



Energy Market Assessment

Short-term Canadian Natural Gas Deliverability 2016-2018

Appendices



National Energy
Board

Office national
de l'énergie

June 2016

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Short-term Canadian Natural
Gas Deliverability 2016-2018

ISSN: 1910-7773
NE2-1/2016E-PDF

Email: publications@neb-one.gc.ca
www.neb-one.gc.ca

This publication is available upon request in multiple formats

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Productibilité à court terme de gaz
naturel au Canada 2016-2018

ISSN: 1910-779X
NE2-1/2016F-PDF

Courriel : publications@neb-one.gc.ca
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APPENDIX A

A1 Methodology (Detailed Description)

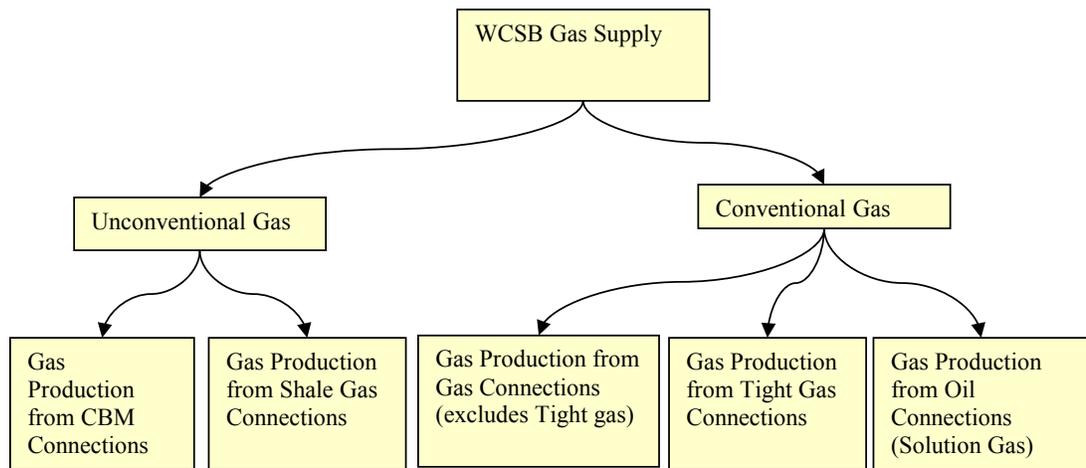
Canadian natural gas deliverability from 2016 to 2018 will consist of conventional gas supply from the WCSB with contributions from Atlantic Canada, Ontario, CBM production from Alberta, and shale gas production from Alberta and B.C. In this report, an analysis of trends in well production characteristics and resource development expectations was undertaken to develop parameters that define future natural gas deliverability from the WCSB. A different approach was undertaken for other regions of Canada where production is sourced from a smaller number of wells.

A1.1 WCSB Gas Supply

To assess gas deliverability for the WCSB, gas production was split into two major categories as shown in Figure A1.1.

FIGURE A1.1

WCSB Major Gas Supply Categories for Deliverability Assessment



The methodology to determine gas deliverability associated with conventional gas connections (including tight gas), CBM connections, and shale gas is described below. The methodology to determine gas deliverability related to oil connections (solution gas) is described in Section A.1.1.2 of this appendix.

A1.1.1 Gas Connections from Gas Wells

The methodology used to assess deliverability is mostly the same for conventional gas connections (including tight gas), CBM connections and shale gas connections. Production decline analysis on historical production data was used to determine parameters that define future performance.

A1.1.1.1 Groupings for Production Decline Analysis

Different groupings of conventional gas connections (including tight gas), shale gas, and CBM connections were made to assess well performance characteristics. Conventional gas connections were grouped geographically on the basis of the Petrocube areas in Alberta, B.C., and Saskatchewan, as shown in Figure A1.2. Conventional and shale gas connections in each area were also grouped by zone. In this analysis, gas deliverability from the Montney formation is separate from the other tight gas sources.

FIGURE A1.2

WCSB Area Map



Within each Petrocube area and zone, gas connections were grouped by connection year, with all connections made prior to 1999 forming a single grouping, and separate groupings for each year from 1999 through 2014.

CBM connections were grouped primarily by zone into three categories:

- Horseshoe Canyon Main Play
- Mannville CBM, and
- Other CBM

For the projection period, CBM production is only in Alberta.

Within each of the three categories of CBM resources, connections were also grouped by connection year. For the Horseshoe Canyon Main Play and Other CBM categories, there is a single grouping for all connections made prior to 2004, and separate groupings for each year from 2004 through 2014. For Mannville CBM, a single grouping was made for all connections made prior to 2006, and separate groupings for each following year.

Existing Connections vs. Future Connections

In this report, “existing connections” are connections brought on production prior to August 1, 2015, and “future connections” are connections brought on production from August 1, 2015 onwards. The methodology applied to make the gas deliverability projections for existing connections is substantially different from what is done to assess deliverability for future connections.

A1.1.1.2 Methodology for Existing Connections

For **existing connections**, production decline analysis on historical production data is done on each grouping (gas type/study area/zone/connection year) to develop two sets of parameters.

1. Group deliverability parameters-- describing deliverability expectations for the entire gas resource grouping.
2. Average connection deliverability parameters-- describing deliverability expectations for the average gas connection in the grouping (note—these only apply when the grouping represents a specific connection year).

The methodology for the production decline analysis on existing connections is described below. The group deliverability parameters and average connection deliverability parameters resulting from this analysis are contained in Appendices A.3 and A.4, respectively. In the deliverability model, the group deliverability parameters are used to make the deliverability projection for existing connections.

Production Decline Analysis Methodology

The production decline analysis procedure described below applies to conventional gas connections (including tight gas), CBM and shale gas in the WCSB.

Conventional and shale gas connections are grouped by study area, zone, and connection year. CBM connections in Alberta are grouped by producing zone and connection year. For each of these groupings, a data set of group marketable production history is created and, where the grouping represents a specific connection year, a data set of average connection marketable production history is also generated.

The data sets for group marketable production are generated as follows:

- Raw well production for gas connections in each grouping is summed by calendar month getting total group raw production by calendar month.
- The total group raw production by calendar month is multiplied by an average shrinkage factor that applies to the grouping and divided by the number of days in each month to get total monthly marketable gas production and marketable gas production rate (MMcf/d) for each calendar month.
- Using this data set, plots of total daily marketable production rate versus total cumulative marketable production are generated for each grouping.

The data sets for average connection production history are created as follows.

- The raw well production by month for each connection in the grouping is put in a data base.
- For each entry of production month for each connection, a value of normalized production month is calculated as the number of months between the month the connection began producing and the actual production month (this is the normalized production month).
- The raw production for connections in the grouping is summed by normalized production month and then multiplied by the average shrinkage factor that applies to the grouping, providing total marketable production by normalized production month.
- The total marketable production by normalized production month is then divided by the total number of connections in the grouping to get marketable production for the average connection by normalized production month.
- The marketable production for normalized production month is then divided by the average number of days in a month, or 30.4375, giving the production rate for the average connection in the grouping by normalized production month. (Note: due to the different number of production months for connections in the grouping coming on stream at different times of the year, some production data could not be used in the calculation of the average connection production rate).
- Using this data set, plots of daily marketable production rate versus cumulative marketable production for the average connection were generated for each grouping.

For conventional gas connections, the following procedures are applied in performing production decline analysis using the group and average connection historical production data sets:

- **Production Decline Analysis for the Pre-1999 Connections**

In each study area, the group rate versus cumulative production plot for the grouping of gas connections on production prior to 1999 is the first to be evaluated. In all study areas, a stable exponential decline for the past several years was exhibited. The group plot for all the connections prior to 1998 yields a current marketable production rate, a stable decline rate applicable to future production, and a terminal decline that may be applicable to later connection year groupings for the study area.

- **Evaluate Connection Year 1999 through 2014**

After the initial aggregate connection year is evaluated for a study area, each connection year is evaluated in sequence, from 1999 through 2014.

a. Production Decline Analysis for the Average Connection:

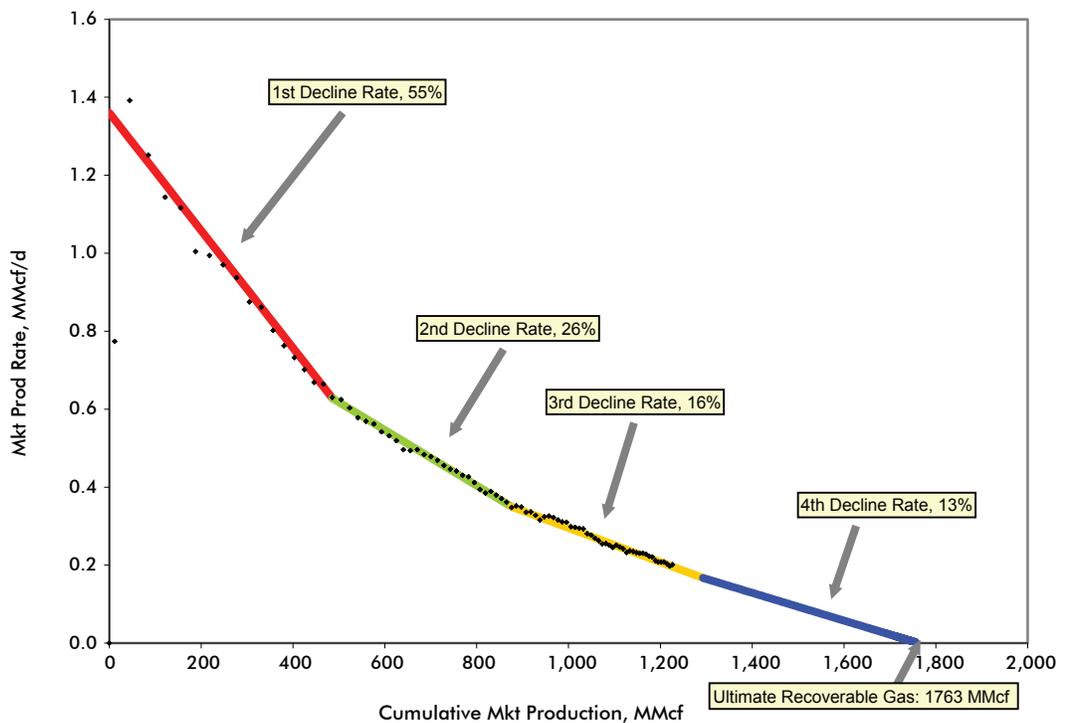
For each connection year, the rate versus cumulative production plot for the average connection is evaluated first to establish the following parameters that describe the production profile of the average connection over the entire productive life:

- Initial Production Rate
- First Decline Rate
- Second Decline Rate
- Months to Second Decline Rate - usually around 18 months
- Third Decline Rate
- Months to Third Decline Rate - usually around 45 months
- Fourth Decline Rate
- Months to Fourth Decline Rate - usually around 100 months

Figure A1.3 shows an example of the plots used in evaluation of average connection performance, and the different decline rates that are applied to describe the production.

FIGURE A1.3

Example of Average Connection Production Decline Analysis Plot



Source: NEB analysis of Divestco Geovista well production data

For the earlier connection years, the available data is usually sufficient to establish all of the above parameters. For more recent connection years, the duration of historical production data becomes shorter and the parameters describing the later life decline performance must be taken from that determined for earlier connection years. In the example shown in Figure A1.3, the available data is sufficient to determine parameters

defining the first, second, and third decline periods for the connection, but the parameters defining the fourth decline period must be assumed based on the analysis of earlier connection years.

It is assumed that, unless the historical data for the connection year indicates otherwise, the fourth decline rate will equal the terminal decline rate for the grouping established through evaluation of all pre-1999 connections, and that period of the terminal decline rate will commence after 120 months of production.

The decline parameters determined in this manner for average connections are available in Appendix A4.

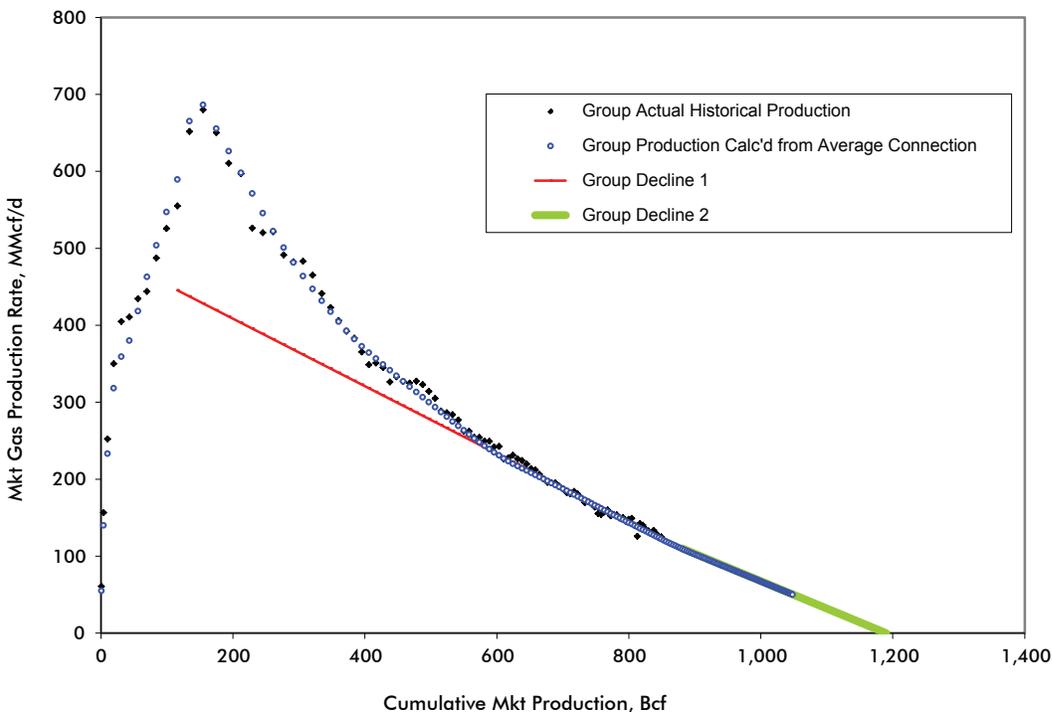
b. Production Decline Analysis for the Group Data:

Once the performance parameters for the average connection are established, the procedure focuses on evaluation of group performance parameters.

As a first step, the average connection performance parameters are combined with the known connection schedule to calculate the expected group performance. This is plotted with the actual group performance data. If the data calculated from average connection performance data does not provide a good match with the actual historical production data for the group, then the average connection parameters may be revised until a good match is obtained between calculated group production data (from average connection data) and actual group production data. An example of the group plots described here is shown in Figure A1.4.

FIGURE A1.4

Example of Group Production Decline Analysis Plot



Source: NEB analysis of Divestco Geovista well production data

The following group performance parameters are determined from the group plot:

- Production Rate as of July 2015
- First Decline Rate
- Second Decline Rate (if applicable)
- Months to Second Decline Rate (if applicable)
- Third Decline Rate (if applicable)
- Months to Third Decline Rate (if applicable)
- Fourth Decline Rate (if applicable)
- Months to Fourth Decline Rate (if applicable)

In the earlier connection year groupings (2001, 2002, etc.), the actual group data is usually stabilized by the current date at or near the terminal decline rate established via the pre-1999 aggregate grouping. In these cases a single decline rate sufficiently describes the entire remaining productive life of the grouping. In these cases the expected performance calculated from average connection data has little influence over determination of the group parameters.

In later connection years (2011, 2012, etc.) actual group production history data cannot provide a good basis upon which to project future deliverability. In these cases the expected performance calculated from average connection data is vital to establishing the current and future decline rates applicable for the connection year.

Group performance parameters determined in this manner are available in Appendix A3.

Production Decline Analysis of CBM

The production decline analysis procedure described above is also applied to the CBM groupings and shale gas, subject to the following:

1. Mannville CBM connections have a different performance profile than the other gas resources in the WCSB. While gas connections for all other groupings can be described by an initial production rate that declines in a relatively predictable manner, Mannville CBM connections go through a dewatering phase with gas production increasing over a period of months to a peak rate. After the peak rate is reached decline will occur. Thus a slightly different set of parameters is used to describe performance of the average connection for Mannville CBM, with initial production rate being replaced by "Months to Peak Production" and "Peak Production Rate".
2. The shorter production history of shale gas makes it more difficult to establish long-term decline rates based on historical data. Nevertheless, decline rates that describe the full productive life of shale gas connections are still estimated in this Energy Market Assessment, based on the NEB's view of ultimate gas recovery for the average connection.

A1.1.1.3 Methodology for Future Connections

For future connections, deliverability is projected based on the number of future connections and the expected average performance characteristics of those connections. The drilling projection is used to estimate the number of future gas connections. Historical trends in average connection performance parameters, obtained from production decline analysis of existing gas connections, are used to estimate average connection performance parameters for future connection years.

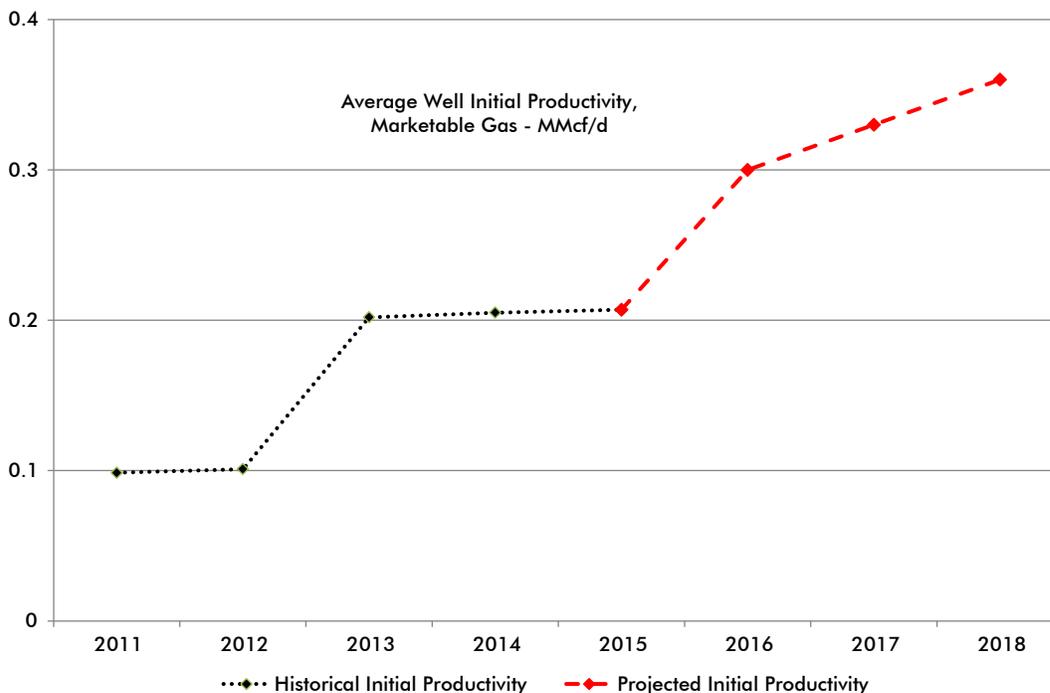
A1.1.1.3.1 Performance of Future Connections

The performance of future connections is obtained in each resource grouping by extrapolating the production performance trends for average connections in past connection years. The performance parameters estimated are initial productivity of the average connection and the associated decline rates.

In many groupings, each new connection year follows a trend of decreasing initial productivity for the average conventional gas connection. This trend is evident in Figure A1.5, which shows the initial production rate over time for conventional gas connections in the West Central Alberta Tertiary conventional grouping. Recently, however, there has been a trend in some tight and shale groupings where initial productivity for the average gas connection has been increasing. The initial production rate for future gas connections is estimated by extrapolating the trend in each resource grouping. Historical and projected initial productivity values for the average connection for all gas resource groupings are contained in Appendices A3 and A4.

FIGURE A1.5

Example of Initial Productivity of Average Connections by Connection Year – West Central Alberta Colorado Tight Grouping

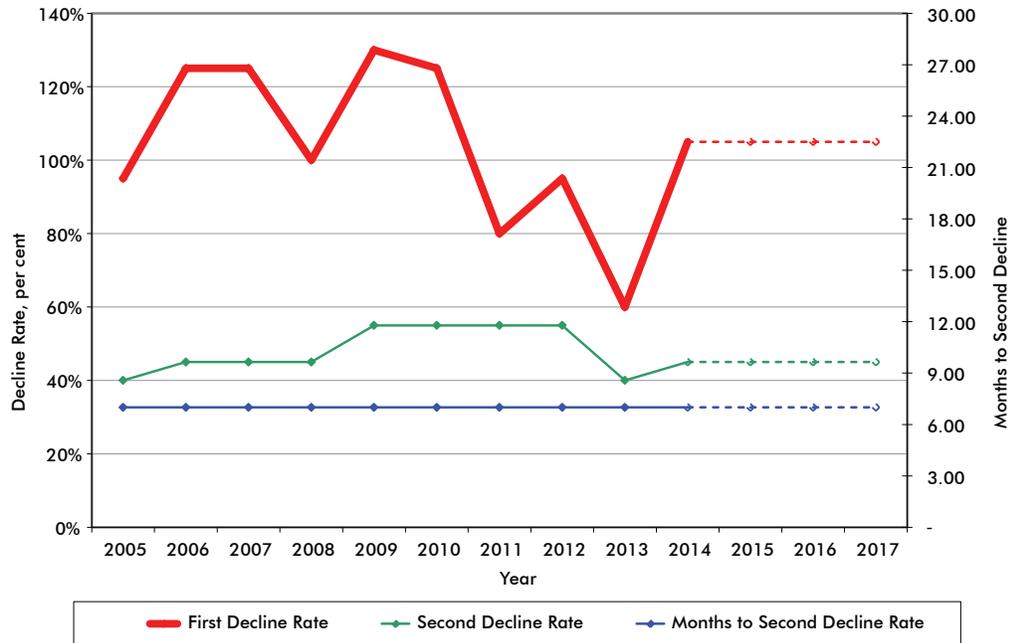


Source: NEB analysis of Divestco well production data

The key decline parameters impacting short-term deliverability are the first decline rate, second decline rate, and months to second decline rate. Figure A1.6 shows the historical and projected values of these key decline parameters for the average connections during the years 2011 through 2018 for conventional gas connections in the Southwest Alberta, Tertiary, Upper Cretaceous, Upper Colorado grouping. As shown in Figure A1.6, trends seen in the decline parameters in past connection years are used to establish these key parameters for future years.

FIGURE A1.6

Example of Key Decline Parameters for Average Connections Over Time - Southwest Alberta, Tertiary, Upper Cretaceous, Upper Colorado Conventional Grouping



A1.1.1.3.2 Number of Future Connections

Projecting the number of future connections requires an estimate of the annual number of gas-intent (including tight gas), shale-intent, and CBM-intent wells for each resource grouping and then multiplying by the ratio of annual connections to annual wells.

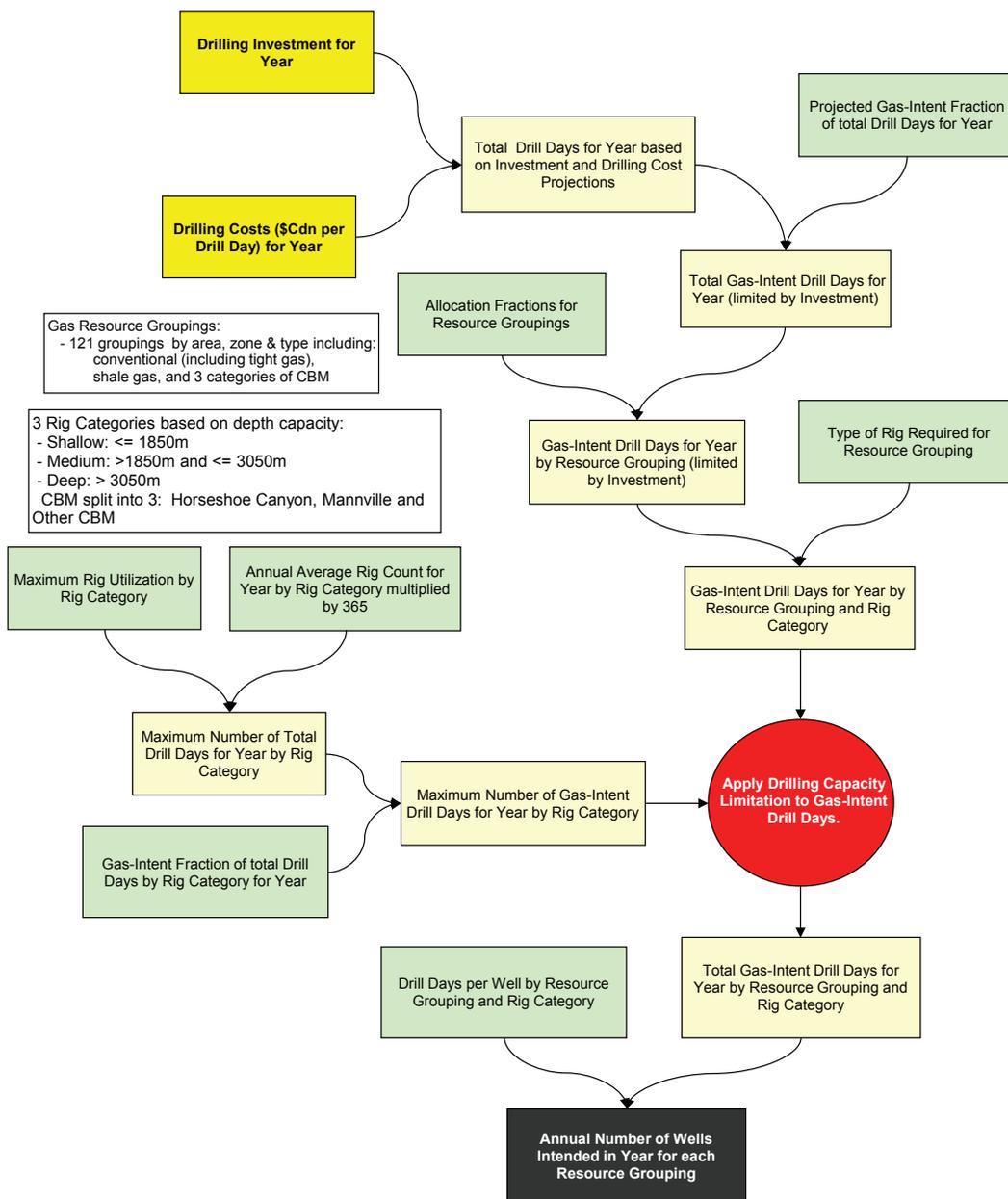
Shown in Figure A1.7 is the methodology for projecting the number of gas-intent and CBM-intent wells for each year over the projection period. The key inputs are **Annual Drilling Investment** and **Costs per Drill Day**. Adjustments to these two key inputs (shown as yellow boxes in Figure A1.7) produce different drilling activity situations in the WCSB. Other inputs required by the procedure are shown in the green boxes in Figure A1.7. The values projected for these other inputs are estimated from an analysis of historical data.

The Board projects an allocation of gas-intent drill days for each of the resource groupings. The allocation fractions are determined from historical trends, recent estimates of supply costs, and the Board's view of development potential for the resource groupings. The allocation fractions reflect the historical trends of an increasing focus on the deeper formations located in the western side of the basin, increasing interest in tight gas and gas shales in B.C, and further development of liquids rich/wet natural gas. Tables of the historical data (drill days and allocation fractions) and the projected allocation fractions are available in Table B1.

After allocating the gas-intent drill days to the resource groupings, a check is completed against drilling capacity to ensure that physical drilling limitations are not exceeded. The number of gas-intent wells drilled in each year is calculated by dividing the drill days targeting each resource grouping by the applicable average number of drill days per well.

FIGURE A1.7

Flowchart of Drilling Projection Methodology



For each resource grouping, a connection ratio (the ratio of annual connections to annual wells drilled targeting a grouping) is estimated based on historical data. The annual number of wells drilled is multiplied by the connection ratio to obtain the number of annual connections for each resource grouping. The connection ratios for each resource grouping are provided in Table B.2. The annual number of connections for each resource grouping is allocated to each month of the year in accordance with the established historical connection schedule.

A1.1.2 *Solution Gas*

Solution gas is gas produced from oil wells in conjunction with the crude oil and accounts for about 13 per cent of total marketable gas production in the WCSB. To estimate deliverability of solution gas, oil connections are grouped by study area and production decline analysis is performed on the entire grouping to obtain the current production rate and the decline rate. The deliverability resulting from these parameters is deemed to represent all solution gas deliverability (i.e. deliverability from both existing and future connections).

A1.1.3 *Yukon and Northwest Territories*

No deliverability from the Mackenzie Delta and elsewhere along the Mackenzie Corridor is included during the three year projection period, as lower prices have rendered production uneconomic. The Norman Wells field produces small amounts of gas that serve local purposes and is not tied into the North American pipeline grid. Cameron Hills production ceased in February 2015

A1.2 *Atlantic Canada*

For producing wells from offshore Nova Scotia, production profiles are based on the seasonal performance of the two producing projects. No additional infill wells are assumed for the producing fields over the projection period. Deliverability from the Deep Panuke development started in fall 2013, but has since turned seasonal.

Onshore production from the McCully Field in New Brunswick was connected into the regional pipeline system at the end of June 2007 and now operates on a seasonal basis.

Shale gas potential exists in New Brunswick and Nova Scotia, however, provincial policies currently prohibit hydraulic fracturing which is required for shale gas development. It is assumed these policies do not change over the projection period.

A1.3 Other Canadian Production

A minor remaining amount of Canadian deliverability is from Ontario. Deliverability from Ontario is projected by extrapolation of historical production volumes. Shale gas potential exists in Quebec, however, provincial policies currently prohibit hydraulic fracturing which is required for shale gas development. It is assumed these policies do not change over the projection period.

A1.4 Canadian Deliverability and Canadian Demand

Canadian natural gas demand is met within the integrated North American natural gas market by a combination of Canadian natural gas deliverability and imports of U.S. gas.

Natural gas deliverability is defined as the estimated amount of gas supply that could be produced from a given area, after field processing, based on historical production and individual well declines, as well as projected activity. All estimated gas use prior to the outlet from field processing plants has already been deducted from the deliverability estimate, and likewise is not included in the demand estimate. Gas consumed at the Goldboro processing facility in Nova Scotia is in this category of field processing and has therefore already been deducted from Atlantic Canada deliverability.

Current and projected Canadian gas demand is divided geographically at the Saskatchewan-Manitoba border into Western and Eastern Canada demand. Western Canada demand includes gas volumes withdrawn during the recovery of natural gas liquids at straddle plants. Approximately 85 to 90 per cent of the gas volumes leaving Alberta are processed through the straddle plants, where much of the ethane in the gas stream is extracted along with traces of other NGLs and heavier components remaining after field processing. A table of the Average Annual Canadian Deliverability and Demand is available in Appendix E.

Canadian gas demand includes gas required for pipeline fuel in the respective areas. The Board's projection of Canadian gas demand is based on historical trends and expected major increments of gas-fired power generation and industrial projects (including oil sands developments). The demand projection is based on the assumption of average weather conditions. Considerable variability in actual gas demand is possible due to the impact of weather variation on Canada's space heating needs.

Appendix A2 - DELIVERABILITY PARAMETERS - RESULTS

A2.1 WCSB

Using the Board's methodology, connections in the WCSB are categorized as either gas or oil. Gas connections are further categorized as conventional (including the tight gas sub-category), and unconventional (including shale gas and CBM). Connections are grouped based on geographical area, producing zone, and connection year, with different grouping criteria applied to different types of connections.

In the case of existing gas connections (those on production prior to 1 August 2015), and all oil connections (solution gas), production decline analysis is used to establish parameters that define future deliverability of each grouping. Section A2.1.1 below provides further discussion of the parameters resulting from the production decline analysis.

For future gas connections (those on production after 1 August 2015), the number of expected future connections and the expected production performance of those future connections is estimated to provide a basis for the deliverability projection. Section A2.1.2 below provides discussion of the parameters used to project deliverability for future gas connections.

A2.1.1 Production from Existing Gas Connections

The future deliverability of existing connections of the resource groupings comprising conventional (including tight gas), and unconventional (including shale gas and CBM), and all solution gas was determined via the production decline analysis procedure described in Appendix A3. The decline parameters describing the expected future deliverability of each grouping are listed in Appendix A3.

The deliverability parameters for these groupings **are not** impacted by the different price cases considered in this report. The different price cases are included to reflect uncertainty in future gas drilling activity only.

The parameters describing future deliverability for all of these groupings are the production rate as of July 2015 and as many as four future decline rates that apply to specified time periods in the future. For the older groupings of wells where production appears to have stabilized at a final decline rate, only one future decline rate is needed to describe future group deliverability. For newer well groupings, the decline rate that applies over future months changes as the group performance progresses towards the final stable decline period. For these newer well groupings, three or possibly four different decline rates have been determined to describe future performance.

The future deliverability projected for these groupings represents the deliverability that would occur from the WCSB if there were no further gas connections made after July 2015.

The Board's projections show that aggregate production for these groupings will decline by 10 per cent per year over 2015 to 2018. Deliverability from future gas connections supplements the declining deliverability from existing connections.

A2.1.2 Future Gas Connections

Deliverability associated with future gas connections is calculated for each resource grouping using estimates for production performance of the average connection and the number of connections in future years. The parameters associated with both of these inputs are discussed in the sections below.

While past deliverability projections for existing gas connections have enjoyed a high degree of accuracy, the certainty associated with the projections for future gas connections is less. The key uncertainty is the level of gas drilling that will occur. Three price cases have been created to address the uncertainty inherent in the gas drilling projections.

A2.1.2.1 Performance Parameters for Future Average Gas Connections

The production decline analysis procedures described in Appendix A.1 provide the basis for establishing performance parameters for future gas connections. The trends seen in average connection performance for the various groupings of existing connections are used to make an estimate of performance parameters for future gas connections.

For conventional gas connections (including tight gas), the connections are grouped based on area, formation, and connection year from 1999 through 2015. These 13 connection year groupings are assessed for each grouping, providing an excellent historical data set to estimate performance of future wells.

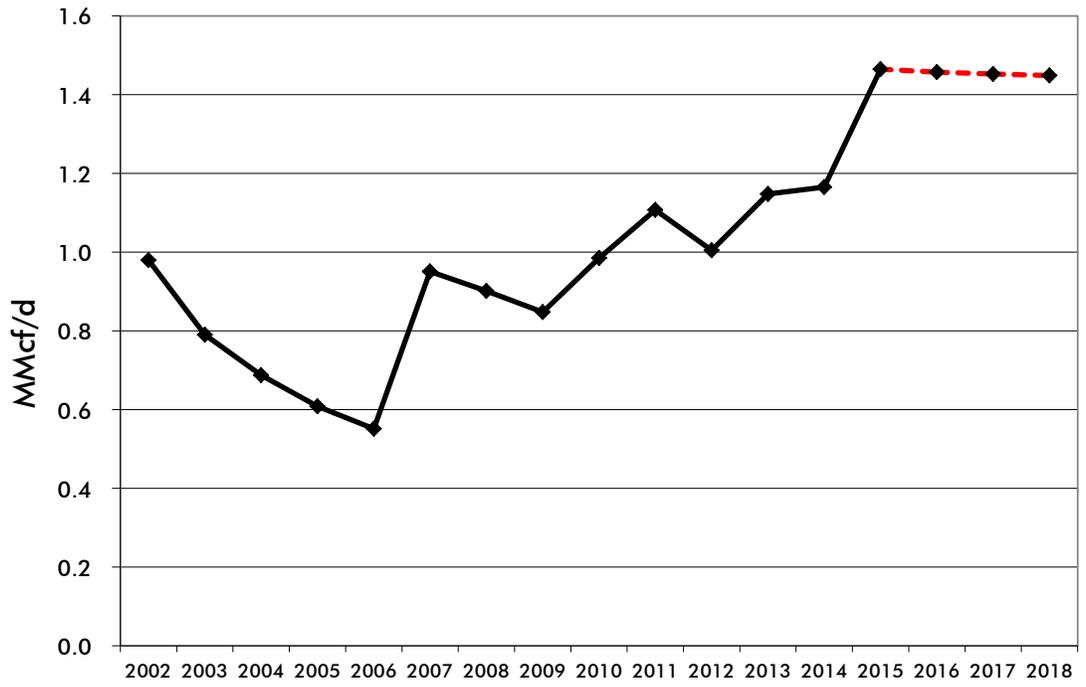
Two trends are apparent in the performance parameters for the existing conventional gas connections.

- Decline rates applicable to the average connection are quite stable over the past several connection years.
- Initial productivity of the average connection increases from connection year to connection year.

With respect to initial productivity of the average gas connection, the overall trend for the WCSB is shown in Figure A2.1. After decreases in initial productivity over 2001 to 2006, the trend reversed upward for 2007, remained fairly stable through 2009, and continued upward through to 2015 as higher initial productivity rates from tight gas and shale gas wells began to represent a growing share of the wells drilled in a year. Initial productivity over the projection is almost flat primarily due to holding the rates constant for most gas wells.

FIGURE A 2 . 1

WCSB Initial Productivity of Average Gas Connections by Connection Year



Source: NEB Analysis of Divestco Well Production Data

Table A2.1 shows the historical average initial production rates for the average gas connections for each area. Appendices A3 and A4 provide a complete listing of all performance parameters for average connections by grouping for both historical and future connection year groupings.

TABLE A2.1

WCSB Initial Productivity of Average Gas Connections by Connection Year by Area - MMcf/d

Area	2008	2009	2010	2011	2012	2013	2014
00 - Alberta CBM	0.099	0.067	0.047	0.046	0.037	0.036	0.034
01 - Southern Alberta	0.119	0.105	0.145	0.130	0.083	0.063	0.048
02 - Southwest Alberta	0.308	0.303	0.259	0.241	0.142	0.170	0.076
03 - Southern Foothills	0.151	0.683	0.008				2.716
04 - Eastern Alberta	0.080	0.093	0.092	0.102	0.097	0.137	0.228
05 - Central Alberta	0.196	0.204	0.227	0.168	0.169	0.149	0.160
06 - West Central Alberta	0.509	0.453	0.505	0.580	1.131	1.030	1.202
07 - Central Foothills	2.152	1.599	1.628	2.966	2.466	0.331	1.066
08 - Kaybob	0.561	0.742	0.697	0.803	0.530	0.998	0.657
09 - Alberta Deep Basin	0.779	1.057	1.022	0.811	0.953	1.018	1.170
10 - Northeast Alberta	0.163	0.149	0.135	0.171	0.051	0.036	0.064
11 - Peace River	0.484	0.596	0.530	0.509	1.298	1.538	0.595
12 - Northwest Alberta	0.391	0.731	0.334	0.122	0.035	3.550	0.017
13 - BC Deep Basin	1.431	1.388	2.482	2.105	1.330	3.084	1.536
14 - Fort St. John	1.218	1.450	1.426	1.297	1.022	1.452	1.407
15 - Northeast BC	1.040	1.016	2.168	1.867	2.217		3.321
16 - BC Foothills	1.552	1.254	1.644	2.193	2.232	2.399	1.211
17 - Southwest Saskatchewan	0.026	0.018	0.016	0.028	0.027	0.028	0.021
18 - West Saskatchewan	0.068	0.062	0.056	0.078	0.033	0.097	0.111
Total WCSB	0.901	0.847	0.985	1.107	1.004	1.147	1.165

Source: NEB Analysis of Divestco Well Production Data

The average connection performance parameters projected for connection years August 2015 through 2018 are the same in all three price cases assessed in this report. Variance between the cases is affected by applying different levels of gas drilling activity as discussed further in Section A2.1.2.2 of this appendix.

A2.1.2.2 Number of Future Gas Connections

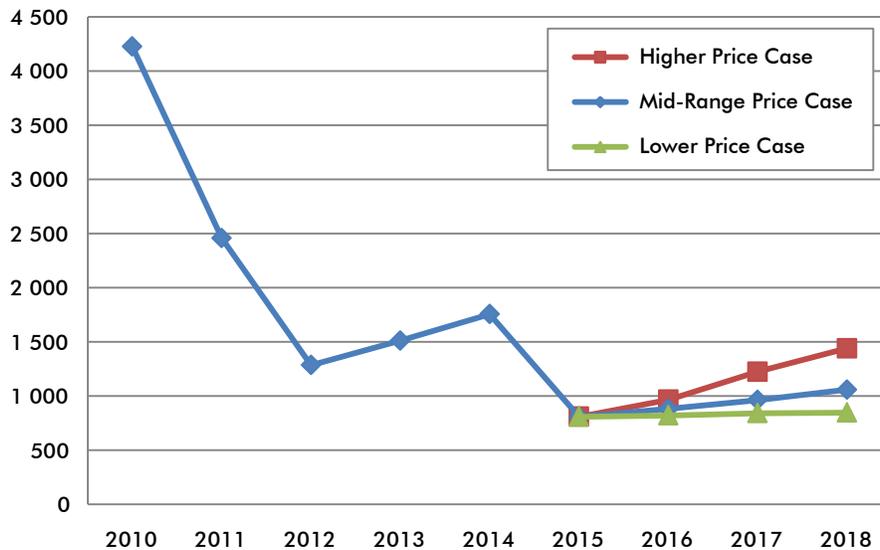
The projected number of connections by year and the projected production performance of the average connections in those years are applied to provide deliverability associated with future gas connections. To determine the number of future gas connections, projections of gas-intent drilling are made for each of the resource groupings. The annual number of wells targeted to each grouping is applied to the ratio of annual connections to annual wells for that grouping to provide the annual number of connections.

Volatile and unpredictable market conditions are expected to be the primary influence on gas-intent drilling activity. As a result, there is a high degree of uncertainty in the gas drilling activity that might occur in the coming years. Three drilling activity cases (Mid-Range, Higher, and Lower) that are based on projections of gas price reflect a range of market conditions that may occur over the projection period. Figure A2.2 indicates the projected number of gas-intent wells for all resource grouping in each case.

Detailed tabulations of projected annual gas-intent-wells, connection ratios, and annual connections for each resource grouping for each case are provided in Table B2.

FIGURE A2.2

WCSB Gas-Intent Well Drilling Cases



A2.2 Atlantic Canada, Ontario, and Quebec

As indicated in Appendix A1, deliverability from Atlantic Canada and Ontario is based on extrapolation of prior trends. No additional wells over the 2016 to 2018 period are assumed to be drilled that would contribute to deliverability at this time.

Marketable production from the Deep Panuke development started in fall 2013. Deep Panuke has begun producing seasonally in the winters, however incursion of water into the reservoir could adversely impact the amount of natural gas recoverable over the lifetime of the project.

Provincial policy in New Brunswick and Nova Scotia currently prohibits hydraulic fracturing which is required for shale gas development. It is assumed that these policies do not change and no additional onshore gas wells are drilled over the projection period. Deliverability from Ontario continues to decline with no additional drilling expected over the projection period.

Provincial policy in Quebec currently prohibits hydraulic fracturing which is required for shale gas development. It is assumed that these policies do not change and no additional gas wells are drilled over the projection period.

Appendix A3 – Decline Parameters for Groupings of Existing Gas Connections

TABLE A3.1

Formation Index

Formation	Abbreviation	Group Number
Tertiary	Tert	02
Upper Cretaceous	UprCret	03
Upper Colorado	UprCol	04
Colorado	Colr	05
Upper Mannville	UprMnvl	06
Middle Mannville	MdlMnvl	07
Lower Mannville	LwrMnvl	08
Mannville	Mnvl	06;07;08
Jurassic	Jur	09
Upper Triassic	UprTri	10
Lower Triassic	LwrTri	11
Triassic	Tri	10;11
Permian	Perm	12
Mississippian	Miss	13
Upper Devonian	UprDvn	14
Middle Devonian	MdlDvn	15
Lower Devonian	LwrDvn	16
Horseshoe Canyon	HSC	-
Mannville CBM	Mannville	-

TABLE A3.2

Grouping Index

Area Name	Area Number	Resource Type	Resource Group
CBM Area	00	CBM	Main HSC
CBM Area	00	CBM	Mannville
Southern Alberta	01	Conventional	Tert;UprCret;UprColr
Southern Alberta	01	Conventional	Colr
Southern Alberta	01	Conventional	Mnvl
Southern Alberta	01	Tight	UprColr
Southwest Alberta	02	Conventional	Tert;UprCret;UprColr
Southwest Alberta	02	Conventional	Colr
Southwest Alberta	02	Conventional	MdlMnvl;LwrMnvl
Southwest Alberta	02	Conventional	Jur;Miss
Southwest Alberta	02	Conventional	UprDvn
Southwest Alberta	02	Tight	UprColr
Southwest Alberta	02	Tight	Colr
Southwest Alberta	02	Tight	LwrMnvl
Southern Foothills	03	Conventional	Miss;UprDvn

Area Name	Area Number	Resource Type	Resource Group
Eastern Alberta	04	Conventional	UprCret;UprColr
Eastern Alberta	04	Conventional	Colr;Mnvl
Eastern Alberta	04	Tight	UprColr
Eastern Alberta	04	Shale	Duvernay
Central Alberta	05	Conventional	Tert;UprCret
Central Alberta	05	Conventional	Colr
Central Alberta	05	Conventional	Mnvl
Central Alberta	05	Conventional	Miss;UprDvn
Central Alberta	05	Tight	Colr
Central Alberta	05	Tight	Mnvl
Central Alberta	05	Tight	Montney
Central Alberta	05	Shale	Duvernay
West Central Alberta	06	Conventional	Tert
West Central Alberta	06	Conventional	UprCret;UprColr
West Central Alberta	06	Conventional	Mnvl
West Central Alberta	06	Conventional	LwrMnvl; Jur
West Central Alberta	06	Conventional	Miss
West Central Alberta	06	Conventional	UprDvn
West Central Alberta	06	Tight	Colr
West Central Alberta	06	Tight	Mnvl
West Central Alberta	06	Tight	Montney
West Central Alberta	06	Shale	Duvernay
Central Foothills	07	Conventional	UprColr
Central Foothills	07	Conventional	Colr;Mnvl
Central Foothills	07	Conventional	Jur;Tri;Perm
Central Foothills	07	Conventional	Miss
Central Foothills	07	Conventional	UprDvn;MdlDvn
Central Foothills	07	Tight	UprColr;Colr
Central Foothills	07	Tight	Mnvl
Central Foothills	07	Tight	Jur
Central Foothills	07	Tight	Montney
Central Foothills	07	Shale	Duvernay
Kaybob	08	Conventional	UprColr;Colr
Kaybob	08	Conventional	Mnvl;Jur
Kaybob	08	Conventional	Tri
Kaybob	08	Conventional	UprDvn
Kaybob	08	Tight	Colr;Mnvl
Kaybob	08	Tight	Tri
Kaybob	08	Tight	Montney
Kaybob	08	Shale	Duvernay
Alberta Deep Basin	09	Conventional	UprCret
Alberta Deep Basin	09	Conventional	UprColr
Alberta Deep Basin	09	Conventional	Mnvl;Jur
Alberta Deep Basin	09	Conventional	Tri
Alberta Deep Basin	09	Conventional	UprDvn

Area Name	Area Number	Resource Type	Resource Group
Alberta Deep Basin	09	Tight	UprColr
Alberta Deep Basin	09	Tight	Colr
Alberta Deep Basin	09	Tight	Mnvl;Jur
Alberta Deep Basin	09	Tight	Tri
Alberta Deep Basin	09	Tight	Montney
Alberta Deep Basin	09	Shale	Duvernay
Northeast Alberta	10	Conventional	Mnvl;UprDvn
Peace River	11	Conventional	UprColr
Peace River	11	Conventional	Colr;UprMnvl
Peace River	11	Conventional	MdlMnvl;LwrMnvl
Peace River	11	Conventional	UprTri
Peace River	11	Conventional	LwrTri
Peace River	11	Conventional	Miss
Peace River	11	Conventional	UprDvn;MdlDvn
Peace River	11	Tight	UprColr
Peace River	11	Tight	MdlMnvl;LwrMnvl
Peace River	11	Tight	UprTri
Peace River	11	Tight	LwrTri
Peace River	11	Tight	Tri
Peace River	11	Tight	Miss
Peace River	11	Tight	Montney
Peace River	11	Shale	Duvernay
Northwest Alberta	12	Conventional	Mnvl
Northwest Alberta	12	Conventional	Miss
Northwest Alberta	12	Conventional	UprDvn
Northwest Alberta	12	Conventional	MdlDvn
Northwest Alberta	12	Shale	Duvernay
BC Deep Basin	13	Conventional	Colr
BC Deep Basin	13	Conventional	LwrTri
BC Deep Basin	13	Tight	Colr
BC Deep Basin	13	Tight	Mnvl
BC Deep Basin	13	Tight	LwrTri
BC Deep Basin	13	Tight	Montney
Fort St. John	14	Conventional	Mnvl
Fort St. John	14	Conventional	Tri
Fort St. John	14	Conventional	Perm;Miss
Fort St. John	14	Conventional	UprDvn;MdlDvn
Fort St. John	14	Tight	Mnvl
Fort St. John	14	Tight	Tri
Fort St. John	14	Tight	Perm;Miss
Fort St. John	14	Tight	Dvn
Fort St. John	14	Tight	Montney

Area Name	Area Number	Resource Type	Resource Group
Northeast BC	15	Conventional	LwrMnvl
Northeast BC	15	Conventional	Perm;Miss
Northeast BC	15	Conventional	UprDvn;MdlDvn
Northeast BC	15	Tight	UprDvn
Northeast BC	15	Shale	Cordova
Northeast BC	15	Shale	Horn River
Northeast BC	15	Shale	Liard
BC Foothills	16	Conventional	Colr;Mnvl
BC Foothills	16	Conventional	Tri;Perm;Miss
BC Foothills	16	Tight	LwrTri
BC Foothills	16	Tight	Tri
BC Foothills	16	Tight	Montney
Southwest Saskatchewan	17	Tight	UprColr
West Saskatchewan	18	Conventional	Colr
West Saskatchewan	18	Conventional	MdlMnvl;LwrMnvl;Miss
East Saskatchewan	19	Conventional	Solution Gas

TABLE A3.3

Decline Parameters for Groupings of Existing Gas Connections

See the spreadsheet file Table A3.3 for decline parameters for groupings of existing gas connections.

Appendix A4 – Decline Parameters for Groupings of Future Gas Connections

See the spreadsheet file Table A4.1 for decline parameters for groupings of future gas connections.

APPENDIX B

B1 - Factors for Allocation of Gas-Intent Drill Days by Area

Year	00 - Alberta CBM	01 - Southern Alberta	02 - Southwest Alberta	03 - Southern Foothills	04 - Eastern Alberta	05 - Central Alberta	06 - West Central Alberta	07 - Central Foothills	08 - Kaybob	09 - Alberta Deep Basin	10 - Northeast Alberta	11 - Peace River	12 - Northwest Alberta	13 - BC Deep Basin	14 - Fort St. John	15 - Northeast BC (excl Shale)	15 - Northeast BC (Shale)	16 - BC Foothills	17 - Southwest Saskatchewan	18 - West Saskatchewan	19 - East Saskatchewan
2005	25 749	12 406	3 332	399	6 812	8 503	10 808	4 602	2 991	27 082	1 565	4 052	2 409	6 443	5 871	5 795	0	2 218	11 910	1 691	0
2006	11 286	10 938	1 871	391	7 573	4 479	9 356	6 161	3 141	27 174	1 814	4 315	1 769	6 232	5 661	4 661	1 40	2 449	11 766	996	0
2007	10 930	8 637	1 528	451	3 924	2 826	5 683	3 862	2 696	16 135	1 234	2 201	587	3 219	4 007	2 260	228	2 449	6 347	496	0
2008	7 541	6 390	1 218	78	1 486	2 652	5 828	3 839	2 705	15 389	702	2 783	486	4 200	5 769	1 858	1 162	2 912	6 573	1 719	0
2009	4 866	2 537	335	21	441	741	3 193	2 007	2 348	10 365	280	1 669	179	3 016	4 220	610	5 001	1 427	848	148	0
2010	8 358	5 603	1 001	118	626	1 059	3 399	1 282	2 306	14 385	87	2 303	78	4 373	5 441	818	3 563	3 205	179	15	0
2011	2 733	1 061	295	57	350	388	3 498	978	1 813	13 122	79	1 711	45	2 704	5 911	594	5 568	2 825	119	35	0
2012	320	174	36	0	321	192	2 181	582	2 133	11 058	33	1 323	27	1 090	6 460	60	2 890	2 151	20	37	0
2013	271	390	7	0	83	185	2 948	485	3 761	11 849	13	1 279	0	2 100	6 553	56	2 032	3 678	0	36	0
2014	687	275	4	49	113	75	4 750	335	2 515	15 347	24	1 528	10	1 596	7 986	192	500	4 028	0	73	11

Drill	00 - Alberta CBM	01 - Southern Alberta	02 - Southwest Alberta	03 - Southern Foothills	04 - Eastern Alberta	05 - Central Alberta	06 - West Central Alberta	07 - Central Foothills	08 - Kaybob	09 - Alberta Deep Basin	10 - Northeast Alberta	11 - Peace River	12 - Northwest Alberta	13 - BC Deep Basin	14 - Fort St. John	15 - Northeast BC (excl Shale)	15 - Northeast BC (Shale)	16 - BC Foothills	17 - Southwest Saskatchewan	18 - West Saskatchewan	19 - East Saskatchewan
2005	0.1780	0.0858	0.0230	0.0028	0.0471	0.0588	0.0747	0.0318	0.0207	0.1872	0.0108	0.0280	0.0167	0.0445	0.0406	0.0401	0.0000	0.0153	0.0823	0.0117	0.0000
2006	0.0924	0.0895	0.0153	0.0032	0.0620	0.0367	0.0766	0.0504	0.0257	0.2224	0.0148	0.0353	0.0145	0.0510	0.0463	0.0382	0.0011	0.0200	0.0963	0.0082	0.0000
2007	0.1371	0.1083	0.0192	0.0057	0.0492	0.0354	0.0713	0.0484	0.0338	0.2023	0.0155	0.0276	0.0074	0.0404	0.0502	0.0283	0.0029	0.0313	0.0796	0.0062	0.0000
2008	0.1002	0.0849	0.0162	0.0010	0.0197	0.0352	0.0774	0.0510	0.0359	0.2044	0.0093	0.0370	0.0065	0.0558	0.0766	0.0247	0.0154	0.0387	0.0873	0.0228	0.0000
2009	0.1100	0.0573	0.0076	0.0005	0.0100	0.0167	0.0722	0.0454	0.0531	0.2342	0.0063	0.0377	0.0040	0.0682	0.0954	0.0138	0.1130	0.0322	0.0192	0.0033	0.0000
2010	0.1436	0.0963	0.0172	0.0020	0.0108	0.0182	0.0584	0.0220	0.0396	0.2472	0.0015	0.0396	0.0013	0.0751	0.0935	0.0141	0.0612	0.0551	0.0031	0.0003	0.0000
2011	0.0623	0.0242	0.0067	0.0013	0.0080	0.0088	0.0797	0.0223	0.0413	0.2990	0.0018	0.0390	0.0010	0.0616	0.1347	0.0135	0.1269	0.0644	0.0027	0.0008	0.0000
2012	0.0103	0.0056	0.0012	0.0000	0.0103	0.0062	0.0702	0.0187	0.0686	0.3557	0.0011	0.0426	0.0009	0.0351	0.2078	0.0019	0.0930	0.0692	0.0006	0.0012	0.0000
2013	0.0076	0.0109	0.0002	0.0000	0.0023	0.0052	0.0825	0.0136	0.1053	0.3317	0.0004	0.0358	0.0000	0.0588	0.1834	0.0016	0.0569	0.1030	0.0000	0.0010	0.0000
2014	0.0171	0.0069	0.0001	0.0012	0.0028	0.0019	0.1185	0.0084	0.0627	0.3827	0.0006	0.0381	0.0002	0.0398	0.1992	0.0048	0.0125	0.1005	0.0000	0.0018	0.0003

Drill	00 - Alberta CBM	01 - Southern Alberta	02 - Southwest Alberta	03 - Southern Foothills	04 - Eastern Alberta	05 - Central Alberta	06 - West Central Alberta	07 - Central Foothills	08 - Kaybob	09 - Alberta Deep Basin	10 - Northeast Alberta	11 - Peace River	12 - Northwest Alberta	13 - BC Deep Basin	14 - Fort St. John	15 - Northeast BC (excl Shale)	15 - Northeast BC (Shale)	16 - BC Foothills	17 - Southwest Saskatchewan	18 - West Saskatchewan	19 - East Saskatchewan
2015	315	35	0	25	35	104	1 792	192	1 189	8 148	6	848	0	910	5 600	85	0	1 094	0	14	0
2016	343	38	0	27	38	114	1 969	210	1 302	8 881	7	917	0	985	6 056	94	0	1 183	0	15	0
2017	376	42	0	30	42	126	2 181	230	1 437	9 716	7	992	0	1 066	6 552	104	0	1 280	0	17	0
2018	415	46	0	33	46	140	2 435	254	1 604	10 685	8	1 078	0	1 160	7 118	117	0	1 391	0	18	0

Projected Fraction of Total Gas-Intent Drill Days by Area - Mid-Range Price Case																				
DrYr	00 - Alberta CBM	01 - Southern Alberta	02 - Southwest Alberta	03 - Southern Foothills	04 - Eastern Alberta	05 - Central Alberta	06 - West Central Alberta	07 - Central Foothills	08 - Kaybob	09 - Alberta Deep Basin	10 - Northeast Alberta	11 - Peace River	12 - Northwest Alberta	13 - BC Deep Basin	14 - Fort St. John	15 - Northeast BC (excl Shale)	16 - BC Foothills	17 - Southwest Saskatchewan	18 - West Saskatchewan	19 - East Saskatchewan
2015	0.0154	0.0017	0.0000	0.0012	0.0017	0.0051	0.0879	0.0094	0.0583	0.3996	0.0003	0.0416	0.0000	0.0446	0.2746	0.0042	0.0536	0.0000	0.0007	0.0000
2016	0.0155	0.0017	0.0000	0.0012	0.0017	0.0051	0.0888	0.0095	0.0587	0.4004	0.0003	0.0413	0.0000	0.0444	0.2731	0.0042	0.0534	0.0000	0.0007	0.0000
2017	0.0155	0.0017	0.0000	0.0012	0.0017	0.0052	0.0901	0.0095	0.0594	0.4015	0.0003	0.0410	0.0000	0.0441	0.2708	0.0043	0.0529	0.0000	0.0007	0.0000
2018	0.0156	0.0017	0.0000	0.0012	0.0017	0.0053	0.0917	0.0096	0.0604	0.4025	0.0003	0.0406	0.0000	0.0437	0.2681	0.0044	0.0524	0.0000	0.0007	0.0000

Projected Gas-Intent Drill Days by Area - Higher Price Case																				
DrYr	00 - Alberta CBM	01 - Southern Alberta	02 - Southwest Alberta	03 - Southern Foothills	04 - Eastern Alberta	05 - Central Alberta	06 - West Central Alberta	07 - Central Foothills	08 - Kaybob	09 - Alberta Deep Basin	10 - Northeast Alberta	11 - Peace River	12 - Northwest Alberta	13 - BC Deep Basin	14 - Fort St. John	15 - Northeast BC (excl Shale)	16 - BC Foothills	17 - Southwest Saskatchewan	18 - West Saskatchewan	19 - East Saskatchewan
2015	315	35	0	25	35	104	1 792	192	1 189	8 148	6	848	0	910	5 600	85	0	1 094	0	14
2016	377	42	0	30	42	125	2 159	230	1 427	9 739	7	1 006	0	1 080	6 642	103	0	1 298	0	17
2017	478	53	0	38	53	160	2 773	293	1 827	12 353	9	1 261	0	1 356	8 330	133	0	1 628	0	21
2018	564	63	0	45	63	190	3 311	346	2 181	14 531	11	1 465	0	1 577	9 679	159	0	1 892	0	25

Projected Fraction of Total Gas-Intent Drill Days by Area - Higher Price Case																				
DrYr	00 - Alberta CBM	01 - Southern Alberta	02 - Southwest Alberta	03 - Southern Foothills	04 - Eastern Alberta	05 - Central Alberta	06 - West Central Alberta	07 - Central Foothills	08 - Kaybob	09 - Alberta Deep Basin	10 - Northeast Alberta	11 - Peace River	12 - Northwest Alberta	13 - BC Deep Basin	14 - Fort St. John	15 - Northeast BC (excl Shale)	16 - BC Foothills	17 - Southwest Saskatchewan	18 - West Saskatchewan	19 - East Saskatchewan
2015	0.0154	0.0017	0.0000	0.0012	0.0017	0.0051	0.0879	0.0094	0.0583	0.3996	0.0003	0.0416	0.0000	0.0446	0.2746	0.0042	0.0536	0.0000	0.0007	0.0000
2016	0.0155	0.0017	0.0000	0.0012	0.0017	0.0051	0.0888	0.0095	0.0587	0.4004	0.0003	0.0413	0.0000	0.0444	0.2731	0.0042	0.0534	0.0000	0.0007	0.0000
2017	0.0155	0.0017	0.0000	0.0012	0.0017	0.0052	0.0901	0.0095	0.0594	0.4015	0.0003	0.0410	0.0000	0.0441	0.2708	0.0043	0.0529	0.0000	0.0007	0.0000
2018	0.0156	0.0017	0.0000	0.0012	0.0017	0.0053	0.0917	0.0096	0.0604	0.4025	0.0003	0.0406	0.0000	0.0437	0.2681	0.0044	0.0524	0.0000	0.0007	0.0000

Projected Gas-Intent Drill Days by Area - Lower Price Case																				
DrYr	00 - Alberta CBM	01 - Southern Alberta	02 - Southwest Alberta	03 - Southern Foothills	04 - Eastern Alberta	05 - Central Alberta	06 - West Central Alberta	07 - Central Foothills	08 - Kaybob	09 - Alberta Deep Basin	10 - Northeast Alberta	11 - Peace River	12 - Northwest Alberta	13 - BC Deep Basin	14 - Fort St. John	15 - Northeast BC (excl Shale)	16 - BC Foothills	17 - Southwest Saskatchewan	18 - West Saskatchewan	19 - East Saskatchewan
2015	315	35	0	25	35	104	1 792	192	1 189	8 148	6	848	0	910	5 600	85	0	1 094	0	14
2016	320	36	0	25	36	106	1 833	195	1 212	8 270	6	854	0	917	5 639	87	0	1 102	0	14
2017	329	37	0	26	37	110	1 906	201	1 256	8 493	6	867	0	932	5 728	91	0	1 119	0	15
2018	332	37	0	26	37	112	1 950	204	1 284	8 558	6	863	0	929	5 701	94	0	1 114	0	15

Projected Fraction of Total Gas-Intent Drill Days by Area - Lower Price Case																				
DrYr	00 - Alberta CBM	01 - Southern Alberta	02 - Southwest Alberta	03 - Southern Foothills	04 - Eastern Alberta	05 - Central Alberta	06 - West Central Alberta	07 - Central Foothills	08 - Kaybob	09 - Alberta Deep Basin	10 - Northeast Alberta	11 - Peace River	12 - Northwest Alberta	13 - BC Deep Basin	14 - Fort St. John	15 - Northeast BC (excl Shale)	16 - BC Foothills	17 - Southwest Saskatchewan	18 - West Saskatchewan	19 - East Saskatchewan
2015	0.0154	0.0017	0.0000	0.0012	0.0017	0.0051	0.0879	0.0094	0.0583	0.3996	0.0003	0.0416	0.0000	0.0446	0.2746	0.0042	0.0536	0.0000	0.0007	0.0000
2016	0.0155	0.0017	0.0000	0.0012	0.0017	0.0051	0.0888	0.0095	0.0587	0.4004	0.0003	0.0413	0.0000	0.0444	0.2731	0.0042	0.0534	0.0000	0.0007	0.0000
2017	0.0155	0.0017	0.0000	0.0012	0.0017	0.0052	0.0901	0.0095	0.0594	0.4015	0.0003	0.0410	0.0000	0.0441	0.2708	0.0043	0.0529	0.0000	0.0007	0.0000
2018	0.0156	0.0017	0.0000	0.0012	0.0017	0.0053	0.0917	0.0096	0.0604	0.4025	0.0003	0.0406	0.0000	0.0437	0.2681	0.0044	0.0524	0.0000	0.0007	0.0000

B2 – Detailed Gas-Intent Drilling and Gas Connection Projections by Case

Mid-Range Price Case							
Resource Grouping	Projected Annual Number of Wells Targeted to Resource Grouping			Connection Ratio	Projected Annual Number of Connections for Resource Grouping		
	2016	2017	2018		2016	2017	2018
Gas Connections							
00 - Alberta CBM	71	77	82	1.279	91	99	104
01 - Southern Alberta	17	18	19	1.219	20	22	23
<i>Tight Portion</i>	0	0	0		0	0	0
02 - Southwest Alberta	0	0	0		0	0	0
<i>Tight Portion</i>	0	0	0		0	0	0
03 - Southern Foothills	1	1	1	1.186	1	1	1
04 - Eastern Alberta	8	9	10	1.059	9	10	10
<i>Tight Portion</i>	0	0	0		0	0	0
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
05 - Central Alberta	14	15	16	1.229	18	19	20
<i>Tight Portion</i>	1	1	1	1.346	1	2	2
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
06 - West Central Alberta	93	102	109	1.105	103	113	121
<i>Tight Portion</i>	55	60	65	1.127	62	68	73
<i>Duvernay Shale Portion</i>	9	10	11	1.000	9	10	11
07 - Central Foothills	8	9	9	1.344	11	12	13
<i>Montney Tight Portion</i>	0	0	0		0	0	0
<i>Other Tight Portion</i>	0	1	1	1.325	1	1	1
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
08 - Kaybob	34	37	39	1.004	34	37	39
<i>Montney Tight Portion</i>	9	10	10	1.000	9	10	10
<i>Other Tight Portion</i>	4	5	5	1.050	4	5	5
<i>Duvernay Shale Portion</i>	19	21	22	1.000	19	21	22
09 - Alberta Deep Basin	352	383	406	1.205	424	462	492
<i>Montney Tight Portion</i>	130	139	145	1.000	130	139	145
<i>Other Tight Portion</i>	177	195	210	1.380	245	270	290
<i>Duvernay Shale Portion</i>	2	2	2	1.000	2	2	2
10 - Northeast Alberta	3	4	4	0.930	3	3	4
11 - Peace River	40	42	44	1.000	40	42	44
<i>Montney Tight Portion</i>	38	41	43	1.000	38	41	43
<i>Other Tight Portion</i>	0	0	0		0	0	0
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
12 - Northwest Alberta	0	0	0		0	0	0
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
13 - BC Deep Basin	15	16	17	1.003	15	16	17
<i>Montney Tight Portion</i>	13	14	15	1.000	13	14	15
<i>Other Tight Portion</i>	2	2	2	1.017	2	2	2
14 - Fort St. John	155	166	173	1.000	155	166	173
<i>Montney Tight Portion</i>	152	163	170	1.000	152	163	170
15 - Northeast BC	5	6	6	0.977	5	6	6
<i>Tight Portion</i>	4	4	5	0.970	4	4	5
<i>Cordova Shale Portion</i>	0	0	0		0	0	0
<i>Horn River Shale Portion</i>	1	1	1	1.000	1	1	1
16 - BC Foothills	27	29	31	1.000	27	29	31
<i>Montney Tight Portion</i>	26	28	29	1.000	26	28	29
17 - Southwest Saskatchewan	0	0	0		0	0	0
<i>Tight Portion</i>	0	0	0		0	0	0
18 - West Saskatchewan	4	5	5	1.014	4	5	5
19 - East Saskatchewan	0	0	0		0	0	0
Subtotal: Gas - Conventional (non-tight)	133	144	153	1.130	150	163	173
Subtotal: Gas - Tight	613	663	700	1.123	688	746	789
<i>Montney portion of Tight</i>	369	395	411	1.000	369	395	411
Subtotal: Gas - CBM	71	77	82	1.279	91	99	104
Subtotal: Gas - Shale	31	34	37	1.000	31	34	37
Gas Connections - CBM Breakdown							
AB - Main HSC	68	79	94	1.279	88	101	120
AB - Mannville CBM	0	0	0		0	0	0
AB - Other CBM	0	0	0		0	0	0
Subtotal: Gas - CBM	68	79	94	1.279	88	101	120
Total: All Gas	848	919	971	1.132	961	1 041	1 103

Higher Price Case							
Resource Grouping	Projected Annual Number of Wells Targeted to Resource Grouping			Connection Ratio	Projected Annual Number of Connections for Resource Grouping		
	2016	2017	2018		2016	2017	2018
Gas Connections							
00 - Alberta CBM	79	94	106	1.279	101	120	135
01 - Southern Alberta	19	22	25	1.219	23	27	30
<i>Tight Portion</i>	0	0	0		0	0	0
02 - Southwest Alberta	0	0	0		0	0	0
<i>Tight Portion</i>	0	0	0		0	0	0
03 - Southern Foothills	1	1	1		1	1	1
04 - Eastern Alberta	9	11	12	1.059	10	12	13
<i>Tight Portion</i>	0	0	0		0	0	0
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
05 - Central Alberta	16	19	21	1.229	19	23	26
<i>Tight Portion</i>	1	1	2	1.346	2	2	2
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
06 - West Central Alberta	103	124	141	1.105	114	137	156
<i>Tight Portion</i>	61	73	84	1.127	69	83	95
<i>Duvernay Shale Portion</i>	10	12	14	1.000	10	12	14
07 - Central Foothills	9	11	12	1.344	12	14	16
<i>Montney Tight Portion</i>	0	0	0		0	0	0
<i>Other Tight Portion</i>	1	1	1	1.325	1	1	1
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
08 - Kaybob	37	45	51	1.004	38	45	51
<i>Montney Tight Portion</i>	10	12	13	1.000	10	12	13
<i>Other Tight Portion</i>	5	5	6	1.050	5	6	7
<i>Duvernay Shale Portion</i>	21	25	29	1.000	21	25	29
09 - Alberta Deep Basin	391	465	526	1.205	472	561	637
<i>Montney Tight Portion</i>	144	168	187	1.000	144	168	187
<i>Other Tight Portion</i>	197	237	272	1.380	272	327	375
<i>Duvernay Shale Portion</i>	2	2	3	1.000	2	2	3
10 - Northeast Alberta	4	4	5	0.930	4	4	5
11 - Peace River	44	51	57	1.000	44	51	57
<i>Montney Tight Portion</i>	43	50	55	1.000	43	50	55
<i>Other Tight Portion</i>	0	0	0		0	0	0
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
12 - Northwest Alberta	0	0	0		0	0	0
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
13 - BC Deep Basin	17	20	22	1.003	17	20	22
<i>Montney Tight Portion</i>	15	17	19	1.000	15	17	19
<i>Other Tight Portion</i>	2	3	3	1.017	2	3	3
14 - Fort St. John	172	201	224	1.000	172	201	224
<i>Montney Tight Portion</i>	169	198	220	1.000	169	198	220
15 - Northeast BC	6	7	8	0.977	6	7	8
<i>Tight Portion</i>	4	5	6	0.970	4	5	6
<i>Cordova Shale Portion</i>	0	0	0		0	0	0
<i>Horn River Shale Portion</i>	1	2	2	1.000	1	2	2
16 - BC Foothills	30	36	39	1.000	30	36	40
<i>Montney Tight Portion</i>	29	34	38	1.000	29	34	38
17 - Southwest Saskatchewan	0	0	0		0	0	0
<i>Tight Portion</i>	0	0	0		0	0	0
18 - West Saskatchewan	5	6	6	1.014	5	6	6
19 - East Saskatchewan	0	0	0		0	0	0
Subtotal: Gas - Conventional (non-tight)	148	175	198	1.130	167	198	224
Subtotal: Gas - Tight	681	805	906	1.123	765	905	1 021
<i>Montney portion of Tight</i>	410	479	532	1.000	410	479	532
Subtotal: Gas - CBM	79	94	106	1.279	101	120	135
Subtotal: Gas - Shale	35	41	47	1.000	35	41	47
Gas Connections - CBM Breakdown							
AB - Main HSC	68	79	94	1.279	88	101	120
AB - Mannville CBM	0	0	0		0	0	0
AB - Other CBM	0	0	0		0	0	0
Subtotal: Gas - CBM	68	79	94	1.279	88	101	120
Total: All Gas	943	1 115	1 257	1.132	1 068	1 264	1 427

Lower Price Case							
Resource Grouping	Projected Annual Number of Wells Targeted to Resource Grouping			Connection Ratio	Projected Annual Number of Connections for Resource Grouping		
	2016	2017	2018		2016	2017	2018
Gas Connections							
00 - Alberta CBM	68	58	63	1.279	88	75	81
01 - Southern Alberta	16	14	15	1.219	20	17	18
<i>Tight Portion</i>	0	0	0		0	0	0
02 - Southwest Alberta	0	0	0		0	0	0
<i>Tight Portion</i>	0	0	0		0	0	0
03 - Southern Foothills	1	1	1		1	1	1
04 - Eastern Alberta	8	7	7	1.059	8	7	8
<i>Tight Portion</i>	0	0	0		0	0	0
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
05 - Central Alberta	14	12	13	1.229	17	14	16
<i>Tight Portion</i>	1	1	1	1.346	1	1	1
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
06 - West Central Alberta	88	76	83	1.105	98	84	92
<i>Tight Portion</i>	52	45	49	1.127	58	51	56
<i>Duvernay Shale Portion</i>	9	8	8	1.000	9	8	8
07 - Central Foothills	8	7	7	1.345	11	9	10
<i>Montney Tight Portion</i>	0	0	0		0	0	0
<i>Other Tight Portion</i>	0	0	0	1.325	1	1	1
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
08 - Kaybob	32	28	30	1.004	32	28	30
<i>Montney Tight Portion</i>	9	7	8	1.000	9	7	8
<i>Other Tight Portion</i>	4	3	4	1.050	4	4	4
<i>Duvernay Shale Portion</i>	18	15	17	1.000	18	15	17
09 - Alberta Deep Basin	337	289	314	1.204	405	348	379
<i>Montney Tight Portion</i>	126	106	114	1.000	126	106	114
<i>Other Tight Portion</i>	168	145	160	1.380	232	201	221
<i>Duvernay Shale Portion</i>	2	1	2	1.000	2	1	2
10 - Northeast Alberta	3	3	3	0.930	3	3	3
11 - Peace River	38	32	35	1.000	38	32	35
<i>Montney Tight Portion</i>	37	32	34	1.000	37	32	34
<i>Other Tight Portion</i>	0	0	0		0	0	0
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
12 - Northwest Alberta	0	0	0		0	0	0
<i>Duvernay Shale Portion</i>	0	0	0		0	0	0
13 - BC Deep Basin	15	12	13	1.003	15	12	13
<i>Montney Tight Portion</i>	13	11	11	1.000	13	11	11
<i>Other Tight Portion</i>	2	2	2	1.017	2	2	2
14 - Fort St. John	150	127	136	1.000	150	127	136
<i>Montney Tight Portion</i>	148	125	134	1.000	148	125	134
15 - Northeast BC	5	4	5	0.978	5	4	5
<i>Tight Portion</i>	4	3	4	0.970	4	3	3
<i>Cordova Shale Portion</i>	0	0	0		0	0	0
<i>Horn River Shale Portion</i>	1	1	1	1.000	1	1	1
16 - BC Foothills	26	22	24	1.001	26	22	24
<i>Montney Tight Portion</i>	25	22	23	1.000	25	22	23
17 - Southwest Saskatchewan	0	0	0		0	0	0
<i>Tight Portion</i>	0	0	0		0	0	0
18 - West Saskatchewan	4	3	4	1.014	4	4	4
19 - East Saskatchewan	0	0	0		0	0	0
Subtotal: Gas - Conventional (non-tight)	127	109	118	1.130	144	123	134
Subtotal: Gas - Tight	588	503	543	1.121	659	564	611
<i>Montney portion of Tight</i>	357	303	323	1.000	357	303	323
Subtotal: Gas - CBM	68	58	63	1.279	88	75	81
Subtotal: Gas - Shale	30	25	28	1.000	30	25	28
Gas Connections - CBM Breakdown							
AB - Main HSC	68	58	63	1.279	88	75	81
AB - Mannville CBM	0	0	0		0	0	0
AB - Other CBM	0	0	0		0	0	0
Subtotal: Gas - CBM	68	58	63	1.279	88	75	81
Total: All Gas	814	696	753	1.131	920	788	853

APPENDIX C

Deliverability Details by Case

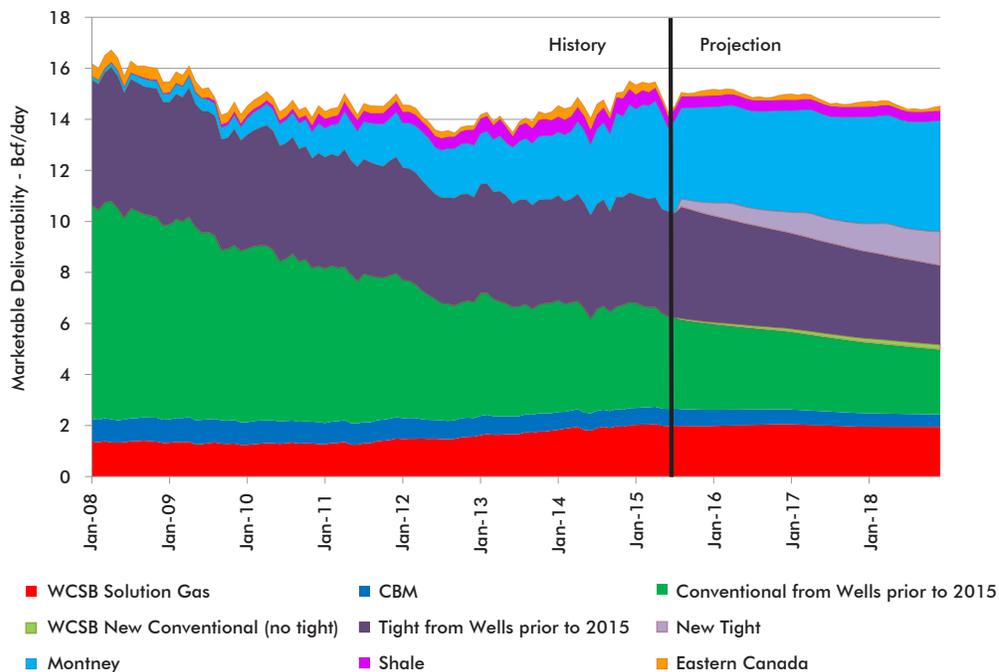
C.1 - Canadian Gas Deliverability by Area/Resource – Mid-Range Price Case										
Area/Resource	Historical				Projected					
	2014		2015		2016		2017		2018	
	10 ⁶ m ³ /d	MMc/d								
00 - Alberta CBM	19.13	675	18.78	663	17.21	608	15.68	553	14.30	505
HSC Portion	14.08	497	13.93	492	12.81	452	11.70	413	10.70	378
Mannville Portion	1.65	58	1.48	52	1.33	47	1.21	43	1.09	38
Other CBM Portion	3.40	120	3.37	119	3.07	108	2.78	98	2.51	89
01 - Southern Alberta	25.51	900	23.84	842	21.76	768	19.98	705	18.38	649
Solution Gas	2.51	89	2.46	87	2.38	84	2.35	83	2.32	82
Tight Portion	15.93	562	14.84	524	13.39	473	12.11	428	10.96	387
02 - Southwest Alberta	5.09	180	4.72	167	4.32	152	4.00	141	3.73	132
Solution Gas	0.82	29	0.85	30	0.84	30	0.81	29	0.80	28
Tight Portion	1.50	53	1.31	46	1.14	40	1.04	37	0.94	33
03 - Southern Foothills	3.66	129	3.56	126	3.07	108	2.77	98	2.51	89
Solution Gas	0.14	5	0.15	5	0.14	5	0.14	5	0.13	5
04 - Eastern Alberta	12.67	447	12.28	434	11.58	409	11.05	390	10.42	368
Solution Gas	4.85	171	5.01	177	5.06	179	5.17	182	5.11	180
Tight Portion	0.27	10	0.27	10	0.26	9	0.25	9	0.24	8
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
05 - Central Alberta	15.19	536	14.12	498	13.07	461	12.43	439	11.84	418
Solution Gas	4.01	142	3.65	129	3.46	122	3.40	120	3.36	119
Tight Portion	1.55	55	1.69	60	1.56	55	1.47	52	1.39	49
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
06 - West Central Alberta	50.14	1 770	49.62	1 752	46.93	1 657	44.22	1 561	42.02	1 483
Solution Gas	13.49	476	13.40	473	13.14	464	12.65	447	12.22	431
Tight Portion	19.54	690	20.32	717	19.23	679	18.01	636	17.05	602
Duvernay Shale Portion	0.29	10	0.42	15	0.52	18	0.64	23	0.78	28
07 - Central Foothills	16.84	594	15.54	549	14.21	502	13.15	464	12.26	433
Solution Gas	0.42	15	0.38	14	0.37	13	0.36	13	0.35	13
Montney Tight Portion	0.08	3	0.06	2	0.05	2	0.05	2	0.05	2
Other Tight Portion	0.94	33	0.94	33	0.92	32	0.88	31	0.86	30
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
08 - Kaybob	20.49	723	20.94	739	20.69	730	20.36	719	19.71	696
Solution Gas	6.88	243	7.42	262	7.68	271	7.60	268	7.14	252
Montney Tight Portion	1.97	69	2.42	85	2.59	91	2.74	97	2.88	102
Other Tight Portion	5.95	210	5.43	192	4.80	170	4.35	154	3.95	139
Duvernay Shale Portion	1.20	42	1.83	64	2.19	77	2.48	88	2.77	98
09 - Alberta Deep Basin	73.50	2 595	86.27	3 045	96.32	3 400	102.55	3 620	108.25	3 821
Solution Gas	3.23	114	3.70	131	3.77	133	3.72	131	3.68	130
Montney Tight Portion	9.74	344	16.70	589	21.41	756	24.69	872	27.59	974
Other Tight Portion	54.54	1 925	59.51	2 101	64.69	2 284	67.44	2 381	70.09	2 474
Duvernay Shale Portion	0.28	10	0.38	13	0.49	17	0.54	19	0.58	21
10 - Northeast Alberta	7.78	274	7.58	268	7.48	264	7.19	254	6.67	235
Solution Gas	2.24	79	2.65	94	2.83	100	2.76	98	2.45	86
11 - Peace River	24.22	855	24.85	877	24.38	861	23.97	846	23.57	832
Solution Gas	6.71	237	7.51	265	7.74	273	7.54	266	7.28	257
Montney Tight Portion	10.50	371	11.05	390	10.96	387	11.25	397	11.53	407
Other Tight Portion	1.38	49	1.23	44	1.08	38	0.96	34	0.86	30
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
12 - Northwest Alberta	6.23	220	6.21	219	6.07	214	5.82	205	5.59	197
Solution Gas	2.25	79	2.56	90	2.69	95	2.65	94	2.62	93
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
13 - BC Deep Basin	14.84	524	15.58	550	14.06	496	13.47	475	12.97	458
Montney Portion	7.67	271	9.99	353	9.17	324	8.96	316	8.81	311
Other Tight Portion	4.03	142	3.17	112	2.89	102	2.70	95	2.54	90
14 - Fort St. John	56.86	2 007	60.31	2 129	61.25	2 162	62.99	2 224	64.38	2 273
Solution Gas	1.13	40	1.27	45	1.35	47	1.37	48	1.41	50
Montney Portion	43.10	1 522	49.11	1 734	52.23	1 844	54.85	1 936	56.99	2 012

C.1 - Canadian Gas Deliverability by Area/Resource – Mid-Range Price Case (continued)										
Area/Resource	Historical				Projected					
	2014		2015		2016		2017		2018	
	10 ^m ³/d	MMc/d								
15 - Northeast BC	23.79	840	18.96	669	15.74	556	13.91	491	12.42	438
Solution Gas	0.13	4	0.13	5	0.13	5	0.12	4	0.12	4
Tight Portion	5.80	205	5.35	189	4.71	166	4.16	147	3.70	130
Cordova Shale Portion	0.77	27	0.63	22	0.54	19	0.47	17	0.42	15
Horn River Shale Portion	14.07	497	10.37	366	8.24	291	7.27	257	6.50	229
16 - BC Foothills	17.47	617	25.28	892	30.58	1 079	29.03	1 025	27.72	978
Montney Tight Portion	10.18	359	13.00	459	12.49	441	12.32	435	12.18	430
17 - Southwest Saskatchewan	6.03	213	5.68	200	5.27	186	4.88	172	4.52	160
Solution Gas	0.54	19	0.65	23	0.73	26	0.77	27	0.80	28
Tight Portion	5.42	191	4.99	176	4.54	160	4.11	145	3.72	131
18 - West Saskatchewan	4.53	160	4.45	157	4.25	150	4.31	152	4.31	152
Solution Gas	2.86	101	2.92	103	2.91	103	3.10	109	3.22	114
19 - East Saskatchewan	1.76	62	1.91	68	1.96	69	2.08	73	2.16	76
Solution Gas	1.76	62	1.91	67	1.96	69	2.08	73	2.16	76
22 - Yukon and North West Territories	0.31	11	0.23	8	0.19	7	0.14	5	0.11	4
Total Conventional (no tight, no solution gas)	116.25	4 104	110.31	3 894	105.93	3 739	97.99	3 459	91.00	3 212
Total Tight	200.07	7 063	221.39	7 815	228.11	8 053	232.35	8 202	236.32	8 342
Montney Portion	83.23	2938.27	102.33	3612.40	108.89	3844.07	114.85	4054.47	120.03	4237.19
Total Solution Gas	53.96	1904.93	56.62	1998.87	57.16	2017.71	56.59	1997.81	55.19	1948.17
Total CBM	19.13	675	18.78	663	17.21	608	15.68	553	14.30	505
Total Shale	16.61	586	13.62	481	11.98	423	11.39	402	11.05	390
Total WCSB	406.03	14 333	420.72	14 852	420.39	14 840	414.01	14 615	407.85	14 398
Atlantic Canada	9.38	331	5.64	199	4.50	159	4.19	148	3.91	138
Other Canada	0.30	10	0.31	11	0.30	11	0.28	10	0.24	9
Total Canada	415.71	14 675	426.67	15 062	425.19	15 009	418.47	14 772	412.01	14 544

rates are annual averages
*matched to 2015 actual production for Jan-July

FIGURE C.1

Outlook for Canadian Gas Deliverability – Mid-Range Price Case



C.2 – Canadian Gas Deliverability by Area/Resource – Higher Price Case										
Area/Resource	Historical				Projected					
	2014		2015		2016		2017		2018	
	10 ^m ³/d	MMcf/d								
00 - Alberta CBM	19.13	675	18.78	663	17.22	608	15.71	555	14.37	507
HSC Portion	14.08	497	13.93	492	12.82	453	11.73	414	10.76	380
Mannville Portion	1.65	58	1.48	52	1.33	47	1.21	43	1.09	38
Other CBM Portion	3.40	120	3.37	119	3.07	108	2.78	98	2.51	89
01 - Southern Alberta	25.51	900	23.84	842	21.78	769	20.05	708	18.53	654
Solution Gas	2.51	89	2.46	87	2.40	85	2.42	85	2.46	87
Tight Portion	15.93	562	14.84	524	13.39	473	12.11	428	10.96	387
02 - Southwest Alberta	5.09	180	4.72	167	4.32	153	4.03	142	3.78	133
Solution Gas	0.82	29	0.85	30	0.84	30	0.83	29	0.85	30
Tight Portion	1.50	53	1.31	46	1.14	40	1.04	37	0.94	33
03 - Southern Foothills	3.66	129	3.56	126	3.07	109	2.79	98	2.54	90
Solution Gas	0.14	5	0.15	5	0.14	5	0.14	5	0.14	5
04 - Eastern Alberta	12.67	447	12.28	434	11.62	410	11.20	395	10.74	379
Solution Gas	4.85	171	5.01	177	5.09	180	5.32	188	5.41	191
Tight Portion	0.27	10	0.27	10	0.26	9	0.25	9	0.24	8
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
05 - Central Alberta	15.19	536	14.12	498	13.10	462	12.54	443	12.07	426
Solution Gas	4.01	142	3.65	129	3.48	123	3.50	124	3.56	126
Tight Portion	1.55	55	1.69	60	1.56	55	1.48	52	1.41	50
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
06 - West Central Alberta	50.14	1 770	49.62	1 752	47.14	1 664	45.03	1 589	43.62	1 540
Solution Gas	13.49	476	13.40	473	13.22	467	13.01	459	12.96	457
Tight Portion	19.54	690	20.32	717	19.31	682	18.28	645	17.55	620
Duvernay Shale Portion	0.29	10	0.42	15	0.53	19	0.68	24	0.89	31
07 - Central Foothills	16.84	594	15.54	549	14.23	503	13.24	467	12.42	438
Solution Gas	0.42	15	0.38	14	0.37	13	0.37	13	0.38	13
Montney Tight Portion	0.08	3	0.06	2	0.05	2	0.05	2	0.05	2
Other Tight Portion	0.94	33	0.94	33	0.92	32	0.89	31	0.87	31
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
08 - Kaybob	20.49	723	20.94	739	20.82	735	20.86	736	20.71	731
Solution Gas	6.88	243	7.42	262	7.73	273	7.82	276	7.57	267
Montney Tight Portion	1.97	69	2.42	85	2.62	92	2.86	101	3.10	110
Other Tight Portion	5.95	210	5.43	192	4.81	170	4.36	154	3.97	140
Duvernay Shale Portion	1.20	42	1.83	64	2.24	79	2.63	93	3.07	108
09 - Alberta Deep Basin	73.50	2 595	86.27	3 045	97.77	3 451	107.51	3 795	118.00	4 166
Solution Gas	3.23	114	3.70	131	3.79	134	3.83	135	3.90	138
Montney Tight Portion	9.74	344	16.70	589	21.89	773	26.33	930	30.80	1 087
Other Tight Portion	54.54	1 925	59.51	2 101	65.55	2 314	70.37	2 484	75.88	2 679
Duvernay Shale Portion	0.28	10	0.38	13	0.50	18	0.57	20	0.65	23
10 - Northeast Alberta	7.78	274	7.58	268	7.50	265	7.27	257	6.82	241
Solution Gas	2.24	79	2.65	94	2.84	100	2.84	100	2.60	92
11 - Peace River	24.22	855	24.85	877	24.56	867	24.62	869	24.85	877
Solution Gas	6.71	237	7.51	265	7.79	275	7.75	274	7.72	272
Montney Tight Portion	10.50	371	11.05	390	11.09	392	11.67	412	12.36	436
Other Tight Portion	1.38	49	1.23	44	1.08	38	0.96	34	0.86	30
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
12 - Northwest Alberta	6.23	220	6.21	219	6.09	215	5.90	208	5.74	203
Solution Gas	2.25	79	2.56	90	2.70	95	2.73	96	2.78	98
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
13 - BC Deep Basin	14.84	524	15.58	550	14.13	499	13.73	485	13.51	477
Montney Portion	7.67	271	9.99	353	9.24	326	9.20	325	9.29	328
Other Tight Portion	4.03	142	3.17	112	2.90	102	2.73	96	2.59	91
14 - Fort St. John	56.86	2 007	60.31	2 129	62.03	2 190	65.73	2 320	69.64	2 458
Solution Gas	1.13	40	1.27	45	1.37	48	1.46	52	1.55	55
Montney Portion	43.10	1 522	49.11	1 734	52.99	1 871	57.49	2 029	62.09	2 192
15 - Northeast BC	23.79	840	18.96	669	15.76	556	13.97	493	12.53	442
Solution Gas	0.13	4	0.13	5	0.13	5	0.13	5	0.13	5
Tight Portion	5.80	205	5.35	189	4.72	167	4.18	148	3.72	131
Cordova Shale Portion	0.77	27	0.63	22	0.54	19	0.47	17	0.42	15
Horn River Shale Portion	14.07	497	10.37	366	8.25	291	7.30	258	6.57	232

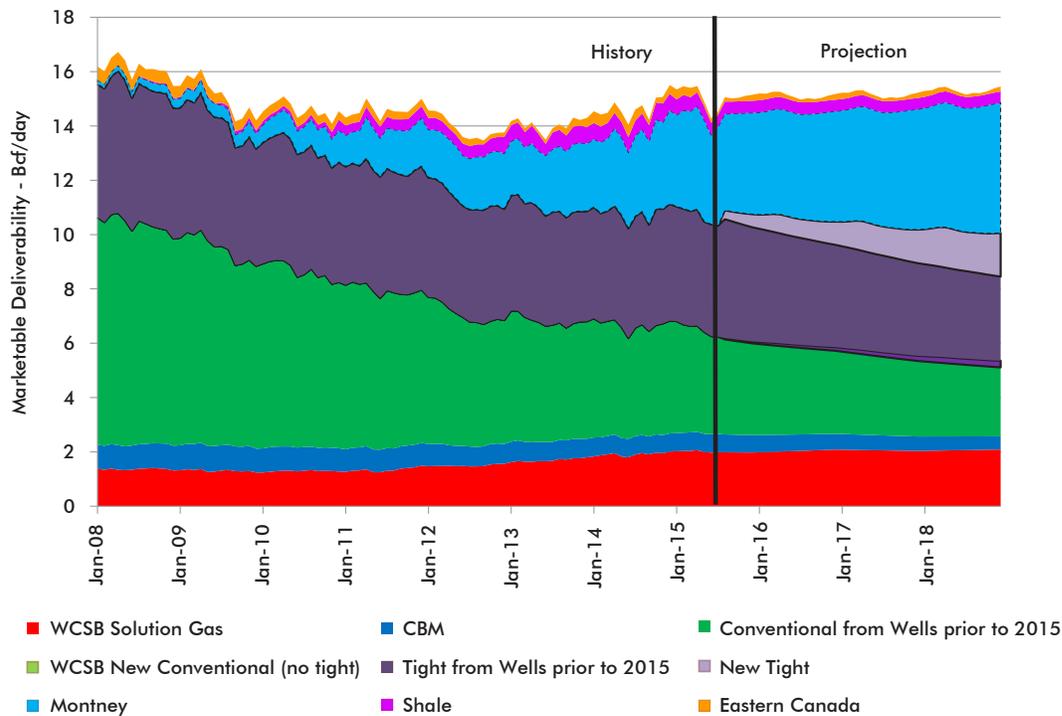
C.2 – Canadian Gas Deliverability by Area/Resource – Higher Price Case										
Area/Resource	Historical				Projected					
	2014		2015		2016		2017		2018	
	10 ⁶ m ³ /d	MMc/d								
16 - BC Foothills	17.47	617	25.28	892	30.68	1 083	29.39	1 037	28.42	1 003
<i>Montney Tight Portion</i>	10.18	359	13.00	459	12.59	444	12.66	447	12.88	455
17 - Southwest Saskatchewan	6.03	213	5.68	200	5.28	186	4.90	173	4.55	160
<i>Solution Gas</i>	0.54	19	0.65	23	0.73	26	0.79	28	0.83	29
<i>Tight Portion</i>	5.42	191	4.99	176	4.54	160	4.11	145	3.72	131
18 - West Saskatchewan	4.53	160	4.45	157	4.27	151	4.37	154	4.42	156
<i>Solution Gas</i>	2.86	101	2.92	103	2.93	104	3.15	111	3.32	117
19 - East Saskatchewan	1.76	62	1.91	68	1.97	70	2.12	75	2.23	79
<i>Solution Gas</i>	1.76	62	1.91	67	1.97	70	2.12	75	2.23	79
22 - Yukon and North West Territories	0.31	11	0.23	8	0.19	7	0.14	5	0.11	4
Total Conventional (no tight, no solution gas)	116.25	4 104	110.31	3 894	106.07	3 744	98.49	3 477	91.96	3 246
Total Tight	200.07	7 063	221.39	7 815	230.65	8 142	241.03	8 509	253.27	8 941
<i>Montney Portion</i>	83.23	2938.27	102.33	3612.40	110.47	3899.65	120.27	4245.61	130.56	4608.97
Total Solution Gas	53.96	1904.93	56.62	1998.87	57.55	2031.47	58.20	2054.59	58.37	2060.63
Total CBM	19.13	675	18.78	663	17.22	608	15.71	555	14.37	507
Total Shale	16.61	586	13.62	481	12.05	425	11.66	411	11.59	409
Total WCSB	406.03	14 333	420.72	14 852	423.54	14 951	425.08	15 006	429.57	15 164
Atlantic Canada	9.38	331	5.64	199	4.50	159	4.19	148	3.91	138
Other Canada	0.30	10	0.31	11	0.30	11	0.28	10	0.24	9
Total Canada	415.71	14 675	426.67	15 062	428.34	15 121	429.55	15 164	433.72	15 311

rates are annual averages

*matched to 2014 actual production for Jan-July

FIGURE C.2

Outlook for Canadian Gas Deliverability – Higher Price Case



C.3 – Canadian Gas Deliverability by Area/Resource – Lower Price Case										
Area/Resource	Historical				Projected					
	2014		2015		2016		2017		2018	
	10 ^m ³/d	MMc/d								
00 - Alberta CBM	19.13	675	18.78	663	17.20	607	15.64	552	14.25	503
HSC Portion	14.08	497	13.93	492	12.81	452	11.69	413	10.68	377
Mannville Portion	1.65	58	1.48	52	1.33	47	1.21	43	1.09	38
Other CBM Portion	3.40	120	3.37	119	3.07	108	2.78	98	2.51	89
01 - Southern Alberta	25.51	900	23.84	842	21.73	767	19.89	702	18.24	644
Solution Gas	2.51	89	2.46	87	2.35	83	2.27	80	2.19	77
Tight Portion	15.93	562	14.84	524	13.39	473	12.11	428	10.96	387
02 - Southwest Alberta	5.09	180	4.72	167	4.31	152	3.97	140	3.69	130
Solution Gas	0.82	29	0.85	30	0.83	29	0.78	27	0.75	27
Tight Portion	1.50	53	1.31	46	1.14	40	1.04	37	0.94	33
03 - Southern Foothills	3.66	129	3.56	126	3.07	108	2.76	97	2.49	88
Solution Gas	0.14	5	0.15	5	0.14	5	0.13	5	0.13	4
04 - Eastern Alberta	12.67	447	12.28	434	11.51	406	10.85	383	10.11	357
Solution Gas	4.85	171	5.01	177	5.00	176	4.98	176	4.80	170
Tight Portion	0.27	10	0.27	10	0.26	9	0.25	9	0.24	8
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
05 - Central Alberta	15.19	536	14.12	498	13.02	460	12.29	434	11.63	410
Solution Gas	4.01	142	3.65	129	3.42	121	3.28	116	3.16	112
Tight Portion	1.55	55	1.69	60	1.56	55	1.47	52	1.38	49
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
06 - West Central Alberta	50.14	1 770	49.62	1 752	46.54	1 643	43.25	1 527	40.57	1 432
Solution Gas	13.49	476	13.40	473	12.97	458	12.19	430	11.50	406
Tight Portion	19.54	690	20.32	717	19.10	674	17.71	625	16.63	587
Duvernay Shale Portion	0.29	10	0.42	15	0.50	18	0.59	21	0.70	25
07 - Central Foothills	16.84	594	15.54	549	14.17	500	13.06	461	12.11	428
Solution Gas	0.42	15	0.38	14	0.36	13	0.35	12	0.33	12
Montney Tight Portion	0.08	3	0.06	2	0.05	2	0.05	2	0.05	2
Other Tight Portion	0.94	33	0.94	33	0.91	32	0.87	31	0.84	30
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
08 - Kaybob	20.49	723	20.94	739	20.46	722	19.76	697	18.81	664
Solution Gas	6.88	243	7.42	262	7.58	268	7.33	259	6.72	237
Montney Tight Portion	1.97	69	2.42	85	2.53	89	2.61	92	2.70	95
Other Tight Portion	5.95	210	5.43	192	4.80	169	4.33	153	3.93	139
Duvernay Shale Portion	1.20	42	1.83	64	2.13	75	2.31	81	2.50	88
09 - Alberta Deep Basin	73.50	2 595	86.27	3 045	93.97	3 317	96.88	3 420	100.02	3 531
Solution Gas	3.23	114	3.70	131	3.72	131	3.59	127	3.46	122
Montney Tight Portion	9.74	344	16.70	589	20.63	728	22.79	805	24.85	877
Other Tight Portion	54.54	1 925	59.51	2 101	63.30	2 234	64.10	2 263	65.26	2 304
Duvernay Shale Portion	0.28	10	0.38	13	0.47	17	0.50	18	0.53	19
10 - Northeast Alberta	7.78	274	7.58	268	7.44	263	7.09	250	6.52	230
Solution Gas	2.24	79	2.65	94	2.79	98	2.66	94	2.31	81
11 - Peace River	24.22	855	24.85	877	24.07	850	23.21	819	22.44	792
Solution Gas	6.71	237	7.51	265	7.64	270	7.26	256	6.85	242
Montney Tight Portion	10.50	371	11.05	390	10.75	380	10.76	380	10.84	383
Other Tight Portion	1.38	49	1.23	44	1.08	38	0.96	34	0.86	30
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
12 - Northwest Alberta	6.23	220	6.21	219	6.03	213	5.72	202	5.43	192
Solution Gas	2.25	79	2.56	90	2.65	94	2.56	90	2.47	87
Duvernay Shale Portion	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
13 - BC Deep Basin	14.84	524	15.58	550	13.93	492	13.16	464	12.51	442
Montney Portion	7.67	271	9.99	353	9.05	320	8.68	306	8.39	296
Other Tight Portion	4.03	142	3.17	112	2.88	102	2.68	94	2.50	88
14 - Fort St. John	56.86	2 007	60.31	2 129	60.00	2 118	59.90	2 115	60.02	2 119
Solution Gas	1.13	40	1.27	45	1.34	47	1.35	48	1.37	48
Montney Portion	43.10	1 522	49.11	1 734	50.99	1 800	51.80	1 829	52.69	1 860
15 - Northeast BC	23.79	840	18.96	669	15.72	555	13.85	489	12.33	435
Solution Gas	0.13	4	0.13	5	0.13	4	0.12	4	0.12	4
Tight Portion	5.80	205	5.35	189	4.70	166	4.15	146	3.67	130
Cordova Shale Portion	0.77	27	0.63	22	0.54	19	0.47	17	0.42	15
Horn River Shale Portion	14.07	497	10.37	366	8.22	290	7.23	255	6.44	227

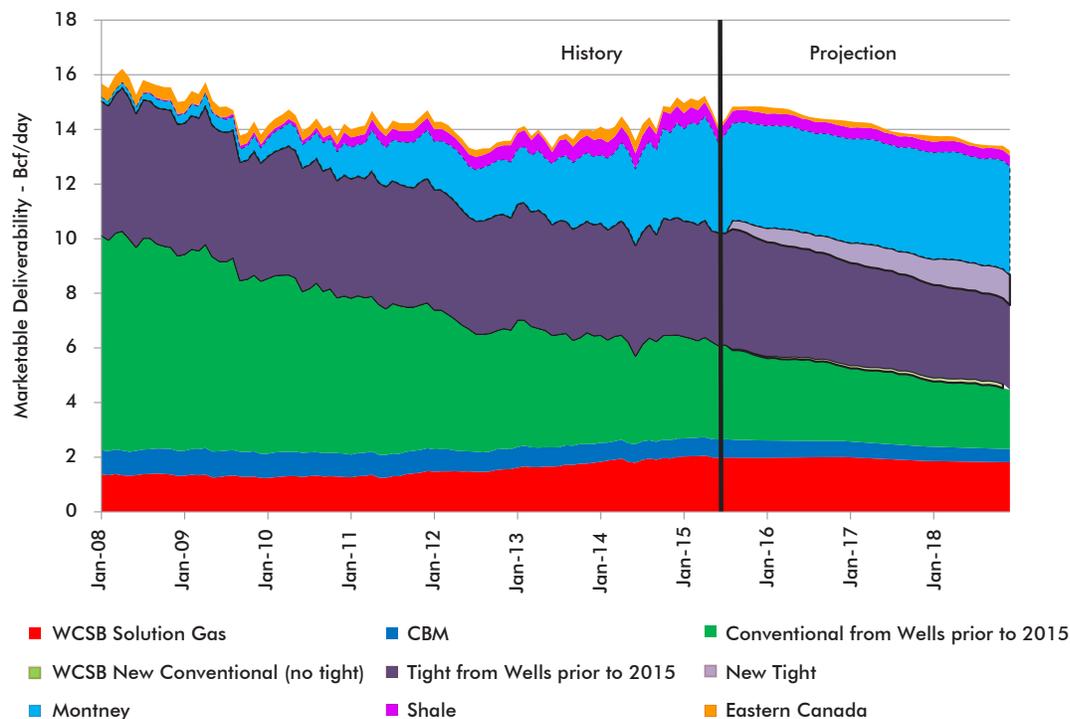
C.3 – Canadian Gas Deliverability by Area/Resource – Lower Price Case										
Area/Resource	Historical				Projected					
	2014		2015		2016		2017		2018	
	10 ^m ³/d	MMc/d								
16 - BC Foothills	17.47	617	25.28	892	30.42	1 074	28.62	1 010	27.11	957
<i>Montney Tight Portion</i>	10.18	359	13.00	459	12.33	435	11.91	420	11.59	409
17 - Southwest Saskatchewan	6.03	213	5.68	200	5.26	186	4.85	171	4.47	158
<i>Solution Gas</i>	0.54	19	0.65	23	0.72	25	0.75	26	0.76	27
<i>Tight Portion</i>	5.42	191	4.99	176	4.54	160	4.11	145	3.72	131
18 - West Saskatchewan	4.53	160	4.45	157	4.21	149	4.19	148	4.12	145
<i>Solution Gas</i>	2.86	101	2.92	103	2.88	102	2.98	105	3.03	107
19 - East Saskatchewan	1.76	62	1.91	68	1.93	68	2.00	71	2.03	72
<i>Solution Gas</i>	1.76	62	1.91	67	1.93	68	2.00	71	2.03	72
22 - Yukon and North West Territories	0.31	11	0.23	8	0.19	7	0.14	5	0.11	4
Total Conventional (no tight, no solution gas)	116.25	4 104	110.31	3 894	105.69	3 731	97.40	3 438	90.14	3 182
Total Tight	200.07	7 063	221.39	7 815	224.01	7 908	222.38	7 850	222.02	7 837
<i>Montney Portion</i>	83.23	2938.27	102.33	3612.40	106.35	3754.25	108.60	3833.70	111.10	3921.91
Total Solution Gas	53.96	1904.93	56.62	1998.87	56.42	1991.85	54.57	1926.36	51.96	1834.40
Total CBM	19.13	675	18.78	663	17.21	607	15.67	553	14.28	504
Total Shale	16.61	586	13.62	481	11.86	419	11.09	391	10.58	374
Total WCSB	406.03	14 333	420.72	14 852	415.19	14 657	401.10	14 159	388.99	13 732
Atlantic Canada	9.38	331	5.64	199	4.50	159	4.19	148	3.91	138
Other Canada	0.30	10	0.31	11	0.30	11	0.28	10	0.24	9
Total Canada	415.71	14 675	426.67	15 062	419.99	14 826	405.57	14 317	393.15	13 878

rates are annual averages

*matched to 2014 actual production for Jan-July

FIGURE C.3

Perspectives de productibilité de gaz au Canada – Scénario de prix plus bas

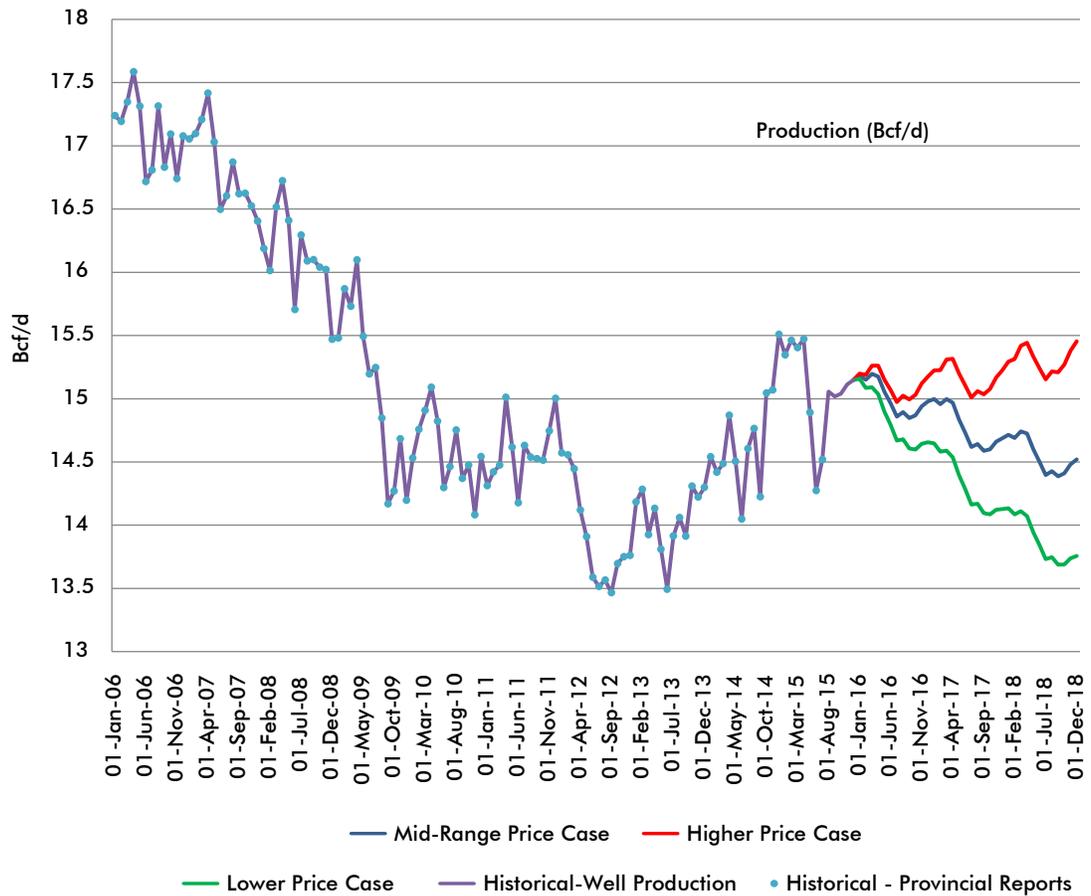


APPENDIX D

Total Canadian Deliverability Comparison by Case

FIGURE D.1

Total Canadian Deliverability Comparison by Case



APPENDIX E

Average Annual Canadian Deliverability and Demand

	2015		2016		2017		2018	
	10 ⁶ m ³ /d	Bcf/d						
Canadian Deliverability, Mid-Range Case	427	15.1	425	15.0	418	14.8	412	14.5
Total Canadian Demand ^[a]	283	10.0	294	10.4	304	10.7	313	11.0
Western Canada Demand	179	6.3	189	6.7	197	7.0	205	7.2
Eastern Canada Demand	103	3.6	106	3.7	106	3.8	108	3.8

[a] Demand is equal to total primary natural gas demand less natural gas used in gas mining and processing.