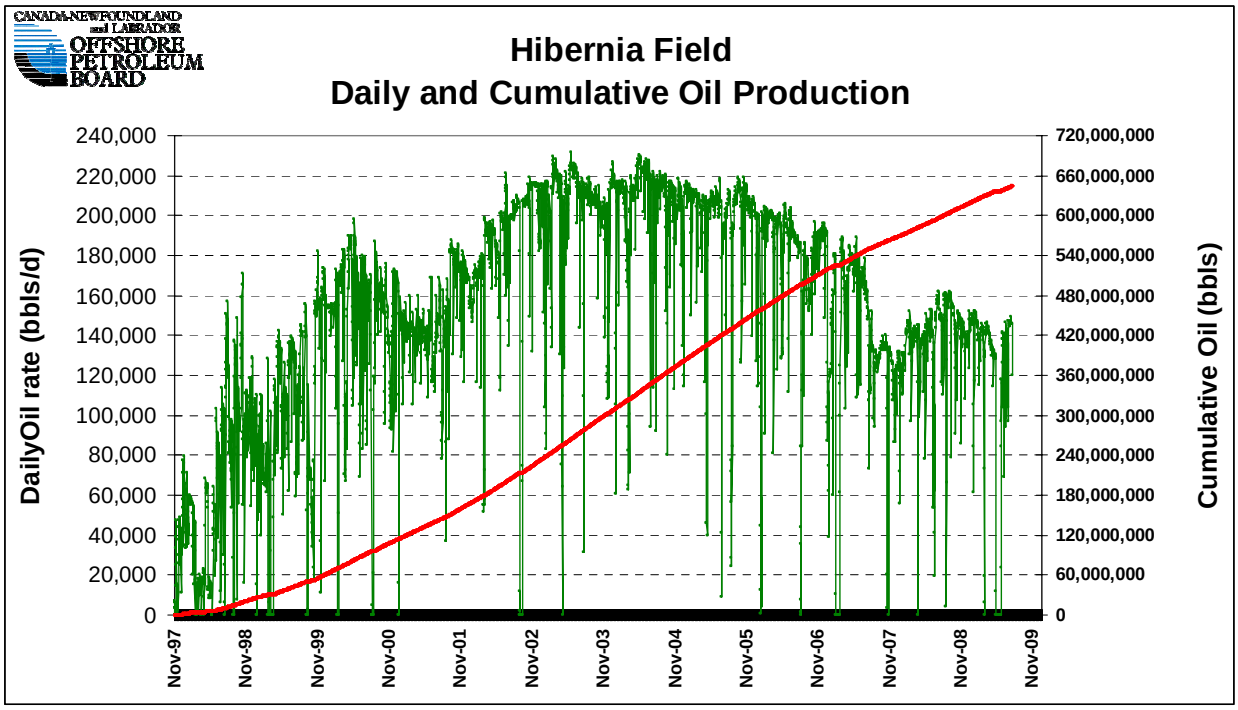

Figure 2. 2: Hibernia Daily Oil Production (Source: C-NLOPB)

3.0 INDUSTRIAL BENEFITS

Background

The Board's staff reviewed the Application to assess any potential impact with respect to the Hibernia Benefits Plan provisions prescribed by subsections 45(1), 45(3), and 45(4) of the Accord Acts.

The Application describes the Proponent's development strategies for Hibernia B Pool, Ben Nevis-Avalon Formations, Hibernia A Pool, and in particular the Hibernia AA Blocks of the Hibernia B Pool. All of these reservoirs are contained within Production License 1001 and are therefore covered by the existing Hibernia Benefits Plan. The Hibernia South Unit, which is a deferred development, extends into PL1005.

The Proponent indicates that developments in the Application will be executed in accordance with the principles and commitments contained in the existing Hibernia Canada-Newfoundland Benefits Plan. The Proponent also indicates that an amendment to the approved benefits plan will be submitted to the Board prior to development of the Hibernia South Unit, and will describe HMDC's Research & Development and Education & Training (R&D) expenditure plans and Affirmative Action program.

The Proponent states in the Application that existing production facilities will be used for all developments detailed in the submission, no construction is anticipated for any development detailed in the submission, and no changes are planned to the transportation system. For the AA Block in particular, the currently selected scheme is to drill two producers and two water injectors from the Hibernia platform – the preferred option. However, the Proponent also presents options to drill either two or four subsea wells. Capital costs for the AA Blocks are estimated to be $196 million for the preferred option.

Analysis

The Application was assessed to determine implications for the Approved Benefits Plan. Assuming the AA Block is developed using platform wells, all wells planned for the reservoirs described in the Application will generally be drilled using existing contracts for goods and services, and existing employees. In this case the Board's staff has concluded that the provisions of the approved Hibernia Benefits Plan adequately address subsections 45(1) and paragraphs 45(3)(a), (b), (d) of the legislation (participation of the labour force and the business community, office location, full and fair opportunity, first consideration).

The existing Benefits Plan did not address the legislative requirements for Research & Development and Education & Training (R&D) expenditures or Affirmative Action within the context of the February 2006 Benefits Plan Guidelines. However, the Proponent's plan to address these areas in a Benefits Plan Amendment submitted to the Board prior to development of the Hibernia South Unit, describing HMDC's R&D expenditure plans and Affirmative Action program is reasonable and acceptable.

However, should the Proponent opt to develop the AA Block using subsea wells, this strategy would create increased Benefits in the form of additional employment and the procurement of additional goods and services (e.g. engineering and project management, fabrication, marine activity etc.). This scenario would require a Benefits Plan Amendment describing these activities and associated Benefits in more detail.

Recommendation

On this basis, for the currently selected development strategy presented in the Application (all platform wells), staff recommends that a Benefits Plan Amendment at this time is not required. However, a Benefits Plan Amendment will be required prior to development of the Hibernia South Unit, including plans for R&D and Affirmative Action.

In the case of the Proponent deciding to drill subsea wells for the AA Block, a Benefits Plan Amendment will be required to be submitted and approved by the Board.

4.0 RESOURCE MANAGEMENT

The Application includes a discussion of the following resource management aspects:

- proposed development of the Hibernia reservoir in the AA Block (B Pool);
- updates on the production and development for the Hibernia Field; and
- an assessment of integrated development for the full field that includes a preliminary assessment of the deferred developments, criteria for a full field development schedule, slot optimization, updated production forecast, and update to the field economic life.

The Application does not contain a development plan for the exploitation of oil contained in those fault blocks located outside PL 1001. This and other potential development areas of the field will be the subject of future Development Plan Amendment application(s) once commercial and technical activities have progressed further.

The Board's staff focused its review on the proposed depletion plan for the Hibernia AA Block area and its implication on full field development.

The Application also contains information regarding geological, reservoir simulation and production forecasting models. Summaries with respect to the following reservoirs and pools are included in Appendix A1 and A2:

- Hibernia B Pool
- Hibernia A Pool
- Cape Island Member
- Catalina Member
- Ben Nevis-Avalon Reservoir

The Board's staff used the Proponent's information, as well as its own data and models, in its analysis of the Application.

4.1 Hibernia AA Blocks – Hibernia B Pool

The AA Block is located in the southern section of the Hibernia Field and is contained entirely on PL 1001 as shown in Figure 4.1.

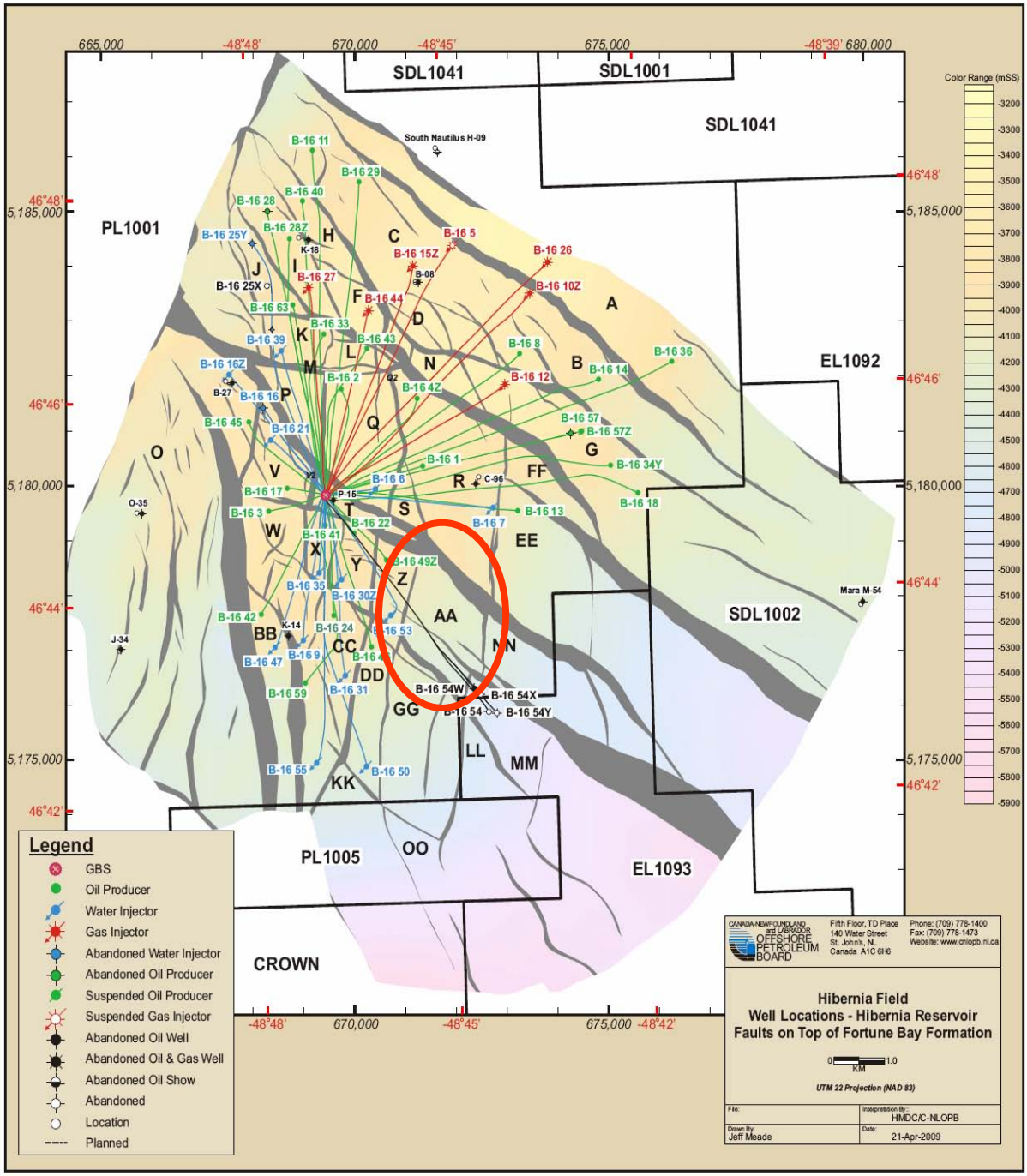

Figure 4. 1: Hibernia Field - Well Locations and AA Block (circled) (Source: C-NLOPB)

4.1.1 Geological/Petrophysical Review (Hibernia AA Block-B Pool)

The Board's staff reviewed the portion of the Proponent's geological model pertaining to the AA Block. The lithologies, facies, reservoir connectivity and continuity, are anticipated by the Proponent to be similar to what has been encountered in the other development wells in the area. The Proponent expects the Hibernia B Pool reservoirs to exhibit degradation of porosity and permeability with increasing burial depth. Consequently, reservoir quality in AA Block is anticipated to be slightly poorer than that at the crest of the field.

On review of the petrophysical data, both the Board and Proponent have estimated similar fluid contacts based on data points from well logs and pressure data for the wells in the southern Hibernia area. The B-16 54 well and its sidetracks suggest that the Hibernia reservoir oil accumulation extends down through AA Block and into EL 1093, and may likely extend into PL 1005. Board's staff agrees with the Proponent that since the AA blocks are structurally higher than lowest known oil contact, the development wells are unlikely to encounter an oil-water contact.

At this time, Staff concurs with the method of determining reservoir engineering parameters used by the Proponent, and realizes that more data will be available once development wells are drilled in the area.

4.1.2 STOOIP /Reserve Estimates (Hibernia AA Block-B Pool)

The Proponent's and the Board's geologic models of the Hibernia reservoir are similar. Since the geological models use essentially the same well-defined structural surfaces, fluid contacts and well data, both assessments provide comparable oil-in-place as seen in Table 4.1.

Table 4. 1: Proponent's 2006, 2009 and C-NLOPB Hibernia AA Blocks B Pool Reserves Estimate Summary (Field Units) (Source: Modified HMDC/C-NLOPB)

	Hibernia AA Block Most Likely Oil Reserve Estimate								
	HMDC (2006)			**HMDC (2009)**			**C-NLOPB (2006)**		
	STOOIP (MB)	**Reserves Millions Barrels**	**Recovery Factor %**	**STOOIP (MB)**	**Reserves Millions Barrels**	**Recovery Factor %**	**STOOIP (MB)**	**Reserves Millions Barrels**	**Recovery Factor %**
Total	**103**	**54**	**52**	**117**	**48.5**	**41**	**124.7**	**52**	**40**

The Proponent has updated its 2006 STOOIP and reserves estimates in the Application. Its current estimate for in-place hydrocarbon volumes for the AA Block are 117 MMbbls (18.6 MMm^3) of oil and 119 GCF [1] (3.4 Gm^3) of gas. As shown in Table 4.1, the

[1] One GCF is equal to one BCF

Proponent's current estimate is closer to the Board's estimate for STOOIP, reserves and recovery factor.

The Proponent's upside reserve estimate was 69.8 MMbbls (58% recovery factor), while that of the Board is 70 MMbbls (56% recovery factor). The Proponent's downside reserve estimate was 37 MMbbls (31% recovery factor), while that of the Board was 32 MMbbls (25% recovery factor).

The Proponent's distribution of oil reserves in the AA blocks is presented in Table 4.2.

Table 4. 2: Hibernia AA Blocks - Estimated Reserve Distribution (Source: HMDC)

C-NLOPB Sub-Pool	Block	Oil STOOIP (MB)	EUR Oil+Cond (MB)	Recovery (% Oil OOIP)
Developed Blocks				
Potential Future Blocks, included in Drill Schedule				
B2	AA1	82.0	38.4	47%
B2	AA2	35.0	10.1	29%
Upside Development (Volume assumes best estimate OWC)				
Subtotal: Developed		*0.0*	*0.0*	
Subtotal: Developed in Schedule		*117.0*	*48.4*	*41%*
Subtotal: Upside Development		*0.0*	*0.0*	
Total AA Blocks		*117.0*	*48.4*	*41%*

The Board's staff concurs with the reserve estimate provided by the Proponent for the AA blocks.

Development Strategy (Hibernia AA Block-B Pool)

The Board's staff reviewed the Proponent's proposed depletion plan for the AA1 and AA2 fault blocks (Figure 4.2).

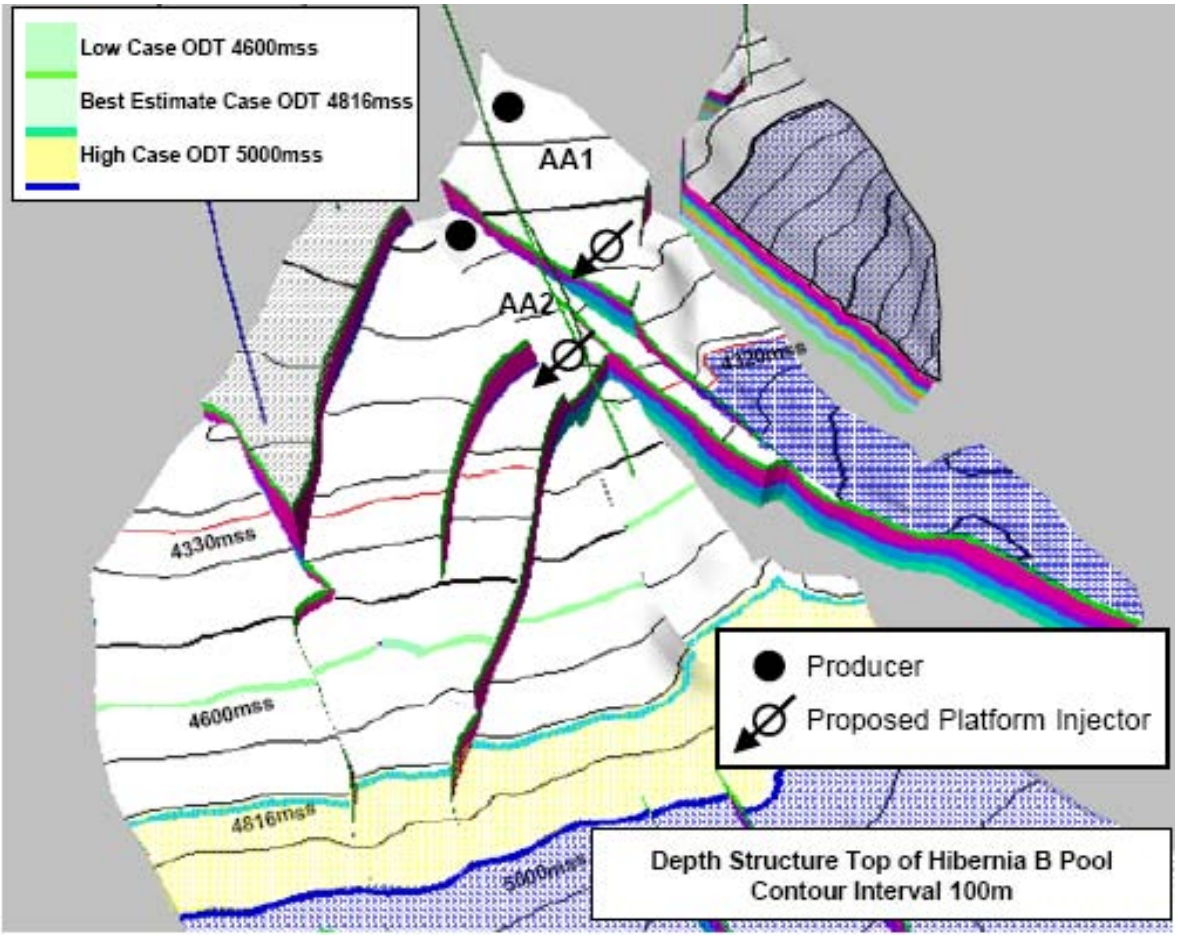

Figure 4. 2: Proposed AA Block Development (Source: Modified after HMDC)

The Proponent is proposing to develop the AA Block through water flood, which has been used in a large part of the Hibernia B Pool development. The Proponent also evaluated several other development options, such as platform/subsea producers or injector wells, or combinations of these types.

The proposed drilling schedule has four wells being drilled from existing GBS slots in the next two years, with a producer – injector pair for AA1 block being drilled back-to-back in late 2009 and early 2010. Staff concurs that the drilling of both producer-injector pairs is appropriate to ensure proper pressure support and sweep efficiency. Water injection will also help ensure that oil is not being drawn across faults from other blocks or other licences areas such as EL1093.

Staff agrees with the Proponent that the proposed water flood scheme and overall depletion strategy are reasonable, as this approach has been effective in other areas of the Hibernia reservoir which have similar characteristics to the AA Block.

The Board's staff notes that the Proponent's estimated costs for drilling and tie-in of AA Block development wells are estimated at $196 million dollars Cdn. Staff believe this

estimate is reasonable based on its internal review of historical drill cost data for the Hibernia Field.

The wells will be drilled with the producer positioned at a structural high point in each fault block, and the water injector located downdip. The Proponent will seek approval for the final well locations in an Approval to Drill application prior to commencing well operations.

The impact of the four-well depletion plan on surrounding Hibernia fault blocks was an important consideration for Board staff. Figure 4.3 shows cross-sections from east to west and north to south through AA Block. It can be seen that the reservoir section of the AA blocks is isolated from other fault blocks, as main reservoir sands are offset. This isolation will limit cross flow between the other blocks. Board's staff concurs with the Proponent that cross flow from other blocks is unlikely; however, staff will monitor performance as production commences in the AA Block.

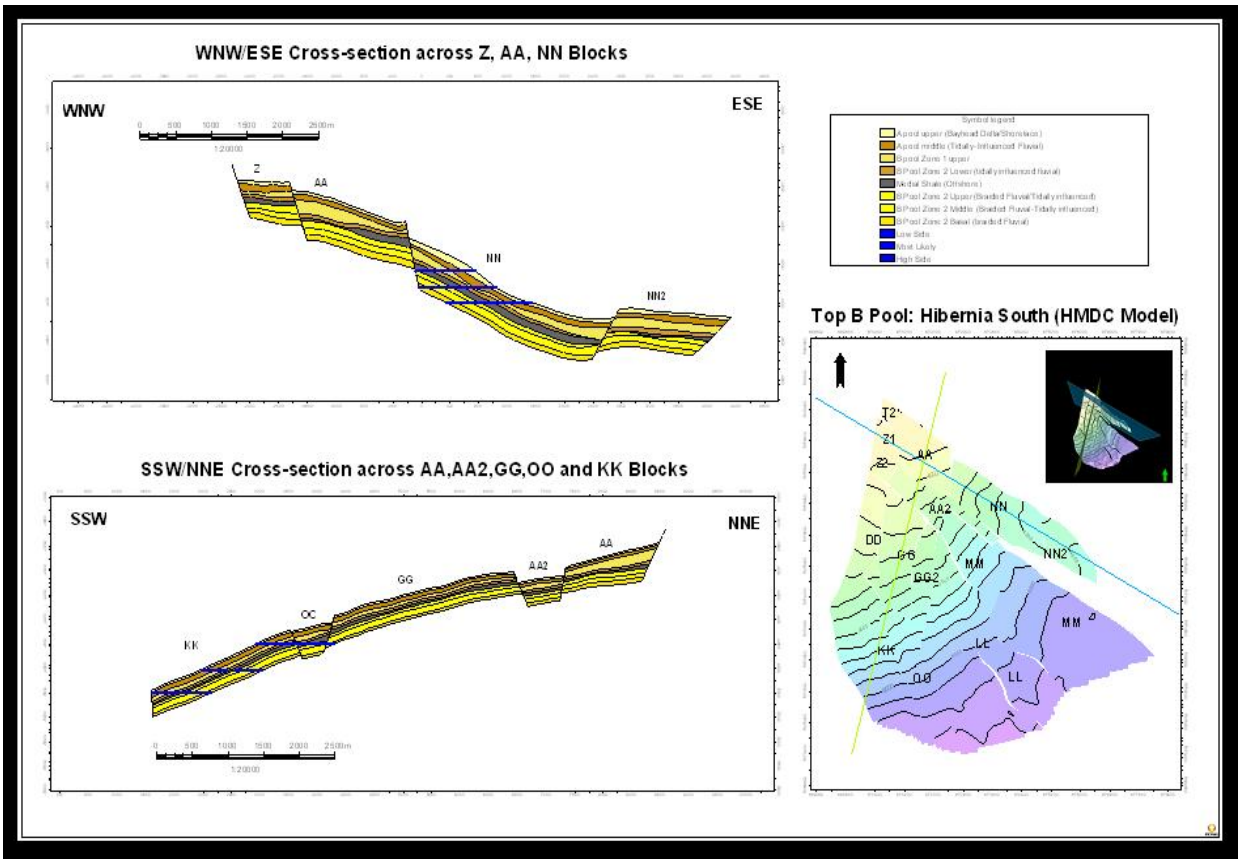

Figure 4. 3: Cross-Sections across the Hibernia AA Block from the Petrel HMDC Model (Source: Modified from HMDC)

The Proponent has noted that information obtained from development drilling and AA Block production could provide additional drilling options that may facilitate increased recovery from this area.

4.1.4 Production Forecast (Hibernia AA Block-B Pool)

The Board's staff reviewed the oil production forecasts provided by the Proponent for the AA Block. Figure 4.4 shows that production will begin in 2010 from AA1 block at an average of 11,000 bbls/d, up to a maximum of 25,000 bbls/d, with the addition of production from AA2 in 2012. Production is estimated to last until 2024 with a cumulative production of 48 million barrels.

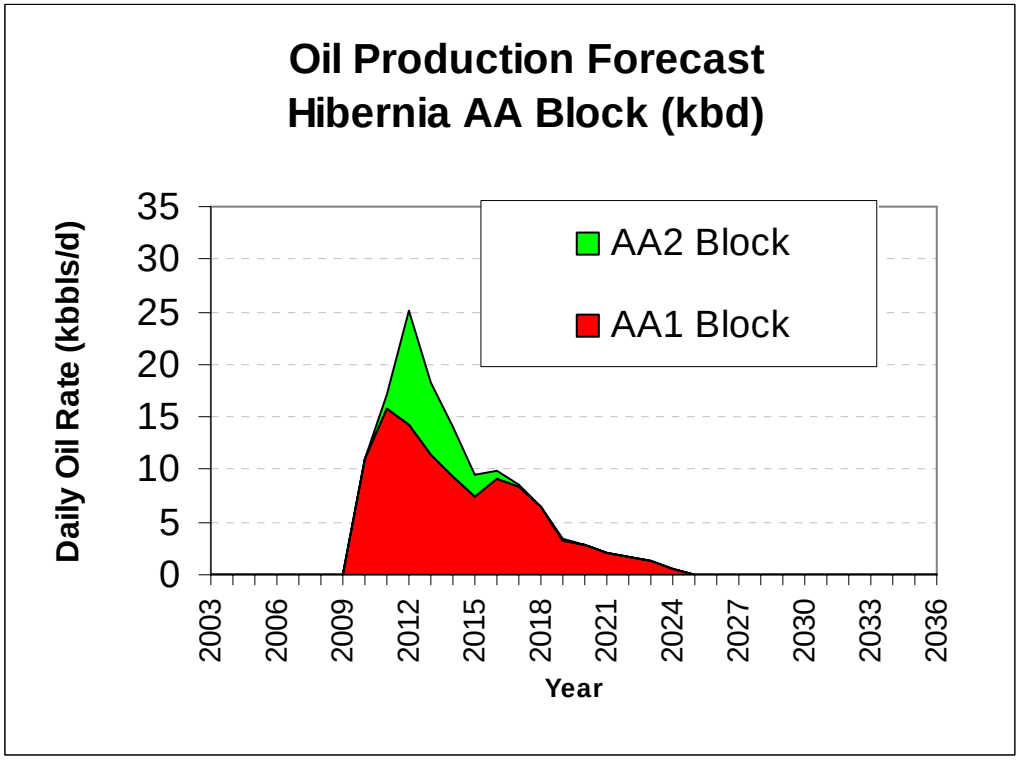

Figure 4. 4: Oil Production Forecast - Hibernia AA Block (Source: HMDC)

Gas production is estimated to reach a maximum of 22 MMscf/d in 2012, and decline with decreasing oil production from the AA Block.

Water production is estimated to reach a maximum of 28,000 bbls/d from AA Block in 2013 (Figure 4.5).

A key consideration for the Board's staff is whether the current production facilities enable oil and gas recovery from the field to be maximized in accordance with sound economic and engineering principles. Staff is confident that continuing operations with the current facility capacities will not lead to a reduction in oil recovery from the AA

Block. The staff analysis has also concluded that the anticipated current forecast of oil, water and gas production from the AA blocks can be handled by the current facilities.

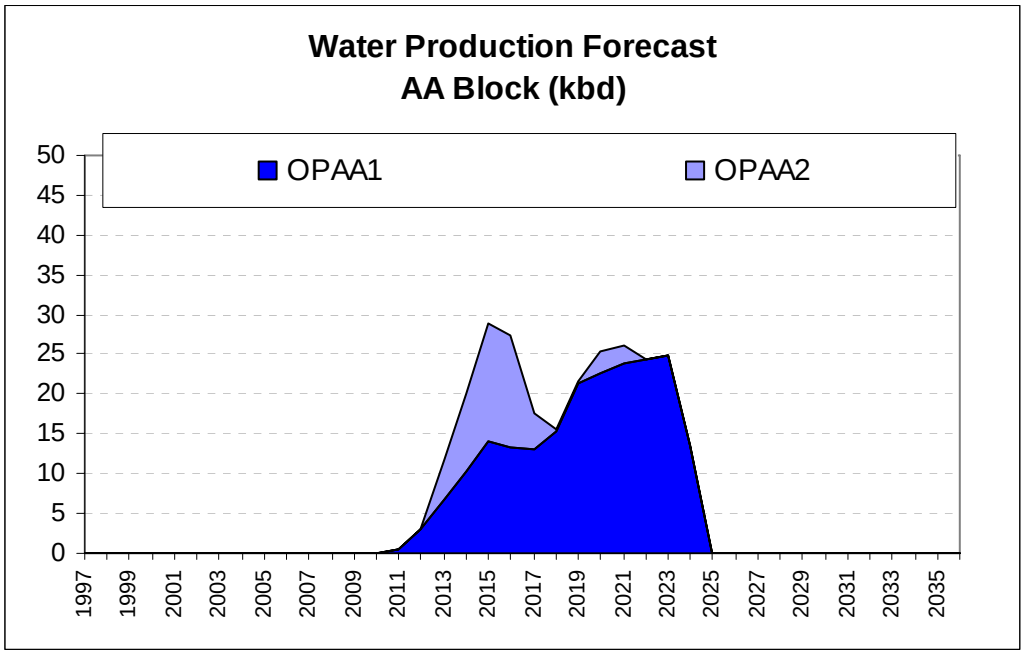

Figure 4. 5: Hibernia AA Block Water Production Forecast (Source: HMDC)

AA Block development will follow the same reservoir management plan as the rest of the Hibernia water flood blocks. The plan is to target a voidage replacement ratio of one to maximize ultimate recovery.

The Proponent's proposed depletion scheme for the Hibernia AA Block appears reasonable. The Board's staff will continue to work with the Proponent to ensure future development of the AA Block will not impact other undeveloped fault blocks within the field.

AA Block within an overall Hibernia Field Development

Board's staff considered AA Block development in the context of its impact on the overall Hibernia Field development, including opportunities within pools/reservoirs under development, as well as deferred developments. Staff reviewed the information supplied by the Proponent and this assessment is contained in Appendix A2.

Staff has determined that AA Block development is timely as it represents one of best development opportunities remaining in the field, and will help offset production decline.

Conclusions and Recommendations

The Board's staff has reached the following conclusions with respect to AA Block development as outlined in the Application.

- The Proponent's best estimates of STOOIP volumes [117 million barrels (18.6 MMm^3) of oil and 119 GCF (3.4 Gm^3) of gas] are considered reasonable.
- The Proponent's recovery factor (41%) is consistent with Board staff's estimate.
- Based on a review of geologic, petrophysics and reservoir engineering data, staff concurs with the Proponent that the proposed water flood strategy is appropriate.
- The depletion strategy consisting of four wells (2 oil producers and 2 water injectors) drilled from the GBS, is considered reasonable.
- The Hibernia AA Block appears to be isolated and cross flow from other blocks is considered unlikely.
- The expected production forecast will reach a maximum of 25,000 barrels /d, with an estimated cumulative production of 48 million barrels.
- No significant facility modifications are required to be made in order to accommodate the development of Hibernia AA Block.
- AA Block development is timely as it will offset Hibernia Field decline and optimize facility utilization.

Resource Management staff have concluded, after reviewing the Application, that the Board should approve the addition of the Hibernia AA Block to the Hibernia Development area.

5.0 OPERATIONS AND SAFETY

The safety review of the Application focused on an assessment of the Proponent's option for developing Hibernia AA Block using wells that will be drilled from the platform using new or reclaimed slots. In a number of places, the Application clearly states that the wells will be drilled from the platform; however, there are a number of statements that include the option to utilize subsea wells. The staff analysis only assessed wells being drilled from the platform. On this basis, there are no significant impacts on equipment, processes or training from wells that are drilled from the platform to targets in the AA block. For greater clarity, the option to drill subsea wells has not been the subject of review of this Application.

The Application discusses the evaluation of gas lift capabilities and makes reference to a facilities modification gas lift project. The Hibernia Platform is not currently set-up for gas lift operations and the original project assumptions did not anticipate the effect of pressure depletion on the production rate from water cut wells and thus did not deem gas lift necessary. The current Hibernia Safety Plan does not address gas lift capabilities. While the Application makes reference to some associated equipment modification such as potential gas compressor modifications and addition of a dehydration package, as well as reference to the recent use of completions that will accommodate gas lift, the Application is silent regarding implications on procedures and training. Gas lift technology and processes are well known and are already in use on the East Coast of Canada; therefore, this additional capability onboard the Hibernia Platform does not present any undue concerns in respect to risk to safety of operations. However, the Proponent has not clearly articulated the scope of impact on equipment, processes and training. In respect to equipment additions/modifications, the Proponent must engage the Certifying Authority and obtain their approval prior to any facility modifications or additions. Prior to implementing gas lift capabilities on the Hibernia Platform, the Proponent must submit, to the satisfaction of the Chief Safety Officer, an amendment to the Safety Plan to address the scope of the facilities modification gas lift project including a summary of the impacted processes, training and documentation.

The development of Hibernia AA Block and the Hibernia South Unit will extend the Facility Life from 2027 to 2036. This is referenced both in the Part 1 submission and in the Hibernia Platform Service Life Extension Report contained in Part 2 of the Application. While the Application and this supporting report speak to a number of key issues associated with Design Life extension, there are a number of key issues that are not addressed or have gaps in the scope of their review. The supporting report does not adequately address the drilling systems and/or well bore integrity for aging wells. There currently are facility systems that are impacted by equipment obsolescence issues, the Application does not discuss any plan for managing equipment obsolescence. The

Application and supporting report takes credit for the management of the asset under the FIMS program from OIMS Element 6-6; up to the end of 2008, FIMS had not yet been fully implemented. The life extension discussion does not appear to account for analysis of actual reliability and maintenance trends, review of manufacturer life recommendations, nor review of historical inspection/monitoring trends. The Certifying Authority must be engaged to consider the appropriateness of life extension.
The issue of Life Extension is not a current or near term consideration. Therefore, the gaps noted above, in the supporting report, are only of concern as we approach the current Design Life of 2027. Approval of facility life beyond 2027 has not been considered at this point in time. Within the last five years of the current design life of the facility, the proponent should undertake a detailed analysis of the appropriateness of extending the life of the platform beyond 2027. The results of such an analysis should submit for Board consideration before the end of 2024.

Conclusions and Recommendations

No safety concerns were identified which would preclude Staff from recommending approval of the Application. Activities in connection with this Application can be managed in accordance with established safety processes and procedures.

The Proponent should follow up with the Chief Safety Officer on the following matters in due course as the project proceeds:

1) The option to drill subsea wells has not been the subject of review of this application.

2) In respect to equipment additions/modifications, the proponent must engage the Certifying Authority and obtain their approval prior to any facility modifications or additions. Prior to implementing gas lift capabilities on the Hibernia Platform, the Proponent submit, to the satisfaction of the Chief Safety Officer, an amendment to the Safety Plan to address the scope of the facilities modification gas lift project including a summary of the impacted processes, training and documentation.

3) Extension of facility life beyond 2027 has not been approved at this point in time. Within the last five years of the current design life of the facility, the Proponent should undertake a detailed analysis of the appropriateness of extending the life of the platform beyond 2027. The results of such an analysis should be submitted before the end of 2024 to the Chief Safety Officer for consideration.

As a matter of course, updates to the Safety Plan to reflect the Hibernia South AA Block Development must be submitted to the Chief Safety Officer for approval.

6.0 PROTECTION OF THE ENVIRONMENT

The Board's staff has reviewed the Proponent's Application to determine whether the Development Plan Amendment raises any new environmental issues. Based on the information presented in the Proponent's documentation, all proposed activities are within the scope of the original environmental assessment.

Any future developments, including the Hibernia Southern Extension, that include the use of subsea wells and the excavation of the associated glory holes in the seabed, likely would be outside the scope of the original Hibernia environmental assessment. In August 2008, HMDC initiated a screening level environmental assessment under the Canadian Environmental Assessment Act in respect of a "Hibernia Drill Centres Construction and Operations Program", to evaluate the potential environmental effects associated with such future developments over the remaining life of the Hibernia field. This assessment is nearing completion. All associated assessment documents have been publicly available on the Board's Web site throughout the assessment process.

Condition 2003.01.02 of Decision 2003.01 required the Proponent to examine the technical and economic feasibility of produced water re-injection (PWRI) at the Hibernia Field. Various technical reports were commissioned by the Proponent and by C-NLOPB to study the PWRI issue between 2004 and 2008. In June 2009, the Board concurred with HMDC's conclusion that PWRI is unfeasible to implement at the Hibernia Field. It also stated its expectation that the Proponent would mitigate potential produced water environmental problems by implementing a continuous improvement plan that included improving the level and reliability of its produced water oil-in-water treatment performance, and encouraging and supporting research into improving water quality monitoring around produced water discharges, the potential effects of these discharges, and practical means for their detection.

The currently approved Hibernia Environmental Protection Plan (EPP) as described in Section 5 of the Hibernia Operational Plan will continue to apply to all developments detailed in the Application.

Conclusion

The Board's staff has concluded that the Application does not require additional environmental assessment pursuant to the Canadian Environmental Assessment Act, including the particular cases of produced water and drilling discharges, and recommends that no environmentally related conditions be attached to the current approval.

Appendix A: Glossary

bbls (Barrels)
1 bbl = 0.15898 m^3

Best Estimate
A HMDC internal favoured deterministic assessment case

BNA
Ben Nevis and Avalon

BOARD
The Canada-Newfoundland and Labrador Offshore Petroleum Board

C-NLOPB
Canada-Newfoundland and Labrador Offshore Petroleum Board

Certifying Authorities
Bodies licensed by the Board to conduct examination of designs, plans and facilities and to issue Certificates of Fitness.

Completion
The activities necessary to prepare a well for the production of oil and gas or injection of a fluid.

Development well
Well drilled for the purpose of production or observation or for the injection or disposal of fluid into or from a petroleum accumulation.

Fault
In the geological sense, a break in the continuity of rock types.

Flooding
The injection of water or gas into or adjacent to, a productive formation or reservoir to increase oil recovery.

GCF
Billion cubic feet

Gm^3
Billion cubic metres

Injection
The process of pumping gas or water into an oil-producing reservoir to provide a driving mechanism for increased oil production.

Logging
A systematic recording of data from the driller's log, mud log, electrical well log, or radioactivity log.

m^3
1 m^3 = 6.2898 bbls

NGL's
Natural gas liquids

Petrel
Trademark of Schlumberger product group geologic modelling software.

Petrophysics
Study of reservoir properties from various logging methods.

Pool
A natural underground reservoir containing or appearing to contain an accumulation of petroleum that is separated or appears to be separated from any such other accumulation

Produced water
Water associated with oil and gas reservoirs that is produced along with the oil and gas.

Production well
A well drilled and completed for the purpose of producing crude oil or natural gas.

Proven Reserves

Hydrocarbons that have been confirmed by drilling and testing or where sufficient geological and geophysical data exist to project the existence of hydrocarbons in adjacent fault blocks. A high confidence level is placed on recovery of these hydrocarbons.

Reserves
The volumes of hydrocarbons proven by drilling, testing and interpretation of geological, geophysical and engineering data, that are considered to be recoverable using current technology and under present and anticipated economic conditions. Hibernia, Terra Nova, and White Rose are classified as reserves.

Reservoir
A porous, permeable rock formation in which hydrocarbons have accumulated.

Reservoir pressure
The pressure of fluids in a reservoir.

Resources
Resources are volumes of hydrocarbons, expressed at 50% probability, assessed to be technically recoverable that have been delineated and have unknown economic viability.

Sandstone
A compacted sedimentary rock composed of detrital grains of sand size.

STOOIP
Stock tank original oil in place

Appendix A.1

A.1.1 Hibernia B Pool - Water Flood Region

The Hibernia B Pool - water flood region is at an advanced stage of depletion, with 17 oil producers in 16 blocks supported by 14 water injectors.

The majority of remaining oil reserves are highlighted in Figure A.1.1. This figure is based on C-NLOPB 2006 2P reserves estimates and production to the end of June 2009.

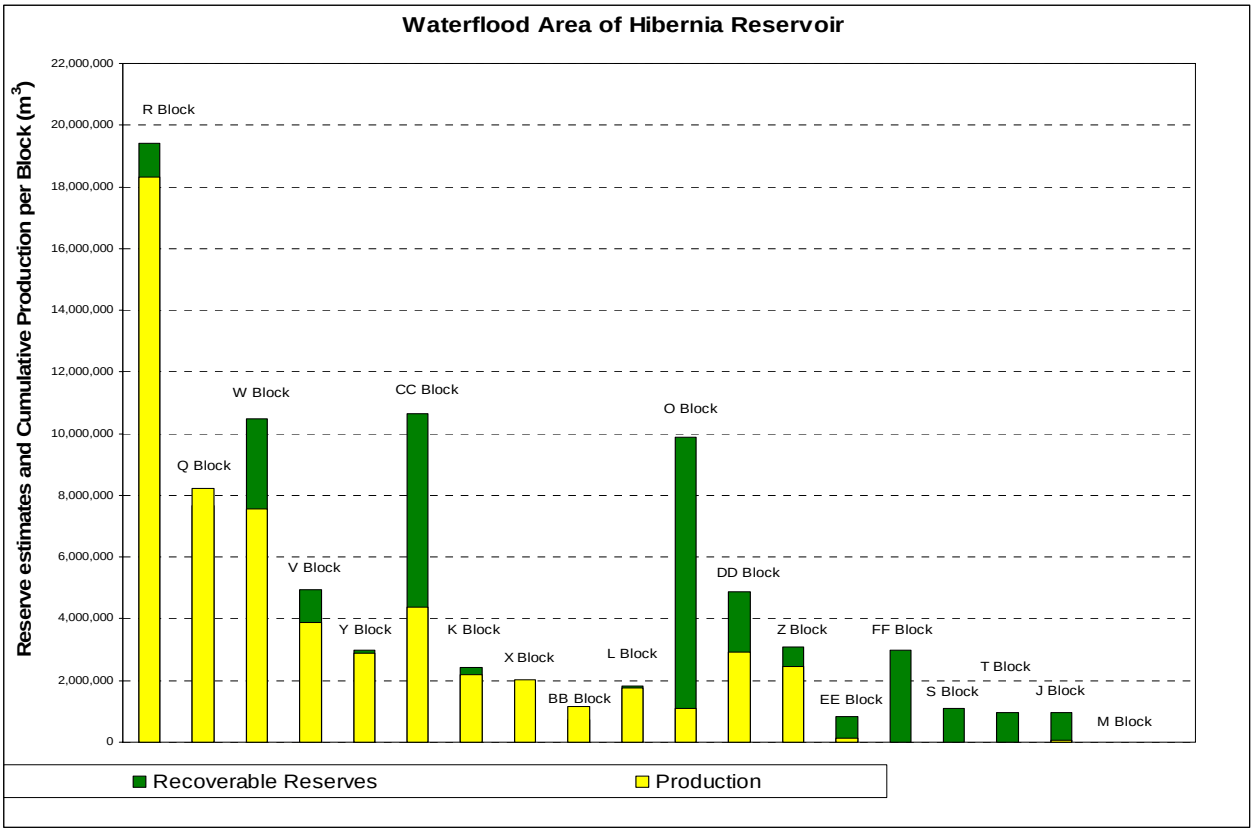

Figure A.1. 1: Hibernia Reservoir: Water Flood Region, Recoverable Reserves (2P) and Cumulative Oil Production per Block as of June 2009 (Source: C-NLOPB)

According to the C-NLOPB reserve estimates, sixty-seven percent of the oil reserves have been produced, whereas based on the Proponent's reserves, 80% of the developed water flood reserves are depleted. The two water flood blocks that have the most significant differences are in the CC and O blocks. The Board's staff includes more STOOIP and reserves in the 'O' fault block, specifically the areas known as O1, O2, and O3. The Proponent views these blocks as water-bearing and assigns STOOIP and reserves only to the O4 and O5 blocks. Staff is continuing to work on reassessing this area.

Board's staff now considers that in some blocks the recoverable reserves from the water flood area could be greater than the 2P Board estimates, such as for Q Block. Others are less than original estimates, such as EE Block. Most blocks are performing as predicted. The Proponent continues to work its bottom-up strategy of isolating watered-out zones and opening upper oil zones.

In conclusion, there are a few opportunities remaining in the water flood area that could be investigated as infill opportunities. The remaining blocks are smaller, more complex and less productive when compared to previous water flood blocks. The challenge for the Proponent will be to manage water production from existing wells and bring on new opportunities.

A.1.1.2 Hibernia B Pool - Gas Flood Region

In the northern area of the Hibernia reservoir, gas reinjection provides pressure support to the oil production. In addition to gas produced from the wells in the gas flood area, gas produced in association with oil from the water flood area is also injected into the gas flood region. The gas flood region is mature and contains 9 producers and 6 gas injectors that are located in six separate blocks.

Several of the production wells in the gas flood area have experienced gas break-through. However, oil production from this region has remained relatively stable, and has been increased to offset production decline in the water flood area.

Using the C-NLOPB reserve estimates (2P), about eighty percent of the oil reserves have been produced (Figure A.1.2), as compared to sixty-five percent based on the Proponent's reserve estimates. This difference is attributed to the Proponent carrying more recoverable reserves than the current Board estimate (2P).

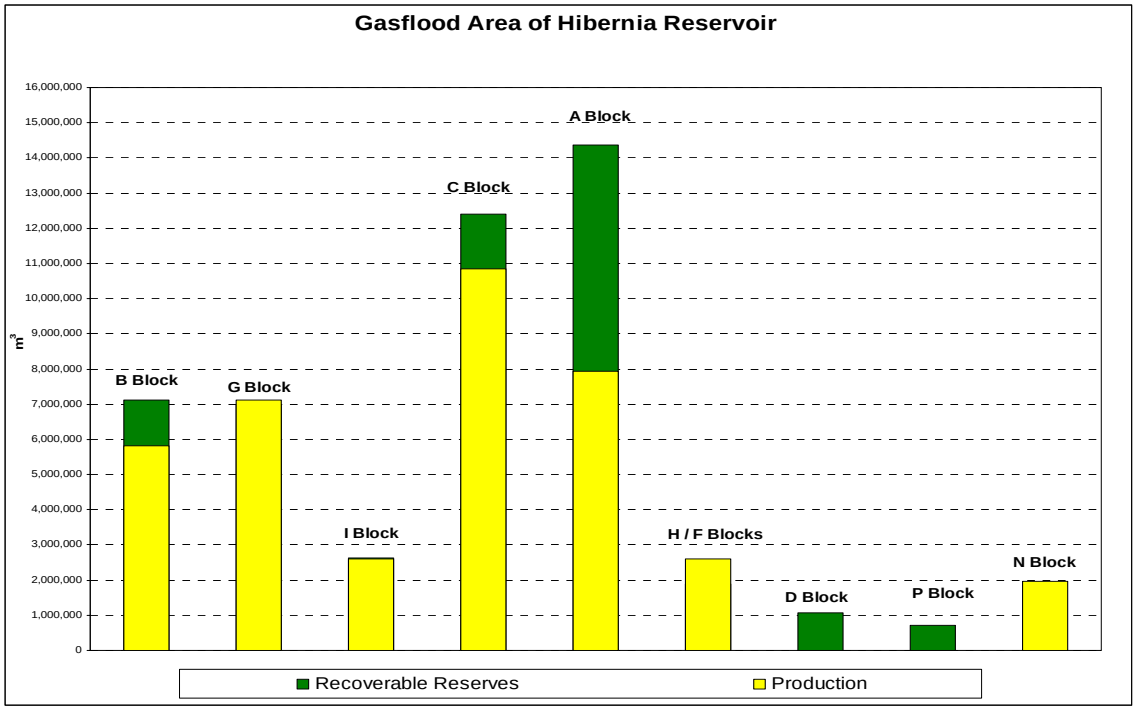

Figure A.1. 2: Hibernia Gas Flood Region Recoverable Reserves (2P) and Cumulative Production by Block as of June 2009 (Source: C-NLOPB)

Since the Proponent's reserve estimates are within the Board's 3P reserve estimates range, Staff accepts the Proponent's estimates as being reasonable.

Gas processing and injection capacity are the main factors limiting oil production from the gas flood region to date (Figure A.1.3). The processing and injection facilities are currently operating at or near capacity, i.e. gas injection capacity is estimated to be between 245 to 260 million standard cubic feet per day (7.0 and 7.5 million Sm^3/day). The Proponent has been able to stabilize the gas-oil ratio by reducing or suspending production at wells that experience gas break-through, and prioritizing production from low gas-oil ratio wells in the water flood region. This is possible because there is sufficient production capacity in other wells, or new wells coming on-stream, to make up for the loss of production in any well. In addition, there is sufficient gas supply from the water flood area to maintain oil production rates.

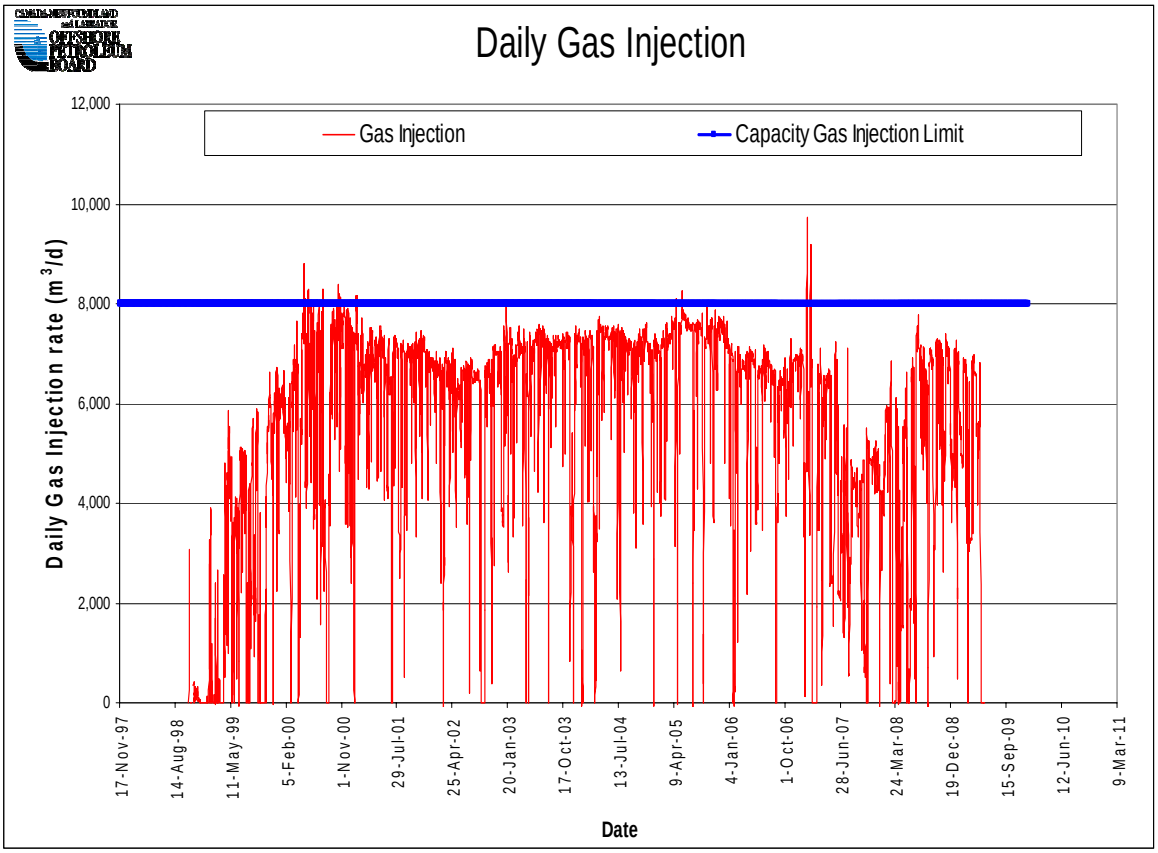

Figure A.1. 3: Hibernia Field Gas Injection Rate (Source: C-NLOPB)

As the gas flood continues to mature, the gas-oil ratio is expected to increase significantly, limiting the gas handling capacity available for processing gas from the water flood region. In addition, as production from the water flood region declines, there will be less gas available to support the gas flood. This situation, along with the decreased oil production from wells experiencing gas break-through, is expected to lead to a decline in production from the gas flood region. This may be somewhat offset by gas injection that is produced as part of Hibernia AA Block development.

In conclusion, the Hibernia B Pool is maturing and in decline. In the water flood area there are a few opportunities remaining, such as CC Block and O Block, which can be investigated as infill opportunities. The rest are smaller, more complex and less productive when compared to previous water flood blocks. The challenge for the Proponent will be to manage water production from existing wells.

In the gas flood area, the A Block is the largest opportunity remaining. It is anticipated that this will be developed in the next few years with the drilling of the OPA2 well. Other areas of opportunity are the D and N blocks, which have smaller reserves. The challenge

for the Proponent will be to increase oil recoveries from existing wells by increasing or maintaining gas injection. Hibernia AA Block production may assist in this.

A.1.2 Ben Nevis-Avalon Reservoir

A.1.2.1 Production Profile

Production from the Ben Nevis-Avalon (BNA) reservoir began in 2000. It is a complex reservoir with a high degree of faulting and compartmentalization. In the past, the BNA has accounted for about five percent of the daily production of the Hibernia Field. In 2008, BNA production rose to an average of 15,400 barrels per day, about 10 % of total field production. Following a pilot scheme to assess production characteristics in the northwest portion of the reservoir, the Board approved the development plan amendment for the Ben Nevis-Avalon reservoir in January 2006 (Decision 2006.01).

Development of this reservoir has been a deferred development to the main Hibernia B Pool reservoir. There have been 14 development wells drilled in this reservoir - six oil producers and eight water injectors. Three of these water injectors are dual water injectors within the Hibernia B Pool.

Development wells in the Ben Nevis-Avalon reservoir, while not as productive as the Hibernia reservoir development wells, are capable of individual production rates up to 10,000 bbls/d (1590 m^3/d). Historical production from the Ben Nevis-Avalon reservoir is shown in Figure A.1.4.

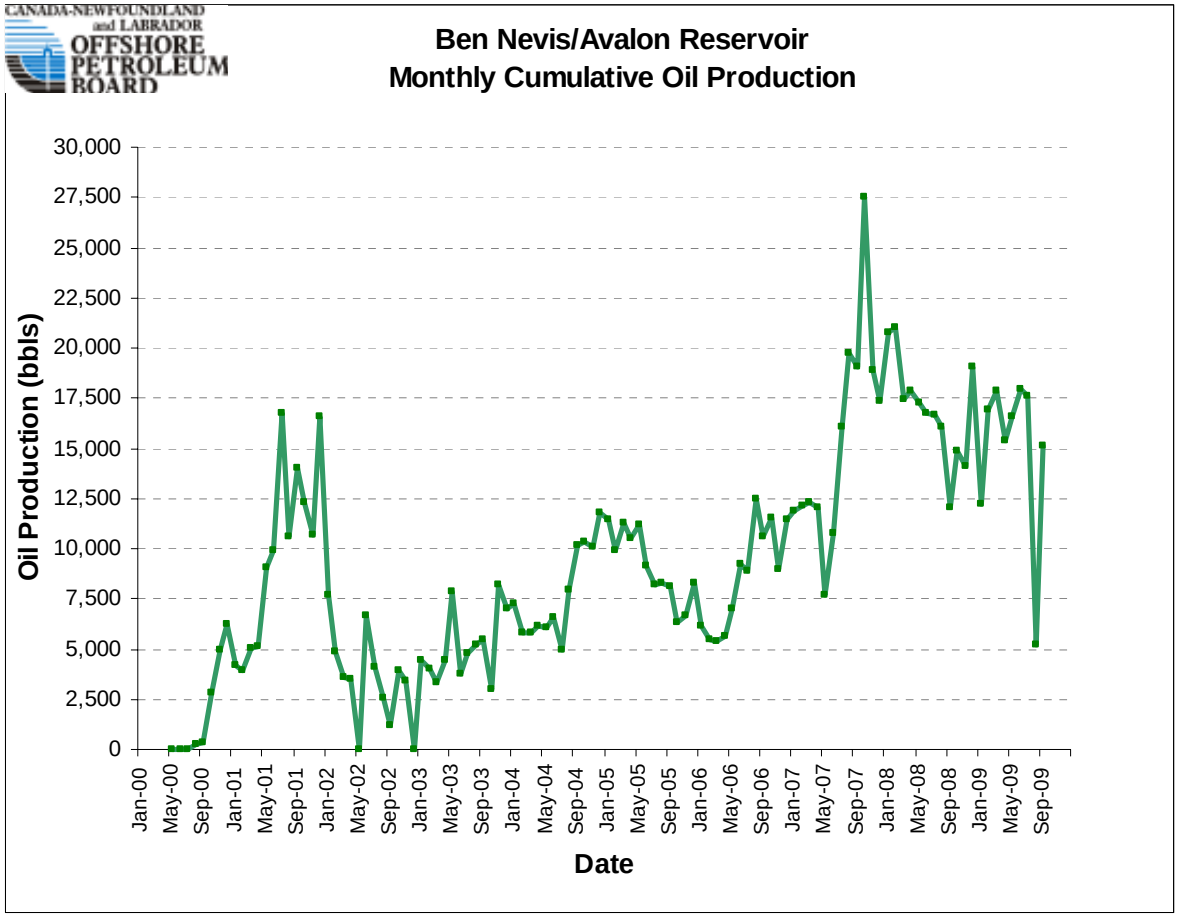

Figure A.1. 4: Hibernia Field Ben Nevis-Avalon Reservoir Productions (Source: C-NLOPB Monthly Data)

Water injection into this reservoir has proven to be a challenge, largely due to poor reservoir quality, stratigraphic uncertainty and complex faulting. Developed fault blocks must also address difficulties associated with sand production.

While this reservoir has proven challenging to produce, the Board's staff has always maintained that there is significant upside potential. In 2006, the Proponent put forward a phased development plan that considers all areas of the BNA in the field. Staff agrees with this phased approach as it is deemed the most appropriate balance to capture recoverable oil with migration of risk due to its structural and stratigraphic complexity. BNA production has increased in the last two years, largely due to this approach.

The Proponent's revised BNA reserve estimate summary is presented in Table A.1.1.

C-NLOPB Pool	Block	Assessment Sector	STOOIP (MB)	EUR (MB)	Recovery (% STOOIP)
Developed Blocks					
B3	Q2 Block	Central	48.4	12.7	26%
B3	I Block (LBN1 Only)	Central	35.4	15.9	45%
B4	B1 South Block	NW	46.0	8.1	18%
B3	G1 Block	Central	23.9	7.4	31%
B3	K Block (LBN1 Only)	Central	27.7	6.9	25%
B2	N1 Block	SW	22.9	5.6	25%
Potential Future Blocks, included in Drill Schedule					
B1	O3 (west+east)	SW	54.1	11.8	22%
B3	Q4	Central	47.7	13.0	27%
B3	G2	Central	17.4	4.8	27%
B3	J (up-dip)	Central	5.7	1.5	26%
B3	H1 (up-dip)	NE	17.0	4.4	26%
Potential Future Blocks (partially in PL1005 or EL1093), included in Drill Schedule					
B3	I/M (LBN3&UBN1)	Central	58.3	15.3	26%
B3	QE (LBN3&UBN1)	Central	55.4	16.2	29%
Potential Upside Development					
B4	B1N	NW	32.8	7.8	24%
B2	N2	SW	16.3	3.9	24%
B3	E06-E08	Central	27.5	6.5	24%
B6	A1	NW	54.8	8.1	15%
B2	O1	SW	26.6	6.3	24%
B5	O4	SW	25.5	6.0	24%
A1/B3	C1	Central	29.6	7.0	24%
B2	P5	SW	22.9	5.4	24%
B3	H2	Central North	20.7	3.1	15%
B6	A2	NW	24.8	3.7	15%
B2,C1	P1	SW	33.1	4.9	15%
B1	O5	SW	18.9	2.8	15%
B2,C1	C3	West	18.8	2.8	15%
B3	Q1	Central	17.2	2.6	15%
B3	Q5	Central	10.9	1.6	15%
B3	F2	Central North	18.4	2.7	15%
B3	Central Subblocks	Central	153.5	7.6	5%
B1	SW Subblocks	SW	132.1	6.5	5%
B2	West Subblocks	West	109.7	5.4	5%
B6	NW Subblocks	NW	78.1	3.9	5%
B3	North-Central Subblocks	Central North	99.0	4.9	5%
B5	NE Subblocks	NE	20.4	1.0	5%
Potential Upside Development (partially in PL1005 or EL1093)					
B3	H1 (down-dip)	NE	21.6	3.2	15%
B3	J (down-dip)	Central	28.0	4.1	15%
B3	I/M (LBN2&LBN1)	Central	18.3	0.9	5%
B3	K (down-dip)	Central	14.5	0.7	5%
B3	QE (LBN2&LBN1)	Central	4.6	0.2	5%
Subtotal: Developed			204.2	56.6	28%
Subtotal: Developed + Included in Schedule			459.7	123.5	27%
Subtotal: Upside Development			1078.8	113.7	11%
Total			**1538.6**	**237.2**	**15%**

Table A.1. 1: BNA Reserve Estimate Summary (Field Units) (Source: Modified After HMDC)

The Proponent has increased its STOOIP and recoverable reserves for the BNA since 2006. In the 2006 submission, the STOOIP was in the range of 339 MM barrels, while the smaller focus area has a recoverable estimate of 106 MM barrels. In the Application, the Proponent is now carrying 1538.6 MMbbls for the whole BNA area. The Board carries a STOOIP in the range of 1893 MMbbls.

In terms of recoverable reserves estimates, the Proponent has increased its estimate for the focus area from 106.0 MM bbls in 2006 to 123.5 MMbbls. This represents the largest percentage upside potential of all deferred developments.

A.1.2.2 Conclusion

Although there has been limited production from the Ben Nevis-Avalon reservoir, recent success in the northwest corner, as part of the phased development approach, could progress to other areas of the BNA reservoir. STOOIP and recovery efficiencies are improving, providing optimism that the lessons learned can be applied to the undeveloped areas, thus leading to increased recovery and more widespread development of the resource. Over the life of the field, reclaimed slots may be used to develop the upside potential contained in this reservoir.

A.1.3 Hibernia A Pool

A.1.3.1 Overview

The Hibernia A Pool is comprised of thin sandstone units that overly the main Hibernia B Pool. The Proponent's estimates of STOOIP volumes are 135 MMstb (21.4 MMm^3) and 290 GCF (8.2 Gm^3), which represent about 3.5 % and 7% of the total Hibernia Field volumes, respectively. This Pool has been considered a deferred development to the Hibernia B Pool.

In the original Hibernia Development Plan approved in 1986, it was recognized that the Hibernia A Pool development should be deferred until more drilling information was available to determine the optimal depletion scheme. In Decision 97.01, the Board placed a condition that "prior to production from the Hibernia A Pool, the Proponent submit its depletion plan for the approval of the Board."

Several limited production tests were conducted during the last few years in which about 1.3 MM bbls were produced from several wells. This data provided sufficient information for the Proponent to prepare a depletion plan. In June 2008, the Proponent submitted this plan to the Board.

A.1.3.2 Depletion Plan

In many blocks, the Hibernia 'A' Pool consists of thin sands with limited connectivity.

In the depletion plan of 2008, the Proponent anticipated that development of the Hibernia A Pool would take several approaches:

1. isolation and perforation of Hibernia A Pool in existing wells as they become available to recomplete;

2. commingling of Hibernia A Pool with Hibernia B Pool production as wells near their end of life; and

3. water flood or gas flood development with a producer/injector pair in select instances using existing wellbores.

The Board approved the Plan in early 2009.

A.1.3.3 Reserve Estimates

As part of its Application, the Proponent provided updated recoverable oil reserves for this pool (Table A.1.2).

Table A.1. 2: Hibernia A Pool Reserve Estimate Summary - Field Units (Source: Hibernia Development Plan, June 2009)

C-NLOPB Pool	Block	STOOIP (MB)	EUR Oil (MB)	EUR Cond (MB)	EUR Oil+Cond (MB)	Recovery (%)
Developed Blocks						
A1	O5	3.36	0.17	0.00	0.17	5%
A1	O5 sub	0.31	0.02	0.00	0.02	6%
A2	BB	1.09	0.06	0.00	0.06	6%
A2	V	14.31	3.58	0.04	3.62	25%
A2	CC3	0.00	0.00	0.00	0.00	--
A2	CC1	1.79	0.09	0.00	0.09	5%
A2	CC2	0.38	0.02	0.00	0.02	5%
A2	DD	0.85	0.05	0.00	0.05	6%
A2	W	4.58	0.23	0.02	0.25	5%
A2	X	1.41	0.08	0.00	0.08	6%
A2	Y	3.26	0.17	0.00	0.17	5%
A2	Z	1.21	0.07	0.00	0.07	6%
A4	EE	0.78	0.04	0.00	0.04	5%
A4	Q	0.00	0.00	0.48	0.48	--
A4	R	3.86	0.20	0.00	0.20	5%
A5	C	12.58	0.63	0.67	1.30	10%
A5	D	0.00	0.00	0.04	0.04	--
A5	D2	0.00	0.00	0.04	0.04	--
A5	F	1.07	0.06	0.08	0.14	13%
A5	B	1.32	0.07	0.09	0.16	12%
A5	G	2.52	0.13	0.25	0.38	15%
A5	H	3.02	0.16	0.00	0.16	5%
A5	I	3.48	0.18	0.04	0.22	6%
A5	J	2.88	0.15	0.00	0.15	5%
A5	K	3.51	0.18	0.00	0.18	5%
A5	L	2.59	0.13	0.08	0.21	8%
A6	A	7.81	0.40	0.26	0.66	8%
Potential Future Blocks, included in Projected Drill Schedule						--
A1	O and O2	13.56	0.68	0.00	0.68	5%
A1	O4	2.86	0.15	0.00	0.15	5%
A3	T	3.62	0.19	0.00	0.19	5%
A4	FF	1.33	0.07	0.00	0.07	5%
A4	P	0.00	0.00	0.13	0.13	--
A4	S	0.39	0.02	0.00	0.02	5%
Potential Upside Development						
A1	P5	3.93	0.20	0.00	0.20	5%
A1	P6	6.67	0.34	0.00	0.34	5%
A5	K3	8.34	0.42	0.00	0.42	5%
A5	N	0.00	0.00	0.07	0.07	--
Blocks HSE						
A2	AA1	5.03	0.26	0.00	0.26	5%
A2	AA2	1.11	0.06	0.00	0.06	5%
A2	GG1	3.26	0.17	0.00	0.17	5%
A2	GG2	1.33	0.07	0.00	0.07	5%
A2	KK	1.59	0.08	0.00	0.08	5%
A2	LL	1.55	0.08	0.00	0.08	5%
A2	MM	1.17	0.06	0.00	0.06	5%
A2	NN	0.53	0.03	0.00	0.03	6%
A2	OO	0.44	0.03	0.00	0.03	7%
Subtotal: Developed		***77.97***	***6.87***	***2.09***	***8.96***	***11%***
Subtotal: Developed + Included in Schedule		***99.73***	***7.98***	***2.22***	***10.20***	***10%***
Subtotal: Upside Development		***18.94***	***0.96***	***0.07***	***1.03***	***5%***
Subtotal: Blocks HSE		***16.01***	***0.84***	***0.00***	***0.84***	***5%***
Total		***134.68***	***9.78***	***2.29***	***12.07***	***9%***

Note: Tables may not sum exactly because of rounding effects

A.1.3.4 Conclusion

To date, there has been limited production from the Hibernia A Pool; however, the depletion strategies to be applied by the Proponent appear reasonable. Board Staff will work with the Proponent to evaluate the production history for this pool.

Appendix A.2

A.2.1 Full Field Development

A.2.1.1 Overview

Development of the Hibernia Field is an integrated development of the main Hibernia B Pool reservoir, Ben Nevis-Avalon reservoir, Hibernia A Pool and several deferred secondary developments. According to the Proponent, the total field, including deferred development of secondary reservoirs, contains approximately 3775 MMbbls (600.0 MMm^3) of original oil-in-place and 4061 GCF (114.9 Gm^3) of gas. The current GBS well count is 56 active wells.

The Proponent divides the part of the Hibernia B Pool that is known as Hibernia Southern Extension, into two parts for the purposes of this Application - Hibernia AA Block and Hibernia South Unit. Only the Hibernia AA Block is proposed for development at this time, whereas the Hibernia South Unit is a deferred development pending further technical assessment.

The secondary reservoirs shown in Figure A.2.1 are included in the combined development of the Hibernia Field. The Ben Nevis-Avalon (BNA) is the largest of the four in terms of resource and development to date. The other three reservoirs are smaller and less developed. They include Hibernia A Pool, Catalina Member and Cape Island Member. Development of the Hibernia A Pool is ongoing. The other two are pending technical evaluation and will require a future development plan amendment.

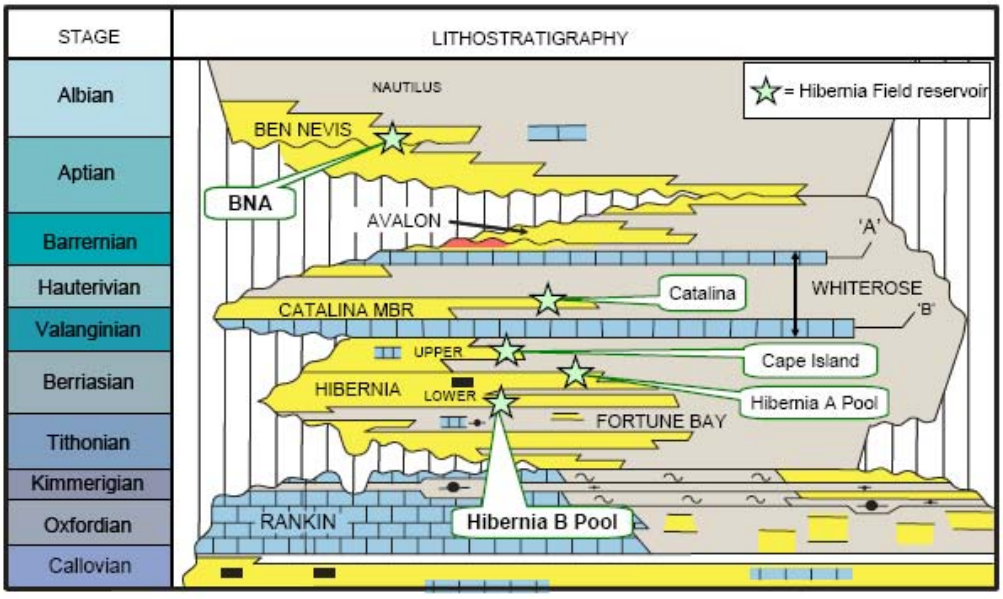

Figure A.2. 1: Hibernia Field Reservoirs (Source: HMDC)

A.2.1.2 Reservoir Modelling - Full Field Development

The Proponent has made significant improvements in the simulation model since 2006, especially in the gas flood area. New models have been constructed for the North Sector (gas flood), Hibernia South Extension, and Hibernia J, K and L blocks. The gas flood model now includes oil vaporization degradation that improves predictions of gas/oil interaction. The assessments are included in the *Hibernia North Sector Compositional Simulation Study* and the *Hibernia North Sector Gas Flood Model History Match* reports that are included in Part II of the Proponent's Application. Staff continues to evaluate the reports and the potential impact on recovery in the gas flood area.

The Proponent has also noted that significant improvement has been made to the Well Management Logic since 2006. It has allowed full utilization of compressor capacity and optimal prioritization of producers. It was this model that was used to generate the production profiles presented in this Application.

A.2.1.3 Reserve Estimates

The Proponent's oil reserves presented in Table A.2.1 are within the range of 1067.6 to 1571.5 million barrels (169.9 to 249 million Sm^3).

Table A.2. 1: Field Oil Recovery Range (Source: HMDC)

Reservoir	Upside Recoverable		Most Likely Recoverable		Downside Recoverable	
	(Mm^3)	(MB)	(Mm^3)	(MB)	(Mm^3)	(MB)
Hibernia B Pool	144.0	905.7	138.0	868.1	130.5	820.6
Hibernia AA Blocks	11.1	69.8	7.7	48.4	5.9	37.0
Ben-Nevis Avalon	38.1	239.6	19.6	123.5	16.7	104.8
Natural Gas Liquids	8.9	56.0	7.2	45.3	6.1	38.1
Hibernia A Pool	2.2	14.1	1.3	8.4	0.7	4.1
Hibernia South Unit	44.6	280.2	27.3	171.6	10.0	63.0
Catalina	0.9	5.9	0.0	0.0	0.0	0.0
Cape Island	0.0	0.2	0.0	0.0	0.0	0.0
Total Proposed DPA	**204.3**	**1285.2**	**173.8**	**1093.7**	**159.9**	**1004.6**
Total w/ Deferred Dvlp	**249.8**	**1571.5**	**201.1**	**1265.3**	**169.9**	**1067.6**

Grey shade = deferred development

The Board's 2006 Hibernia recoverable reserves review reports a P50 of 1446 million barrels which contains 1244 MMbbls for oil and 202 MMbbls of NGL's and an upside oil reserve estimate of 1916 million barrels (305 million Sm^3) .

The upside estimate provided by the Proponent incorporates several assumptions that include 10% improved recovery in Hibernia B Pool, and additional developments of BNA fault blocks. It also assumes a deeper OWC in the southern part of the field and better reservoir quality than the most likely prediction. The Board's upside reserve

estimate is also based upon a deeper OWC, better recovery from the BNA, and a higher recovery rate from the Catalina reservoir.

Staff is encouraged by the Proponent's progress in improving BNA development with the work in 2008 in the northwest wedge area. The Board's staff notes that while recovery in selected areas currently proposed for development are within industry norms (i.e. 25-30 percent recovery), the overall recovery is below industry norms. However, the Proponent is continuing to explore ways to exploit the oil resources in the Ben Nevis-Avalon reservoir, including the application of new technologies and approaches to recovering these resources. As a condition of approval of the Ben Nevis-Avalon Development Plan, these activities will be reported annually in the Proponent's *Annual Production Report*. The Board's staff will continue to monitor development activities for this reservoir.

As discussed earlier, the Proponent reports a most likely oil reserve of 48.4 million barrels (7.7 million Sm^3) for the Hibernia AA Block, and an upside potential of 69.8 million barrels (11.1 million Sm^3). Staff considers these estimates to be reasonable and are within the Board's estimates.

Other secondary reservoirs are listed with upside recoverable estimates, such as the Catalina with 5.9 million barrels (0.9 million Sm^3), and the Cape Island with 0.2 million barrels (0.03 million Sm^3). These estimates could be conservative and will be subject to future assessment by staff and the Proponent.

The Proponent also accounts for natural gas liquids reserves of 56 million barrels (8.9 million Sm^3). The Board does not account for natural gas liquids as a reserve at this time, but refers to natural gas liquids as a resource. Staff is reviewing the calculations involved with NGL's.

A.2.1.4 Conclusion

In conclusion, the oil reserve estimates provided by the Proponent for the most likely case are considered reasonable by the Board's staff. These estimates will continue to be reviewed and up-dated as new information is acquired.

A.2.2 Full Reservoir Exploitation

A.2.2.1 Integrated Development Criteria

The Proponent describes in the Application the criteria used to define the optimum timing for developing deferred reservoirs as follows:

1) Hydrocarbons in-place and Recoverable;
2) Productivity;
3) Reservoir Risk;
4) Value of Information; and
5) Drilling considerations.

These criteria are considered reasonable, as they provide for resource management considerations including maximizing resource recovery, facility optimization, and the prevention of waste.

A.2.2.2 Development Schedule

The Proponent's proposed drilling schedule (Figures A.2.2) for the next two years shows that the AA1 block wells (Producer and Injector) will be drilled first. Then a gas flood producer in A Block will be drilled. This will provide time to evaluate the locations for the next two wells in AA2 block.

The slots being utilized are ones that are currently suspended or abandoned. On this basis, the Board's staff concludes that the Proponent's proposed drilling schedule is reasonable.

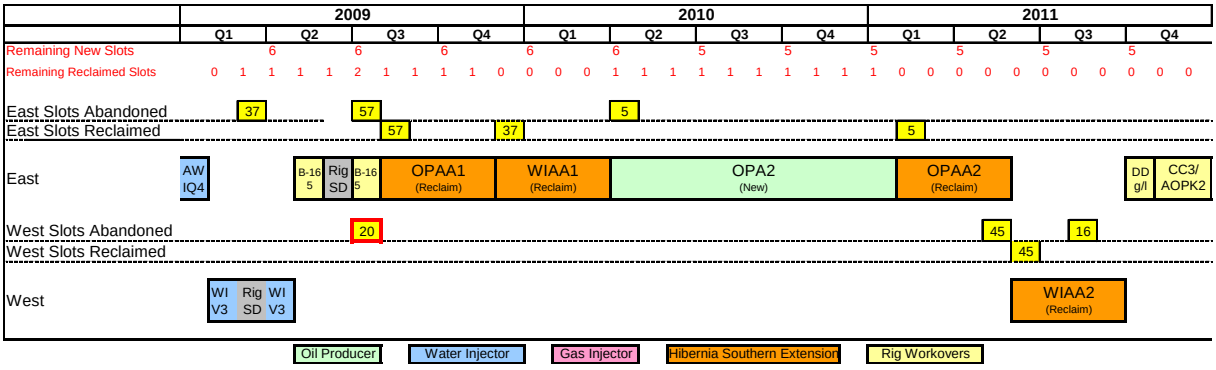

Figure A.2. 2: HMDC Drilling Schedule for Next Three Years for Each Rig and Slot Allocation (Source: Modified from HMDC)

A.2.2.3 Slot Optimization

Figure A.2.3 shows the April 2009 Hibernia GBS well slots configuration. The Proponent's plan is to utilize four slots to develop AA Block. Based on the Proponent's drilling schedule above, and production forecast, Staff concludes that the AA Block development strategy is reasonable.

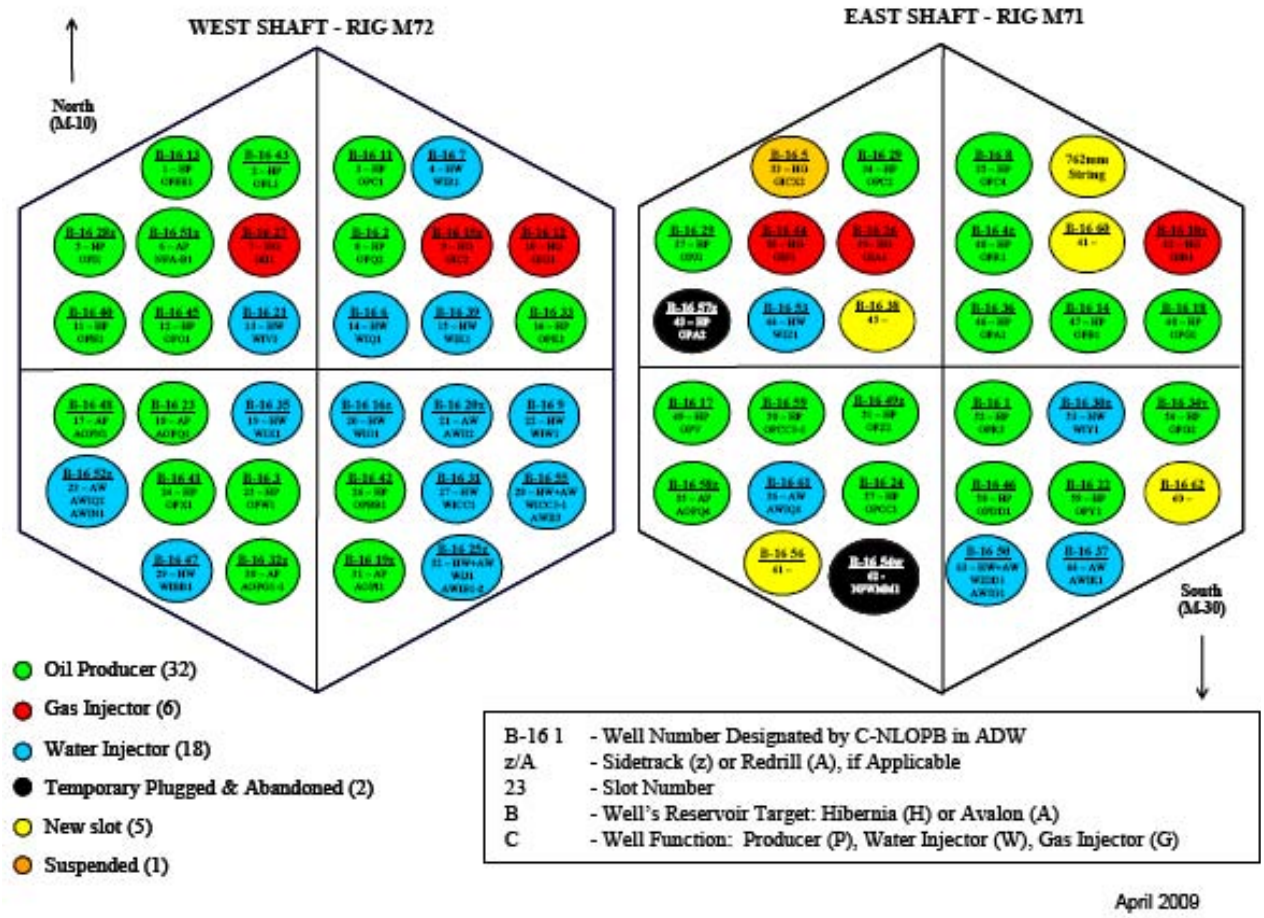

Figure A.2. 3: Hibernia Drill Slot Assignments (Source: HMDC)

A.2.2.4 Production Forecast

The Board's staff has reviewed the oil production forecasts provided by the Proponent (Figure A.2.4). There are several assumptions used in the forecast model that may affect the forecasts, including: drilling schedule, criteria to determine when zones, pools and wells are shut-in, and assumptions related to well slot availability.

The Proponent's production forecast for Hibernia AA Block development appears reasonable. It provides for maximum recovery prior to other deferred developments being developed.

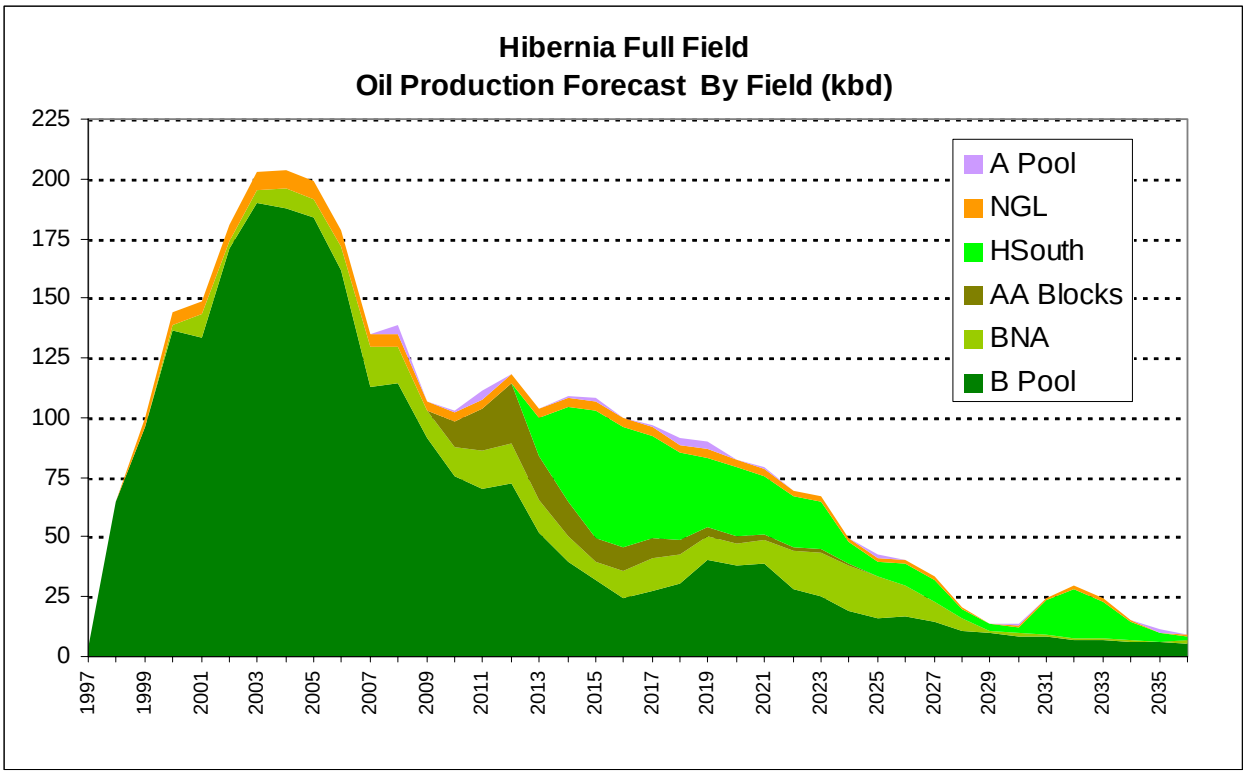

Figure A.2. 4: Hibernia Full Field Production Forecasts for each Reservoir, Pool or Unit (Field Units) (Source: HMDC)

Table A.2.2 highlights a significant production shift from the Hibernia B Pool starting in 2008 to deferred reservoir developments over the next 8 years. Production from Hibernia B Pool will go from 91.6 MMbbls/day in 2009 to an estimated 24 MMbbls/day to 2016.

Note: The increase in production in years 2030 to 2032 is due to work-overs and isolations of intervals in the B Pool in Hibernia South wells. These wells are estimated to have their primary reservoir sections watered out in 2030 but there will be additional oil production from uphole sections in these wells.

Table A.2. 2: Hibernia Production Forecast for Most Likely Case (Source: HMDC)

Year	Oil Production - Most Likely (kbd)								
	Total	NGL	B Pool	AA Blocks	BNA	A Pool	HSouth	Catalina	Cape Isl
1997	3.5	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0
1998	65.2	0.0	65.2	0.0	0.0	0.0	0.0	0.0	0.0
1999	99.7	3.6	96.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	144.2	5.3	136.7	0.0	2.3	0.0	0.0	0.0	0.0
2001	148.7	5.4	133.6	0.0	9.7	0.0	0.0	0.0	0.0
2002	180.4	6.6	170.8	0.0	3.0	0.0	0.0	0.0	0.0
2003	203.0	7.4	190.1	0.0	5.5	0.0	0.0	0.0	0.0
2004	203.7	7.5	187.9	0.0	8.4	0.0	0.0	0.0	0.0
2005	198.9	7.3	183.9	0.0	7.7	0.0	0.0	0.0	0.0
2006	178.3	6.5	162.0	0.0	9.8	0.0	0.0	0.0	0.0
2007	134.8	4.9	113.1	0.0	16.8	0.0	0.0	0.0	0.0
2008	138.5	4.9	114.7	0.0	15.4	3.6	0.0	0.0	0.0
2009	106.9	3.9	91.6	0.0	11.4	0.0	0.0	0.0	0.0
2010	103.1	3.8	75.7	11.1	12.0	0.6	0.0	0.0	0.0
2011	111.1	3.9	70.5	17.2	15.9	3.5	0.0	0.0	0.0
2012	118.5	4.3	72.4	25.2	16.5	0.2	0.0	0.0	0.0
2013	104.0	3.8	52.1	18.2	13.7	0.0	16.3	0.0	0.0
2014	108.8	4.0	39.8	14.1	10.9	0.2	39.8	0.0	0.0
2015	108.5	3.9	32.3	9.5	7.7	1.8	53.3	0.0	0.0
2016	100.2	3.6	24.3	10.0	11.5	0.5	50.4	0.0	0.0
2017	96.8	3.5	27.3	8.6	13.8	1.0	42.6	0.0	0.0
2018	91.7	3.2	30.5	6.6	12.0	3.3	36.1	0.0	0.0
2019	89.7	3.2	40.5	3.4	9.9	3.2	29.6	0.0	0.0
2020	82.7	3.0	38.1	2.9	9.3	0.0	29.3	0.0	0.0
2021	79.3	2.9	38.6	2.1	10.5	0.7	24.5	0.0	0.0
2022	69.5	2.5	28.6	1.8	15.5	0.2	21.0	0.0	0.0
2023	67.3	2.5	25.3	1.4	18.4	0.0	19.8	0.0	0.0
2024	49.8	1.8	19.3	0.6	18.9	0.0	9.2	0.0	0.0
2025	42.4	1.5	16.3	0.0	17.5	0.9	6.2	0.0	0.0
2026	40.7	1.5	16.7	0.0	12.9	0.0	9.7	0.0	0.0
2027	33.8	1.2	14.5	0.0	8.1	0.4	9.7	0.0	0.0
2028	20.9	0.7	10.6	0.0	5.3	0.7	3.6	0.0	0.0
2029	14.1	0.5	9.8	0.0	0.8	0.0	2.9	0.0	0.0
2030	13.5	0.5	8.7	0.0	1.3	0.6	2.5	0.0	0.0
2031	24.5	0.9	8.2	0.0	1.0	0.4	14.2	0.0	0.0
2032	29.4	1.1	6.6	0.0	0.8	0.0	21.0	0.0	0.0
2033	24.1	0.9	6.6	0.0	0.9	0.0	15.8	0.0	0.0
2034	15.1	0.5	6.3	0.0	0.5	0.2	7.6	0.0	0.0
2035	11.2	0.4	5.8	0.0	0.6	1.3	3.2	0.0	0.0
2036	8.8	0.3	5.1	0.0	1.4	0.0	2.0	0.0	0.0
TOTAL (MB)	**1265.8**	**45.1**	**869.0**	**48.4**	**123.2**	**8.4**	**171.6**	**0.0**	**0.0**

Grey shade = deferred development

The Proponent provided upside and downside production profiles for the total development (Figure A.2.5).

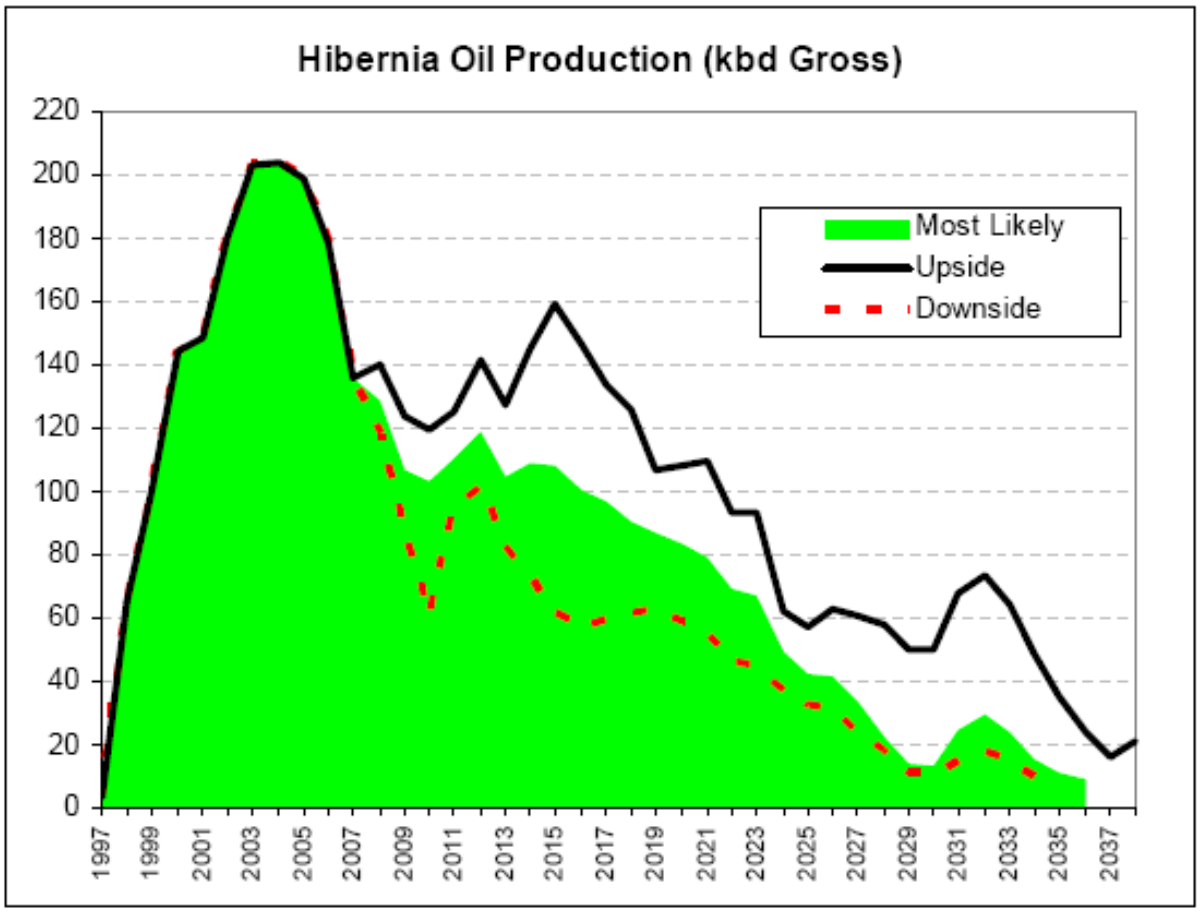

Figure A.2. 5: Hibernia Oil Production Forecast for Upside, Most Likely, and Downside Cases (Source: HMDC)

The Proponent's reservoir simulation model assumes that wells with a 95% water cut or oil production of less than 1000 barrels per day as a production cut-off for zone or well abandonment. The Board's staff feels that this abandonment criteria is reasonable; however, staff will continue to work with the Proponent to define the appropriate criteria for future zone and well abandonments.

A.2.2.5 Field Economic Life

Since Decision Report 97.01, the Proponent has maintained a field economic cut-off of 31,500 barrels per day (5000 m^3/d). This cut-off was based on 1994 estimates of capital and operating expenditures. In this Application, the Proponent's economic limit has been revised and lowered to 10,000 barrels per day (1590 m3/d) (Figure A.2.6). Board's staff feel that this is reasonable at this time.

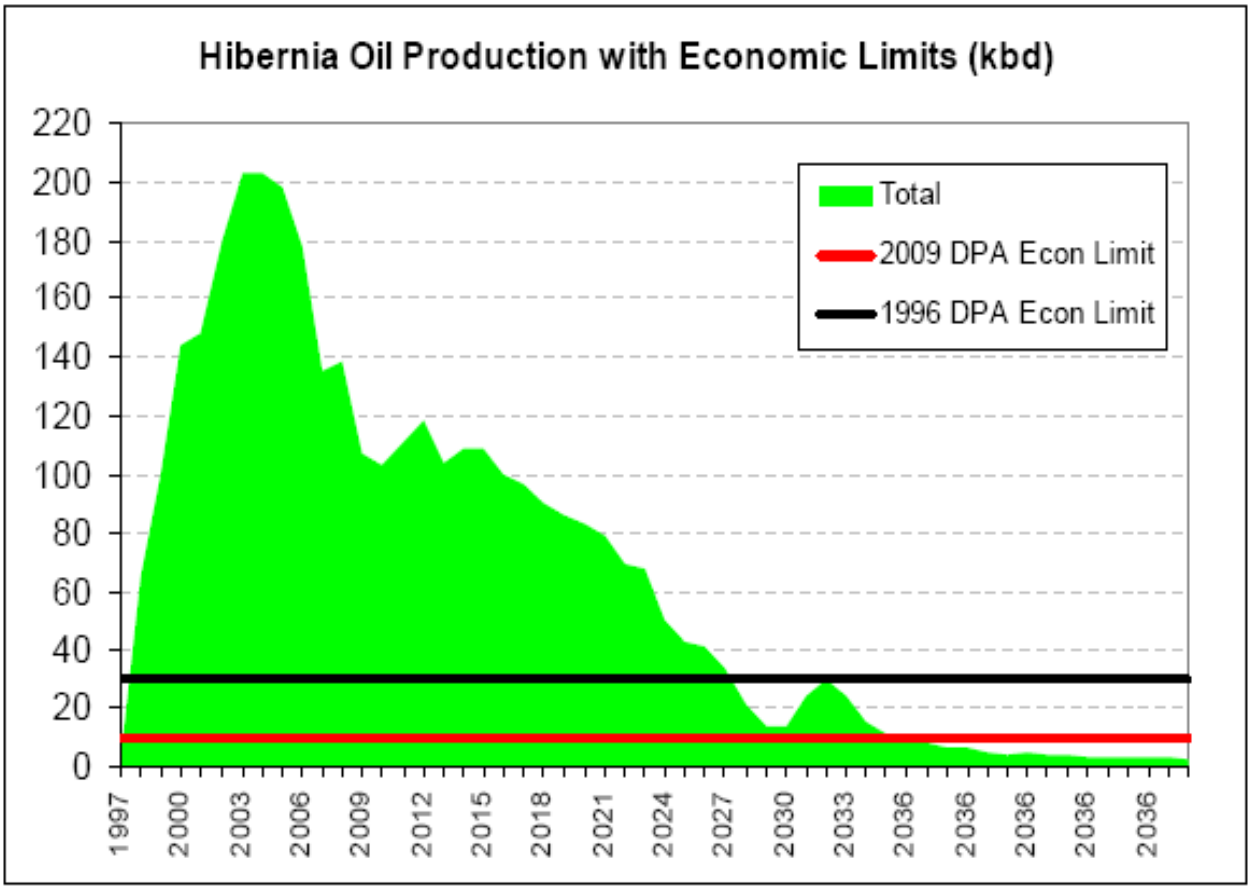

Figure A.2. 6: Hibernia Oil Production Forecast With Economic Limits (kbd) (Source: HMDC)

A.2.2.6 Gas Utilization

In addition to oil production, the Hibernia facility is involved with the production and handling of gas from the Hibernia Field. Figure A.2.7 shows the forecast of gas utilization from oil production for the field life. Since gas injection began in 2000, it is estimated that up to 90% of the gas produced has been reinjected into the reservoir for pressure maintenance and enhanced oil recovery. Starting in 2012, a portion of the gas produced will be used for gas lift as well. Gas from the Hibernia AA Block may be used for injection to improve gas flood oil recoveries or gas lift in the entire field.

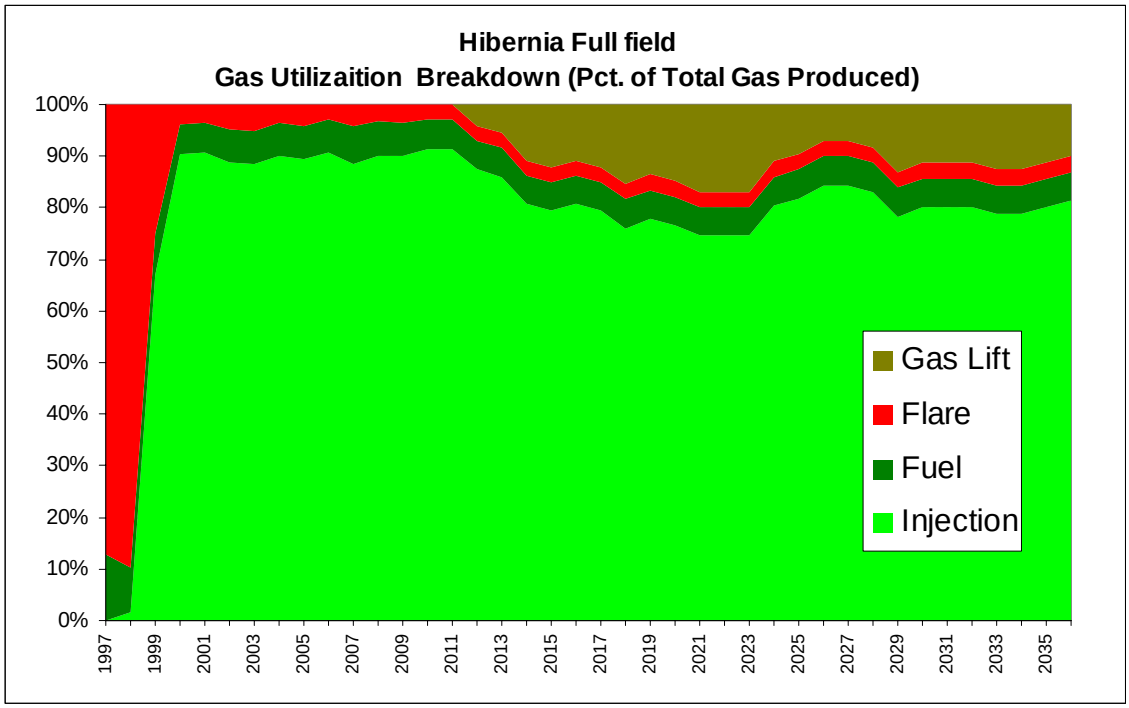

Figure A.2. 7: Hibernia Full Field Gas Utilization Breakdown (Source: HMDC)

A.2.2.7 Deferred Developments

In this Application, the Proponent provided an analysis of the opportunities for Hibernia South Unit, oil resources in the Catalina and Cape Island reservoirs, alternative depletion mechanisms, NGL's and gas development.

Hibernia South Unit

The Hibernia South Unit is a Hibernia B Pool development that is found south of the Hibernia AA Block. Portions of this resource are located within PL 1005 and EL 1093, as well as PL 1001. The Proponent states that a full technical assessment of the development's potential will be done prior to a development plan being submitted. The Proponent also indicates that the commercial arrangements among interest owners will be submitted to the C-NLOPB upon finalization. Staff concurs with this approach.

Catalina and Cape Island Reservoirs

The Proponent plans a full technical assessment of each reservoir's development potential. In the case of Catalina and Cape Island Members, the Application identifies the upside potential of each of these resources. The Proponent has indicated that prior to development of these reservoirs, a development plan assessment detailing technical work and depletion plan will be submitted. Staff is in agreement with the Proponent on this issue.

Miscible Flood

A miscible flood has been considered by the Proponent for the gas flood region of the B Pool. The Proponent has conducted studies to assess this potential. These studies include fluid analysis and modeling, analyses of the displacement processes using core samples and reservoir simulation. The Board's staff reviewed the report (*Hibernia R Block recovery by Double Displacement*) and agrees with the Proponent that the quantities of gas required to maximize oil recovery should be defined before any gas is produced from the Hibernia Field. Board staff continues assessment of this issue.

Natural Gas Liquids (NGL's)

In the Application, the Proponent has provided a forecast of NGL's which are extracted from the produced gas prior to re-injection, in its oil reserve estimates. The most likely recoverable estimate for NGL by the Proponent is 45.3 million barrels (7.2 Mm^3), with an upside of 56 million barrels and a downside of 38.1 million barrels. This represents 3 to 4 % of the Proponent's total most likely oil estimate. The Board estimates natural gas liquid resources to range from 133 million barrels (21.1 million Sm^3) to 262 million barrels (41.7 million Sm^3). In the 2006 Board's staff analysis, it was noted that there may be potential to extract additional natural gas liquids from the Hibernia Field, in excess of that estimated by the Proponent. Data collected from the Hibernia reservoir gas cap suggest that the gas is very rich in liquids. To date, the Board has placed operating pressure limitations on the gas flood region to ensure that the drop-out of these liquids does not occur in the reservoir, and to preserve the opportunity to implement exploitation schemes to recover these resources in the future. Staff will continue to review NGL reserves with the Proponent.

Natural Gas

The Proponent's updated estimate for original gas-in-place and gas reserves for the Hibernia Field is listed in Table A.2.3.

Table A.2. 3: Hibernia Field Gas STOOIP and Recovery Range (Source: HMDC)

Reservoir	Original Gas In Place (GCF)			Gas EUR (GCF)		
	Gas Cap	Solution	Total	Gas Cap	Solution	Total
Hibernia B Pool	466	1970	2436	350	813	1163
Hibernia AA Blocks (B Pool)	0	119	119	0	40	40
Hibernia South Unit (B Pool)	0	276	276	0	93	93
Ben-Nevis Avalon	0	781	781	0	158	158
A Pool Hibernia	111	179	290	28	7	35
Catalina	89	65	154	4	2	6
Cape Island	0	5	5	0	0	0
Total Hibernia Asset	**666**	**3395**	**4061**	**382**	**1113**	**1495**

Recent reserve/resource assessments conducted by the Board's staff estimate the potential recoverable gas resources at the Hibernia Field to range from 953 billion standard cubic feet (26.9 billion m^3) to 2671 billion standard cubic feet (75.2 billion m^3), with a most likely estimate of 1794 billion standard cubic feet (50.6 billion m^3). Staff agrees that the Proponent's estimate for total gas reserves, and especially gas reserves related to Hibernia AA Block, is reasonable.

While the gas resource is currently used for fuel, and for reservoir pressure support to exploit the oil reserves, it will eventually be available for production. Future exploitation of the gas resources may also extend the economic life of the Hibernia Field, permitting additional oil to be recovered. The Proponent conducted a preliminary review of gas commercialization in the Application. The timing of gas availability at the Hibernia Field for commercial purposes is dependent on the gas requirements for the exploitation of the oil reserves and the natural gas liquids resources. According to the Proponent, Hibernia could support gas sales of 200 – 300 million Scf/d starting after 2020 in order to ensure that optimized reservoir oil exploitation occurs (Figure A.2.8).

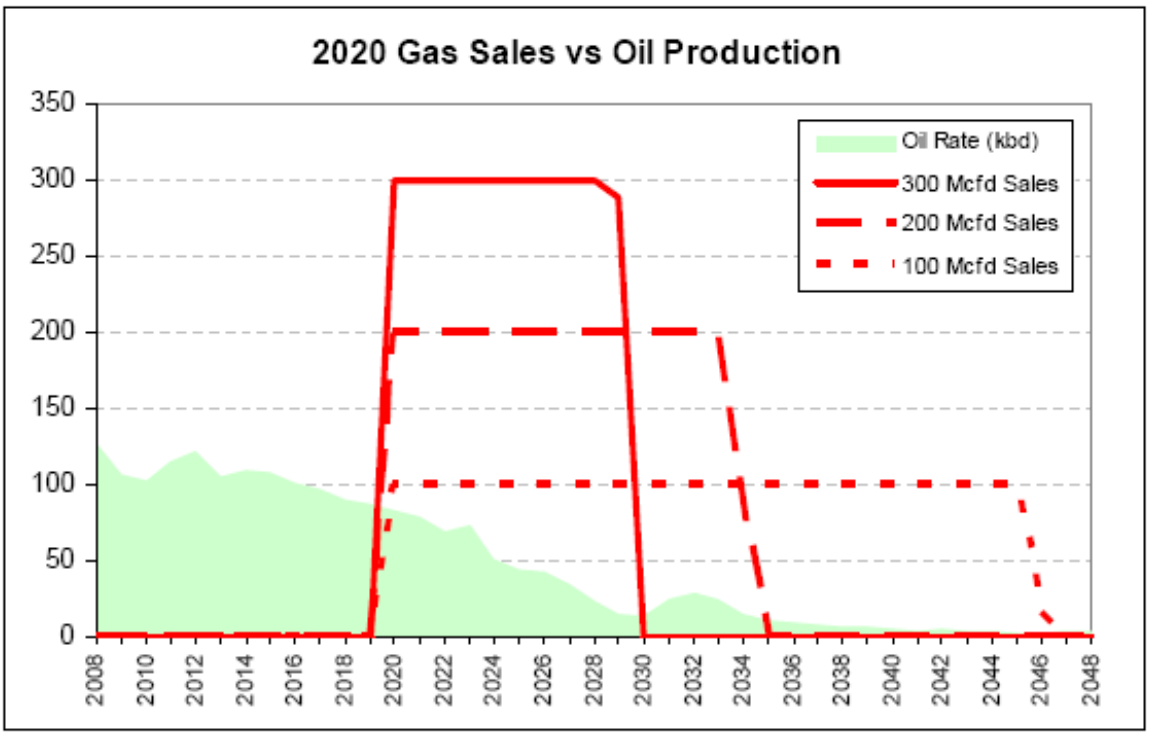

Figure A.2. 8: Possible 2020 Gas Sales vs. Oil Production (Source: HMDC)

Staff agrees with the Proponent that further technical assessment will be required to define the timing of possible gas sales.

A.2.3 Facilities

The current Hibernia facilities are fully utilized for oil production. Consequently, the opportunities for deferred developments must be considered in this context. This circumstance is not unusual for production facilities.

The Proponent has assessed the potential opportunities for de-bottlenecking of the facilities, conducted a development planning study to evaluate facility expansion options, and investigated the potential to add drill slots to the Hibernia platform. The Proponent believes that all opportunities can be developed from the platform. The Proponent has concluded that the limited uplift benefit did not justify the cost of the facility upgrades. Staff concurs with this assessment in the context of AA Block development.

A.2.4 Conclusion: Full Reservoir Exploitation

The Proponent's combined full reservoir exploitation strategy appears reasonable. The Board's staff has reviewed and summarized the key points as follows:

- Only the Hibernia AA Block is proposed for development at this time, whereas all other deferred developments that not have been approved such as the Hibernia South Unit, Catalina, Cape Island and gas development, will require Development Plan Amendments pending further technical assessments.

- The oil reserve estimates provided by the Proponent for most likely case (1265 million barrels) are considered reasonable.

- The proposed drilling schedule for the next two years is reasonable.

- A significant production shift from the Hibernia B Pool to deferred reservoir developments can be expected over the next 8 years.

- A revised field economic cut-off of 10,000 barrels a day has been proposed and is considered reasonable by staff.

- The proponent's combined full reservoir exploitation strategy appears reasonable.

- The Proponent has addressed the Hibernia AA Block development in the context of longer-term opportunities such as Hibernia South Unit, Catalina and gas commercialization.