



Reclaiming Tomorrow Today

*Regulatory timing for
abandonment and
reclamation of well sites in Alberta*

March, 2013

Jason Unger



Library and Archives Canada Cataloguing in Publication

Unger, Jason, 1971-

Reclaiming tomorrow today [electronic resource] : regulatory timing for abandonment and reclamation of well sites in Alberta / Jason Unger.

**Includes bibliographical references.
Electronic monograph in PDF format.
ISBN 978-0-921503-91-0**

1. Petroleum law and legislation--Alberta. 2. Gas industry--Law and legislation--Alberta. 3. Oil wells--Abandonment--Alberta. 4. Gas wells--Abandonment--Alberta. 5. Environmental law--Alberta. I. Environmental Law Centre (Alta.) II. Title.

**KEA351.U54 2013
KF1850.U54 2013**

343.712307'720263

C2013-901899-9

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, or otherwise without permission from the Environmental Law Centre, #800, 10025 -106 Street, Edmonton, Alberta, Canada, T5J 1G4.

Copyright © 2013
Environmental Law Centre

Printed in Canada

The Environmental Law Centre (Alberta) Society

The Environmental Law Centre (Alberta) Society is an Edmonton-based charitable organization established in 1982 to provide Albertans with an objective source of information about environmental and natural resources law and policy. Its vision is an Alberta where the environment is a priority, guiding society's choices.

Environmental Law Centre
#800, 10025 – 106 Street
Edmonton, AB T5J 1G4

Telephone: (780) 424-5099
Fax: (780) 424-5133
Toll-free: 1-800-661-4238
Email: elc@elc.ab.ca

Website: www.elc.ab.ca

Blog: <http://environmentallawcentre.wordpress.com>

Facebook: <http://www.facebook.com/environmentallawcentre>

Twitter: https://twitter.com/ELC_Alberta

To sign up for email updates visit:
<http://www.elc.ab.ca/pages/home/Notification.aspx>

Acknowledgments

The Environmental Law Centre extends its thanks to the funder of this project, the Alberta Law Foundation. Without the generous support and vision of the Foundation, this project would not have been possible.



The Environmental Law Centre also wishes to thank Barry Robinson of Ecojustice for reviewing the report and contributing to the project.

Contents

| | |
|--|----|
| Executive Summary | iv |
| Glossary | vi |
| Reclaiming tomorrow today | 7 |
| A. The legacy of a well site | 7 |
| Environmental impacts | 7 |
| Social impacts | 10 |
| Economic impacts | 11 |
| B. State of abandonment and reclamation in Alberta | 11 |
| C. Current regulations for inactive and abandoned wells | 16 |
| Well Suspension | 16 |
| Well abandonment | 17 |
| Reclamation of well sites | 18 |
| Liability for suspension and abandonment | 19 |
| D. Abandonment and reclamation timing in other jurisdictions | 19 |
| Abandonment timing in other jurisdictions | 19 |
| Reclamation timing in other jurisdictions | 20 |
| E. Policy objectives promoted by timelines | 25 |
| Minimize environmental impairment | 25 |
| Convergence with existing policy directions around cumulative effects management | 26 |
| Minimize Crown liability risk | 26 |
| Minimize conflicts with landowners who want timely reclamation | 26 |
| Increasing safety on public and private lands | 27 |
| Increase due diligence in well transfers | 27 |
| Foster research and innovation in reservoir depletion and reclamation to facilitate increased return | 27 |
| F. Reclaiming today – recommended regulatory amendments | 27 |
| <i>Proposed amendments to the Oil and Gas Conservation Regulation</i> | 30 |
| <i>Proposed amendments to the Pipeline Regulation</i> | 31 |
| <i>Proposed amendments to the Conservation and Reclamation Regulation</i> | 31 |
| <i>Proposed amendments to the Public Land Administration Regulation</i> | 32 |
| Transition provisions | 33 |
| Bibliography | 34 |

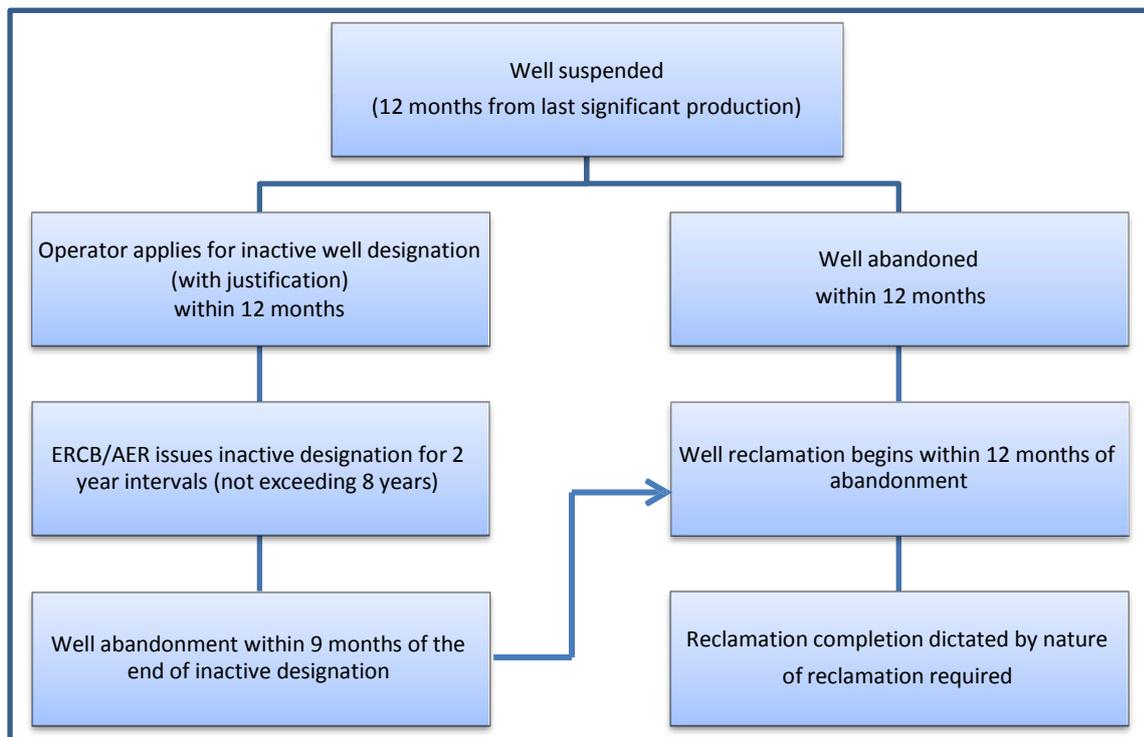
Executive Summary

Abandonment and reclamation of well sites and related infrastructure in Alberta needs to occur in a timely fashion to minimize environmental and fiscal liabilities. Abandonment rates of oil and gas well sites continue to outpace reclamation and undue delay in both abandonment and reclamation contributes to ongoing environmental impacts. This poses problems for Alberta’s management of the cumulative effects of development on biodiversity and landscape integrity. The Environmental Law Centre (ELC) proposes amendments to relevant regulations to place timelines on both the abandonment and reclamation of well sites and associated infrastructure to facilitate environmental, social and economic policy objectives.

A canvass of select US states provides examples of regulatory timelines for abandonment and reclamation of wells. Timelines are proposed for incorporation into the *Oil and Gas Conservation Regulation, Conservation and Reclamation Regulation, Pipeline Regulation, and Public Lands Administration Regulation*.¹

The proposed process and timelines are reflected in Figures 3 and 4 and represent distinct approaches for Crown and private land.

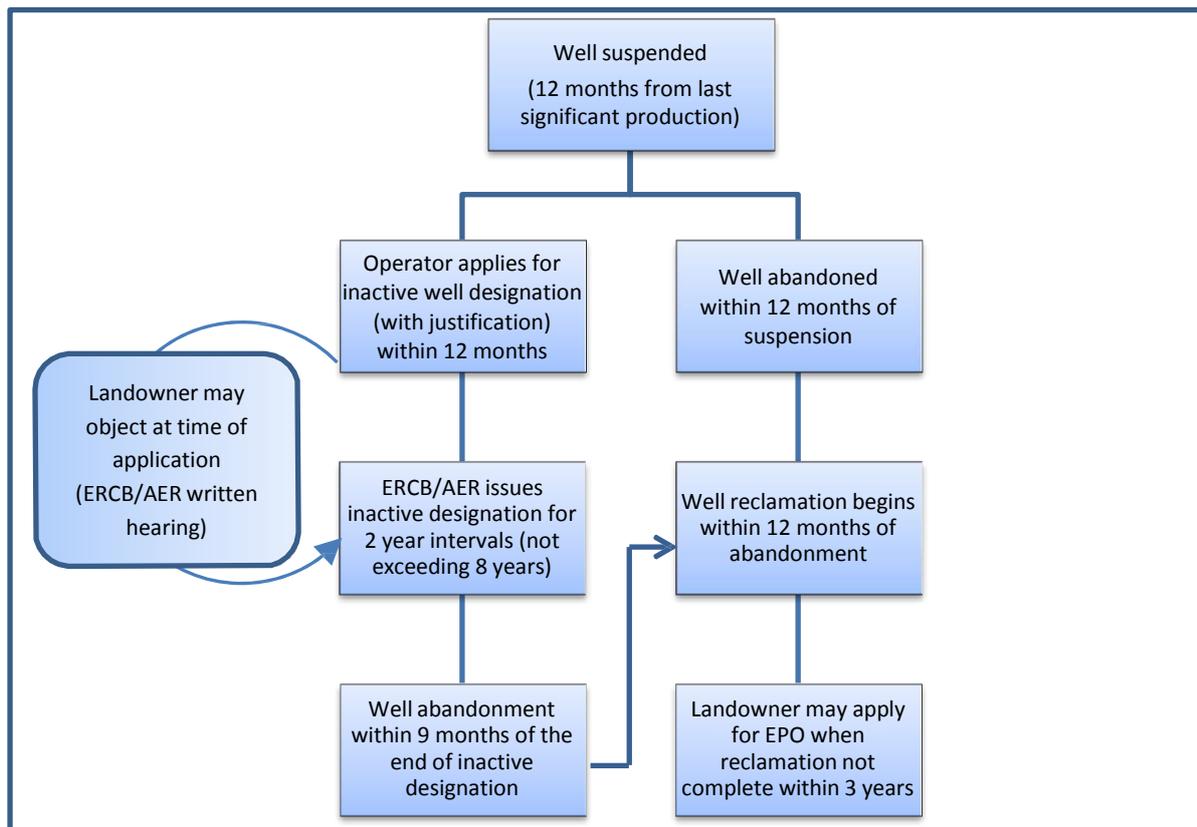
Figure 3: Recommended well abandonment and reclamation timing on Crown land*



* Transitional provisions required.

¹ Alta. Reg. 151/1971, Alta Reg. 115/1993, Alta. Reg. 91/2005, and Alta. Reg. 187/2011, respectively.

Figure 4: Recommended well abandonment and reclamation timing on private land



* Transitional provisions required.

Glossary

Abandonment – “means the permanent dismantlement of a well or facility in the manner prescribed by the regulations and includes any measures required to ensure that the well or facility is left in a permanently safe and secure condition” (s. 1(1)(a) of the *Oil and Gas Conservation Act*, R.S.A. 2000, c. O-6.)

Associated infrastructure – means infrastructure and facilities related to a well and “may include access roads, temporary access roads, temporary work space, borrow sites, campsites, remote sumps, remote cement returns pit, log decks/storage areas and land treatment areas”. (Alberta Environment and Sustainable Resource Development, *2010 Reclamation Criteria for Well sites and Associated Facilities: Application Guidelines* (Edmonton: Government of Alberta, 2011))

Operator – “means a person who... has control of or undertakes the day to day operations and activities at a well or facility, or...keeps records and submits production reports for a well or facility to the Board, whether or not that person is also the licensee or approval holder in respect of the well or facility” (s.1(1)(kk), *Oil and Gas Conservation Act*, R.S.A. 2000, c. O-6.)

Reclamation – “means any or all of the following: (i) the removal of equipment or buildings or other structures or appurtenances; (ii) the decontamination of buildings or other structures or other appurtenances, or land or water; (iii) the stabilization, contouring, maintenance, conditioning or reconstruction of the surface of land; (iv) any other procedure, operation or requirement specified in the regulations”(s. 1(1)(ddd) of the *Environmental Protection and Enhancement Act*, R.S.A. 2000, c. E – 12).

Remediation – “means reducing, removing or destroying substances in soil, water or groundwater through the application of physical, chemical or biological processes”. (s. 1(l) *Remediation Certificate Regulation*, Alta. Reg. 154/2009). There may be a level of remediation required as part of the reclamation certificate process under the *Environmental Protection and Enhancement Act* and related regulations.

Suspension – “means the temporary cessation of operations at a well or facility in the manner prescribed by the regulations and includes any measures required to ensure that the well or facility is left in a safe and secure condition”. (s.1(1)(xx), *Oil and Gas Conservation Act*, R.S.A. 2000, c. O-6.) Under current regulations a licence is suspended “within 12 months after the last production or injection operations have occurred unless the well is produced only to supply a seasonal market or the well is classed as an observation well”. (s. 3.020 (1), *Oil and Gas Conservation Regulations*, Alta. Reg. 151/71).

Reclaiming tomorrow today

Oil and gas exploration and development has been the principal economic driver for Alberta for several decades. During the productive life of a well, the site contributes significantly to the wealth of the province and its residents but also brings with it risks and impacts to the environment and to society. Once a well's production dwindles however, it becomes a liability that must be properly abandoned and the site and related infrastructure must be reclaimed. This liability is a direct financial burden on the operator and, where the operator and any partners are unable to meet their liabilities, on other industry participants. It also may become a general public liability by way of *ad hoc* government grants² or by way of long term liability (where contamination and remediation issues exceed regulatory liability time frames).³

Delayed abandonment and reclamation of well sites also brings with it an environmental liability, particularly in the Green area of the province, insofar as it extends the anthropogenic disturbance on the landscape with related impacts on biodiversity and watershed function. Impacts arise from the well site itself as well as related infrastructure to maintain the well site, including roads, pipelines, power lines and any environmental contamination that has occurred as a result. These impacts accumulate over time in conjunction with other impacts from activities such as oil and gas exploration, forestry, and recreation.

The risk of environmental impacts and related liabilities can be minimized through timely reclamation and abandonment of well sites and related infrastructure. The Environmental Law Centre (ELC) proposes amendments to current regulations to support timely return of lands to environmentally and/or economically productive condition. The discretionary nature of both abandonment and reclamation must change to see sufficient change in abandonment and reclamation rates.

A. The legacy of a well site

A well site brings with it a host of impacts: economic, environmental and social. Some of the impacts have been studied and illustrated, particularly those related to environment. Other impacts of delayed abandonment and reclamation require further study, including economic impacts of delaying the return of the land to other economic uses.

Environmental impacts

A host of impacts from well sites and related roads and other infrastructure are continued when abandonment and reclamation are delayed. These impacts may include:

- impacts on biodiversity;
- impacts on species at risk;
- impacts on hydrology;

² A \$30 million grant was given to the Orphan Well Fund by the Government of Alberta in 2009. See Orphan Well Association, *Orphan Well Association 2011/2012 Annual Report* (June, 2012) at page 4, online: Orphan Well Association <<http://www.orphanwell.ca/OWA%202011-12%20Ann%20Rpt%20Final.pdf>>.

³ See the *Conservation and Reclamation Regulation*, Alta. Reg. 115/1993 at s. 15(2).

- impacts on soil and groundwater where contamination exists; and
- impacts on surface water.

Impacts related to wildlife and species at risk (e.g., woodland caribou and grizzly bear) have attracted more study compared to impacts on hydrology and surface water quality. The impacts of well sites must be viewed at the landscape scale and have implications for cumulative effects management. For some species, the ongoing linear disturbance and access to sites poses more problems than the well site itself although some species may favour these disturbances.

Examples of studies of impacts of well sites and related infrastructure (including linear disturbance) on wildlife include:

- “Caribou encounters with wolves increases near roads and trails: a time-to-event approach”;⁴
- “Identifying indirect habitat loss and avoidance of human infrastructure by northern mountain woodland caribou”;⁵
- *Linear Features, Forestry and Wolf Predation of Caribou and Other Prey in West Central Alberta*;⁶
- “Avoidance of industrial development by woodland caribou”;⁷
- *Woodland Caribou Demography and Persistence Relative to Landscape Change in West-central Alberta 2004*;⁸
- “Road density models describing habitat effectiveness for elk”;⁹
- “Grizzly bear habitat selection in the Swan Mountains, Montana”;¹⁰

⁴ J. Whittington, *et al.*, (2011) *Journal of Applied Ecology*, In Press, July 19, DOI: 10.1111/j.1365-2664.2011.02043.x., online: College of Forestry and Conservation <http://www.cfc.umt.edu/HebLab/PDFS/JAE_Whittington_Wolf-CaribouEncounters_2011.pdf>. Also see C.A.D. Semeniuk, *et al.* “Incorporating behavioral-ecological strategies in pattern-oriented modeling of caribou habitat use in a highly industrialized landscape” (2012) 243 *Ecological Modeling* 18, online: College of Forestry and Conservation <<http://www.cfc.umt.edu/HebLab/PDFS/Semeniuk%20et%20al%202012%20EcoMod.pdf>>.

⁵ J.L. Polfus, M. Hebblewhite and K. Heinemeyer, (2011) *Biological Conservation* 144: 2637, online: College of Forestry and Conservation <http://www.cfc.umt.edu/HebLab/PDFS/BC_Polfus_AtlinCaribouRSF_2011.pdf>.

⁶ M. Hebblewhite, *et al.*, (2010) Final report to the Petroleum Technology Alliance of Canada (PTAC) online: College of Forestry and Conservation, <http://www.cfc.umt.edu/heblab/pdfs/hebblewhite%20and%20musiani%20ptacfinalreport_low_resolution.pdf>.

⁷ SJ Dyer, JP O'Neill, SM Wasel (2001) 65 *Journal of Wildlife Management* 531.

⁸ Kirby Gordon Smith, online: Foothills Research Institute <<http://foothillsresearchinstitute.ca/pages/Publications/PublicationByProgram.aspx?program=747>>. Also see Stan Boutin, *Expert report on woodland caribou Rangifer tranadus caribou in the Traditional Territory of the Beaver Lake Cree Nation* (July 5, 2012), online: scribd <<http://www.scribd.com/doc/37111032/Expert-Stan-Boutin-s-report-on-the-woodland-caribou>>.

⁹ L.J. Lyon, (1983) 81 *Journal of Forestry* 592.

¹⁰ John S. Waller and Richard D. Mace (1997) 61 *Journal of Wildlife Management* 1032.

- “Seismic cutlines, changing landscape metrics and grizzly bear landscape use in Alberta”;¹¹
- “A habitat-based framework for grizzly bear conservation in Alberta”;¹²
- “Linking occurrence and fitness to persistence: habitat-based approach for endangered Greater Sage-grouse”;¹³
- “Greater Sage-grouse population response to energy development and habitat loss”;¹⁴
- *Greater Sage-grouse (Centrocercus urophasianus) population response to natural gas field development in western Wyoming* (PhD Thesis);¹⁵
- *Recruitment by greater sage-grouse in association with natural gas development in western Wyoming* (Master’s Thesis);¹⁶
- “Effects of Disturbance Associated with Natural Gas Extraction on the Occurrence of Three Grassland Songbirds”;¹⁷ and
- *Castle Area Forest Land Use Zone: Linear Disturbances, Access Densities and Grizzly Bear Habitat Security Areas*.¹⁸

Minimizing anthropogenic impacts on ecological systems requires reclamation of well site related infrastructure in concert with well sites. Certainly, meaningful and timely reclamation of impacts related to other industries, such as forestry and seismic lines, are also central to minimizing environmental impacts.

Delays in reclamation and abandonment also bring an increased risk of well and pipeline failures and related contamination of soil and groundwater.¹⁹ This in turn may result in extensive contamination, particularly where insufficient and inadequate policy backstops exist to ensure effective and timely remediation of these sites. While assessment of these liabilities and risks are rare, an example of the

¹¹ J. Linke, *et al.*, (2005) 20 *Landscape Ecology* 811.

¹² S.E., Nielsen, G.B. Stenhouse, M.S. Boyce, (2006) 130 *Biological Conservation* 217.

¹³ C.L. Aldridge and M. S. Boyce, (2007) 17(2) *Ecological Applications* 508.

¹⁴ B. Walker, D. Naugle and K. Doherty. (2007) 71 *The Journal of Wildlife Management* 2644.

¹⁵ M. Holloran, University of Wyoming, Laramie, WY (PhD Thesis, University of Wyoming, 2005)

¹⁶ R. Kaiser, (Master’s Thesis, Department of Zoology and Physiology, University of Wyoming, Laramie, WY., 2006).

¹⁷ Laura, E. Hamilton, Brenda C. Dale and Cynthia A. Paskowski (2011) 6(1) *Avian Conservation and Ecology* 7. Impacts on Savannah Sparrows and Chestnut-collared Longspurs were not observed as part of this study but were observed for Sprague’s pipits.

¹⁸ GlobalForestWatch, (2011), online: GlobalForestWatch <http://www.globalforestwatch.ca/pubs/2011Forests/02Castle/Castle_report_GFWC.pdf>.

¹⁹ See D’Arcy White, *Saltwater spill assessment and remediation in northern Alberta* (Master’s Thesis, Royal Roads University, 2012), online: Royal Roads University, <<http://dspace.royalroads.ca/docs/handle/10170/527>>.

potential problems that may arise can be found in a recent case study regarding pipeline failures in *Saltwater spill assessment and remediation in northern Alberta*.²⁰

Social impacts

Social impacts of legacy sites may also be significant. Surface lease agreements rarely contain provisions that allow landowners to force abandonment and reclamation of sites. While some landowners may be amenable to ongoing property impacts related to the lease site (and related payments), others will want to minimize safety and contamination risks related to these sites and want the land put back to other uses.

This issue of conflicting operator and landowner goals can lead to litigation around these sites. An example of this occurred in southern Alberta in 2009.²¹ In this case the operator of a long inactive well site had refused to abandon and/or reclaim the well site despite the request to do so by the landowner. The surface lease on which the well was situated expired in 2007, following which the landowner sought to have the caveat on title related to the lease removed and an abandonment order issued by the Energy Resource Conservation Board (ERCB) on the basis that the operator had not obtained the requisite surface access. The company applied to the court to have the caveat maintained; however, the court allowed the caveat to be struck finding that, while obligations for reclamation continued, the term of the lease was not continued by operation of the legislation.²² Subsequently, an abandonment order was issued by the ERCB. The landowner later entered into a new surface lease with the operator which required the operator to either produce from the well or abandon and reclaim the well site by specified dates.²³

Timelines for abandonment and reclamation are rarely incorporated into surface leases and landowners may be faced with no option in relation to having a legacy well site and related road way on their land for generations.

The new *Responsible Energy Development Act* provides a mechanism to allow the new Regulator to order compliance with private agreements which have been registered with the Regulator.²⁴ This may not address the vast majority of existing sites as most private agreements to date are not likely to include timelines on abandonment and reclamation. Further enforcement of “private surface agreements” under this Act will operate only on a go forward basis.²⁵

²⁰ *Ibid.*

²¹ *Pennine Petroleum Corporation v. Anthony J. Bruder and Lorraine E. Bruder*, Transcript of Hearing, Action No.: 080600757, May 26, 2009, Lethbridge, Alberta.

²² *Ibid.*

²³ Personal communications, Barry Robinson, Ecojustice, counsel for the landowner.

²⁴ See Bill 2, *Responsible Energy Development Act*, 1st Sess., 28th Leg., Alberta, 2012 (assented to December 10, 2012), online: Alberta Legislature <http://www.assembly.ab.ca/net/index.aspx?p=bills_status&selectbill=002&legl=28&session=1>. It is anticipated that the bulk of regulation of the upstream oil and gas sector will be transferred to a single energy regulator within 1 year of this publication. See Government of Alberta, *Enhancing Assurance: Developing an integrated energy resource regulator* (Edmonton: Government of Alberta 2011), online: Department of Energy <<http://www.energy.alberta.ca/Org/pdfs/REPEnhancingAssuranceIntegratedRegulator.pdf>> (accessed August 13, 2012).

²⁵ *Ibid.* at s.65(2)

Other areas of concern for landowners may include impacts of inactive wells and potential contamination on the availability of credit. Similarly, conflicts between existing landowner mortgage provisions and surface leases may arise.²⁶ Admittedly these concerns remain primarily anecdotal as thorough review and analysis of these impacts remains to be done.

Economic impacts

Delay of abandonment and reclamation is likely to have economic consequences as well. Specifically, once production has ceased from a well, the land effectively remains sterilized from other uses. When one considers that the sites may remain dormant for decades, this represents lost opportunity. Further work is needed to quantify these economic losses.

In addition, a delay in reclamation, particularly for sites where contamination is present, increases economic risks for sites (and related industry and public liability), as costs associated with remediating contamination can escalate rapidly where contaminants are migrating.

Timelines on abandonment may also provide clarity to shareholders in terms of realization of probable and possible reserves. Timelines effectively minimize the duration of investments in more elusive plays, freeing up capital to be more productively utilized in the short term.²⁷

B. State of abandonment and reclamation in Alberta

Cumulative statistics around the abandonment and reclamation of well sites illustrate a scenario of deteriorating effort to abandon and reclaim sites in a timely fashion. The ERCB reports that, as of November 23, 2012, there were 152,151 abandoned well licences.²⁸ As of the same date there were 51,705 suspended wells in the Province.²⁹ In excess of 50,000 wells remained abandoned and uncertified (i.e., unreclaimed) at the end of 2011.³⁰ A continuing rise in the number of abandoned and unreclaimed wells and a legacy of reclamation exempt wells need to be dealt with to minimize public liability in the future.

²⁶ Barry Robinson, person communication.

²⁷ There is also the possibility of accounting issues related to these dormant sites. Specifically, timelines on abandonment and reclamation will minimize the impact of any overestimation of reserves (and resource data that is not classified as “reserve data” under National Instrument 51-101 *Standards of Disclosure for Oil and Gas Activities*). While difficult to assess, dormant sites may be contributing to a propping up or inflation of reported asset values in some cases. Current reporting requirements (under National Instrument 51-101) may not be met in all instances, and overestimation of “probable” reserves and representations of “possible” reserves (and other “resources classes, especially for unconventional resources”) may pose risks to shareholders and creditors. While further investigation into whether overstatement of reserves is taking place is required, timely abandonment and reclamation will invariably curb or minimize this risk.

²⁸ The “abandoned well licence” category includes sites with reclamation certificates and those which are reclamation exempt. Energy Resources Conservation Board, *Response to Freedom of Information and Protection of Privacy Act Request for Access to Records #2012-G-0030*. See also cumulative well site statistics at Alberta Environment and Sustainable Resource Development, “Oil and Gas Reclamation”, online: <<http://www.environment.alberta.ca/02862.html>>.

²⁹ *Ibid.*

³⁰ See cumulative well site statistics, Alberta Environment and Sustainable Resource Development, “Oil and Gas Reclamation”, online: Alberta Environment and Sustainable Resource Development <<http://www.environment.alberta.ca/02862.html>>.

Figures 1 and 2 are Government of Alberta graphs which set out the cumulative statistics for wells from 1963 to 2011 and illustrate the widening gap between abandoned and reclaimed well sites.

Figure 1: Cumulative wells drilled, abandoned and certified reclaimed.

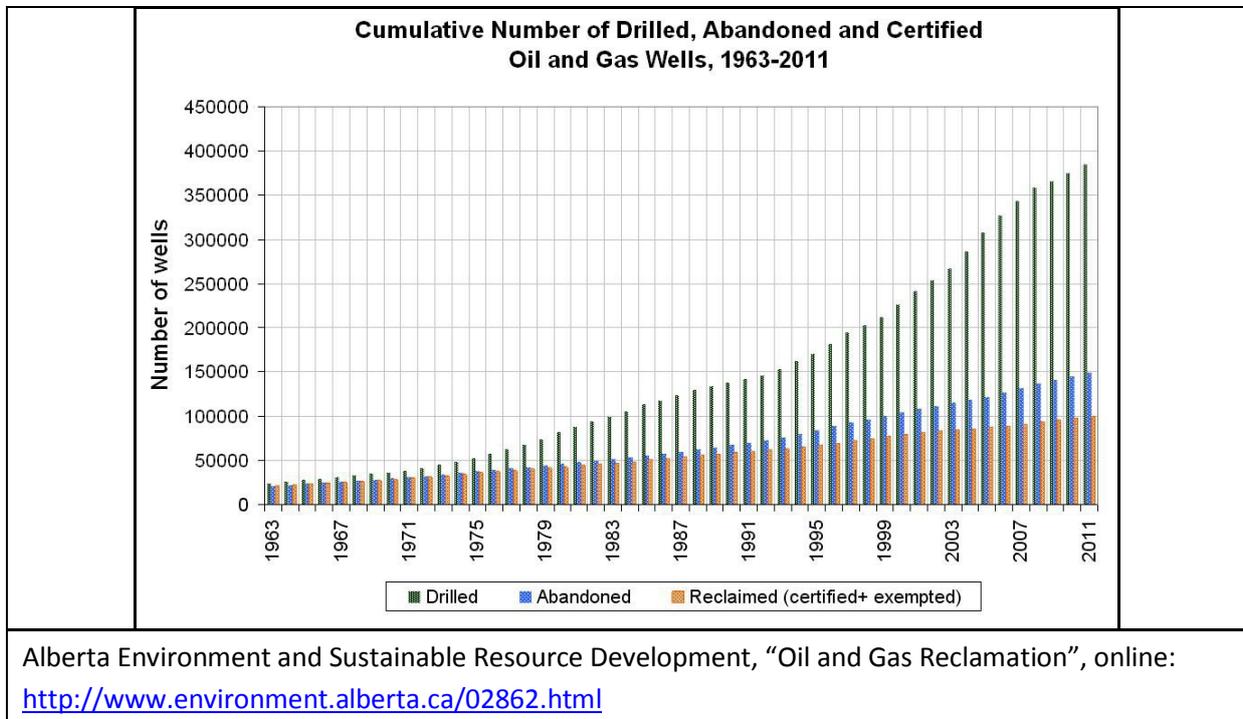
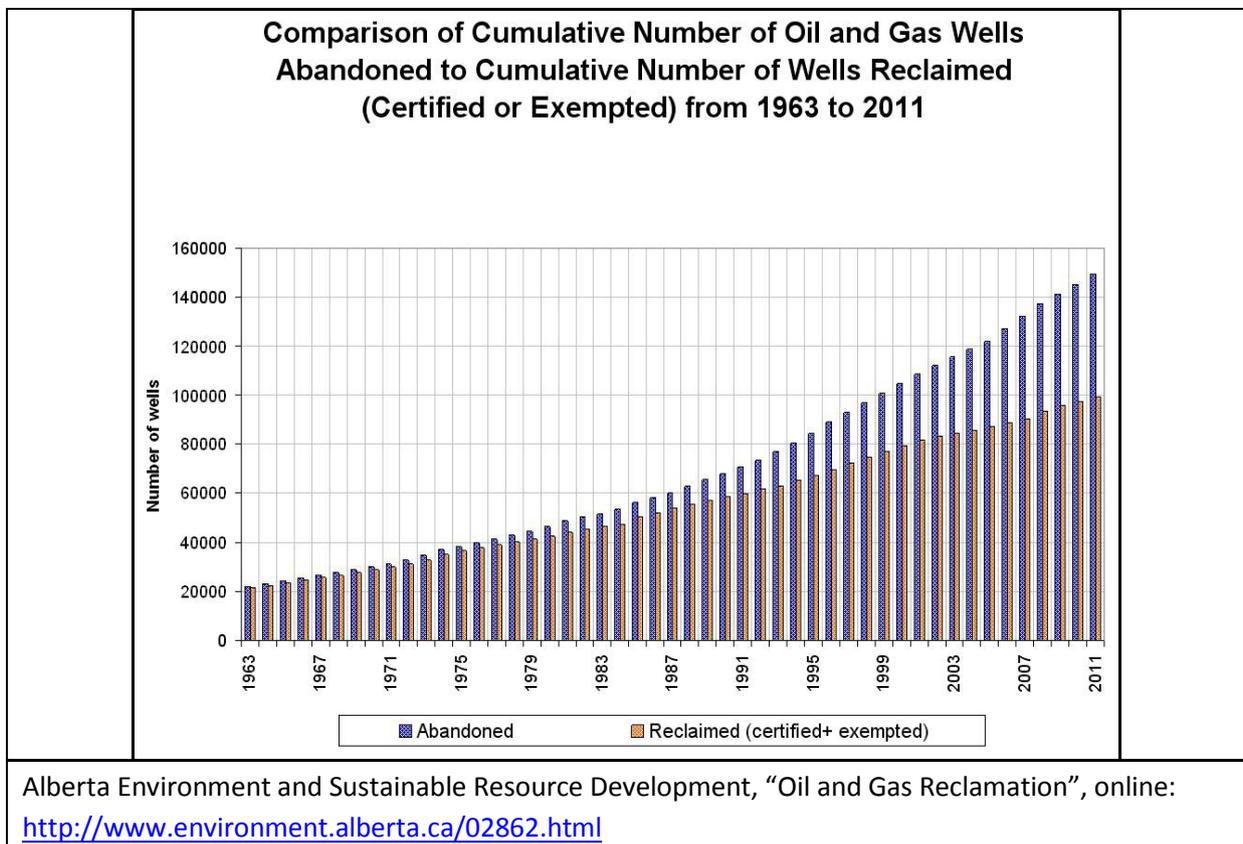


Figure 2: Cumulative wells abandoned and reclaimed (certified and exempt)



The Alberta Environment and Sustainable Resource Development website notes:³¹

There were 50,417 uncertified wells remaining at the end of 2011. Approximately 35 per cent (17,611) of uncertified wells were abandoned between 1963 and 2002. On average, over the last 10 years, approximately 14,227 wells were drilled per year, 4,111 were abandoned and 1,682 certified. This indicates that over the last 10 years, the certification rate has been approximately 40.9 per cent of the abandonment rate.

Abandonment delays have also been an issue of concern for the Energy Resources Conservation Board. In a 1989 report the Board sought “major changes” in how inactive wells were regulated, including:³²

- that “each suspended well will be reviewed every 5 years, at which time the onus will be on the licensee to justify continued suspension or to abandon the well”;³³
- the creation of financial penalties for any defaulting party, payable to the party who undertakes the abandonment; and
- seeking to ensure that previous licencees and lease holders may also be held responsible for the abandonment.

Some aspects of the Board’s report were implemented; however, the timeline around suspension and the need to justify continued suspension were never codified in regulations or directives.

In a 1998 information letter the ERCB (then the Energy and Utilities Board) indicated they would “continue to focus greater efforts on the prevention of contamination and the timely suspension and abandonment of non-economic facilities”.³⁴

What is the nature of the liability that exists?

A clear picture of the scale of abandonment and reclamation (and remediation) liability associated with existing licences is elusive. The *Annual Report of the Auditor General of Alberta 2004-2005* cites a total liability of \$8.63 billion but it is unclear how this number was derived.³⁵ More recent figures and a focused assessment of estimated cumulative liabilities (including remediation work and well site related infrastructure) were not available. The costs related to impacts on other environmental

³¹ *Ibid.*

³² Energy Resources Conservation Board, *Recommendations to Limit the Public Risk From Corporate Insolvencies Involving Inactive Wells* (Calgary: Energy Resources Conservation Board, 1989). Energy Resources Conservation Board, response to *Freedom of Information and Projection Privacy Act Request for Access to Records #2012-G-0030*.

³³ Energy Resources Conservation Board, *Recommendations to Limit the Public Risk From Corporate Insolvencies Involving Inactive Wells*, *ibid.* at 4.

³⁴ Alberta Energy and Utilities Board, *Suspension, Abandonment, Decontamination, And Surface Land Reclamation Of Upstream Oil And Gas Facilities* Information Letter IL98-2, online: ERCB <<http://www.ercb.ca/ils/pdf/il98-02.PDF>>

³⁵ Auditor General of Alberta, *Annual Report of the Auditor General of Alberta 2004-2005* (Edmonton: Auditor General Alberta, 2005), online: Office of the Auditor General <<http://www.oag.ab.ca/files/oag/ar2004-05.pdf>>

factors (ecosystem services, biodiversity, i.e., a “triple bottom line”) are often not included or underrepresented. Publicly available statistics regarding the actual cost of remediation and reclamation are limited.

Regulatory responsibilities for abandonment and reclamation are clear legislatively and, as will be discussed below, are largely borne by the operators or the industry as a whole (with 16% of funding overall coming from government, as of 2011/12).³⁶

The information that is available does lead to several observations about how liabilities are assessed and treated under the current system. Operators need not post financial security for abandonment and reclamation for well sites in Alberta unless required pursuant to the formula provided in Directive 006 as part of the ERCB’s the *Licensee Liability Rating Program (LLR)*.³⁷ The formula used as part of the *LLR*, in rough terms, attempts to determine the risk associated with an operator by comparing deemed assets and liabilities. Liability costs for the purpose of calculating the *LLR* are set out in Directive 011.³⁸ The *LLR* program has been criticized for not truly reflecting the financial status of some operators and for failing to operate as an incentive for timely abandonment and reclamation.³⁹

Part of the problem appears to be that actual liabilities related to well sites likely exceed the liabilities that are attributed to them under Directive 11. This is, in large part, due to the fact that remediation of contaminated land does not factor into the *LLR* system unless the operator does so on their own volition or the ERCB requires them to do so due to the Board identifying a “potential problem site”.⁴⁰ It is also a reflection that Directive 11 costs attributed to abandonment and reclamation are slow to evolve to more closely reflect actual costs.⁴¹

Note: Immediately prior to publication the ERCB indicated that a staged escalation of deemed liabilities under Directive 11 and other changes to the *LLR* program would take place over the next three years. See Energy Resources Conservation Board, Bulletin 2013-09: *Licensee Liability Rating (LLR) Program Changes and Implementation Plan*, online: ERCB <<http://www.ercb.ca/bulletins/Bulletin-2013-09.pdf>>.

³⁶ See Orphan Well Association, *Orphan Well Association 2011/2012 Annual Report* (June 2012) at 4, online: Orphan Well Association <<http://www.orphanwell.ca/OWA%202011-12%20Ann%20Rpt%20Final.pdf>>.

³⁷ Energy Resources Conservation Board, *Licensee Liability Rating (LLR) Program and Licence Transfer Process* (Revised, 2009), Directive 006, online: ERCB <<http://www.ercb.ca/directives/Directive006.pdf>>

³⁸ Energy Resources Conservation Board, *Licensee Liability Rating (LLR) Program Updated Industry Parameters and Liability Costs* (2005), Directive 011, online: ERCB <<http://www.ercb.ca/directives/Directive011.pdf>>.

³⁹ Barry Robinson, “Well Abandonment and Reclamation in Alberta: the Failure of the Licensee Liability Rating Program” Paper prepared for the *Well & Pipeline Abandonment, Suspension and Reclamation Conference*, Canadian Institute, February 9-10, 2010, online: Ecojustice <<http://www.ecojustice.ca/publications/reports/well-abandonment-and-reclamation-in-alberta>>. at 9.

⁴⁰ Energy Resources Conservation Board, *Requirements for Site-Specific Liability Assessments in Support of the ERCB’s Liability Management Programs* (Revised, 2012), Directive 001, online: ERCB <<http://www.ercb.ca/directives/Directive001.pdf>>

⁴¹ See EUB Memorandum, *Voluntary Survey of Industry Abandonment and Reclamation Costs Update*, dated February 14, 2007. (From Liability Management Section, Corporate Compliance Group, to the Liability Management Advisory Committee), Energy Resources Conservation Board, response to *Freedom of Information and Projection Privacy Act Request for Access to Records #2012-G-0030*.

An industry survey conducted by the ERCB (then EUB) in 2005 revealed that the costs of reclamation and abandonment were consistently higher than set out in Directive 11 (also dated 2005).⁴² The survey resulted in a set of recommended costs for the various geographies and well depths for which Directive 11 prescribes costs.⁴³ Of the recommended rates that resulted from the survey, a majority of the recommended abandonment costs were more than 100% greater than current costs under the Directive. Some of the recommended cost values exceed 400% of the current value. Another 21% of prescribed cost values had recommended costs that ranged from 50% - 100% greater than Directive 11 values.⁴⁴

Further, assessments conducted since this survey have also indicated that the costs under Directive 11 are invariably lower than actual costs.⁴⁵ This assessment reflects the shortcomings of the current LLR system to keep up with rising costs and does not even account for other inadequacies of the system to properly assess the financial liquidity of operators in any fulsome sense.⁴⁶

It is also important to note how remediation costs typically escalate the liability related to these sites significantly.⁴⁷ Information from the Orphan Well Association (OWA) indicates that abandonment for sites where remedial repairs were required in 2010/2011 ranged from \$289,000 to \$899,000.⁴⁸ For reclamation of sites (including remediation where necessary) the costs per site ranged from \$5,245 for minor reclamation work to those needing remediation activities averaging \$225,585 (including 13 “very large remediation projects” that capped out at \$924,000), some of which continue for longer than a calendar year.⁴⁹ In 2010-2011 the OWA spent over \$21 million on sites, including some funds from the \$30 million government grant.⁵⁰ It is of interest to note that over 13% of orphan sites in 2010/2011 sites required remediation.

There is also significant liability related to contaminated sites that may not be known. For those sites that are known, the ERCB reports that, as of November 21, 2012, there were 9 potential problem sites and 10 designated problem sites that were known (a mix of well sites and facilities).

⁴² *Ibid.*

⁴³ The recommended costs report was marked for “discussion purposes”.

⁴⁴ *Ibid.*

⁴⁵ See *Directive 11 Abandonment Cost Estimate Study 2009* from Tristar Resources Management Ltd. undated; *Directive 11 Abandonment Cost Estimate Study 2010* from Tristar Resources Management Ltd. undated; *Directive 11 Abandonment Cost Estimate Study 2011* from Tristar Resources Management Ltd. undated; and *Directive 11 Abandonment Cost Estimate Study 2012* from Tristar Resources Management Ltd. undated. Energy Resources Conservation Board, response to *Freedom of Information and Projection Privacy Act Request for Access to Records #2012-G-0030*.

⁴⁶ See Barry Robinson, “Well Abandonment and Reclamation in Alberta: The Failure of the Licensee Liability Rating Program”. Paper prepared for the Well & Pipeline Abandonment, Suspension and Reclamation Conference, Canadian Institute, February 9-10, 2010, online: Ecojustice <<http://www.ecojustice.ca/publications/reports/well-abandonment-and-reclamation-in-alberta>>.

⁴⁷ *Supra* note 36. See for example *Legal Oil & Gas Ltd. 00/05-31-049-26W4/0* and *Legal Oil & Gas Ltd. 00/11-13-057-25W4/0*

⁴⁸ *Ibid.* at p. 25-26.

⁴⁹ *Ibid.* at p. 15-17.

⁵⁰ Orphan Well Association, *Orphan Well Association 2010/2011 Annual Report* (June 2012) at 4, online: Orphan Well Association <<http://www.orphanwell.ca/OWA%202010-11%20Ann%20Rpt%20Final.pdf>>.

The estimated aggregate reclamation cost of the sites was \$41.8 million (12 of the 19 sites related to facilities, 7 are well sites) and abandonment costs were \$2.78 million.⁵¹

This review of costs raises questions, first about the nature of the *LLR* and whether appropriate liabilities are being assessed when determining the need to take security, and second, and more fundamental, whether regulatory timelines on abandonment and reclamation would facilitate more efficient abandonment and reclamation, foster a heightened “polluter pays” approach for these well sites, and increase the level of due diligence in well site transfers.

C. Current regulations for inactive and abandoned wells

The purpose of the *Oil and Gas Conservation Act* includes securing “safe and efficient ... suspension and abandonment of wells and facilities”.⁵² Similarly the mandate of the new single energy Regulator is:⁵³

(a) to provide for the efficient, safe, orderly and environmentally responsible development of energy resources in Alberta through the Regulator’s regulatory activities, and

(b) in respect of energy resource activities, to regulate

- (i) the disposition and management of public lands,
- (ii) the protection of the environment, and
- (iii) the conservation and management of water, including the wise allocation and use of water...

Safety and efficiency are not defined by the relevant Acts; however, the common usage of the terms would entail suspension and abandonment of wells that minimize risks to people and the environment (i.e., safe) and result in the highest productivity of the lands at any given time (i.e., efficient). “Environmentally responsible development” must also entail taking measures to minimize the impacts of oil and gas development.

The *Oil and Gas Conservation Act* also requires that “a licensee or approval holder shall suspend or abandon a well or facility when directed by the Board or required by the regulations.”⁵⁴

Well Suspension

Currently, when production of an oil or gas well ceases or there is no “significant production” or injection operations for a period of 12 months, a well is considered suspended.⁵⁵ A licensee must suspend these wells within 12 months unless the well is for the production of seasonal markets or it is classed as an observation well.⁵⁶ This period of time is reduced to 6 consecutive months if the well

⁵¹ Energy Resources Conservation Board, response to *Freedom of Information and Projection Privacy Act Request for Access to Records* #2012-G-0030.

⁵² *Oil and Gas Conservation Act*, R.S.A. 2000, c. O-6 at s.4(b)

⁵³ *Responsible Energy Development Act*, *supra* note 2 at s.2(1), unproclaimed.

⁵⁴ *Supra* note 52 at s.27.

⁵⁵ *Oil and Gas Conservation Regulation*, Alta. Reg. 151/71 at s. 1.020(1)28.1. The definition also excludes wells used for injection.

⁵⁶ *Ibid.* at s.3.020(1)

is a “critical sour” or “acid gas” well.⁵⁷ The substantive criteria for suspension are prescribed by Directive 013 – *Suspension Requirements for Wells* with varying criteria depending on well categories.⁵⁸ The Directive also indicates that “low-risk” wells must meet heightened suspension requirements after the well has been suspended for 10 consecutive years following “the first year of inactivity”.⁵⁹ Suspensions are reported to the ERCB within 30 days of the suspension operation or inspection and reactivation of wells must similarly be reported.⁶⁰ A well may remain suspended for decades.

Well abandonment

For operators and licencees who are fully compliant with the directives and regulations and have valid licences and leases, there are very limited instances where abandonment may be ordered. Section 3.012 of the *Oil and Gas Conservation Regulation* prescribes limited instances in which a licencee must abandon a well site. These include:⁶¹

- termination of the mineral lease, surface lease or right of entry;⁶²
- failure to obtain the necessary approval for the intended purpose of the well;
- failure of the licensee to hold the right to drill for and produce oil or gas from the well;
- contravention of an Act, a regulation or an order or direction of the Board and the Board has suspended or cancelled the licence;
- where notified by the Board, where the Board is of the opinion that the well or facility may constitute an environmental or a safety hazard;
- where the licencee is not or ceases to be a working interest participant in the well or facility, or resident in Alberta and has not appointed an agent in accordance with the Act;
- a corporation that is no longer being active or dissolved or struck from the corporate registry;
- contravention of suspension requirements established by the Board under section 3.020; or
- where otherwise ordered to do so by the Board.

⁵⁷ Energy Resources Conservation Board, *Directive 013: Suspension Requirements for Wells*, (Calgary: ERCB, 2007) at 2, online: Energy Resources Conservation Board <<http://www.ercb.ca/directives/Directive013.pdf>>.

⁵⁸ *Ibid.*

⁵⁹ *Ibid.* at s. 5.

⁶⁰ *Ibid.* at s. 8.

⁶¹ *Supra* note 55 at s.3.012.

⁶² It should be noted that a failure to develop the resource results in a termination of the mineral lease under the *Mines and Minerals Act* and related regulations.

The Board may also order suspension or abandonment of a well or facility where it is considered necessary to protect the public or the environment.⁶³ The author is not aware of the Board issuing a discretionary order of this nature for the sole protection of the environment. When abandonment is required by Board order or by regulations, the Board may require a licensee, approval holder or a “working interest participant” to carry out suspension and abandonment actions.⁶⁴ Where a well site is not suspended or abandoned as per a Board direction or regulations, the Board may authorize a third party to suspend and abandon the well or facility or it may do so on its own.⁶⁵

The criteria for abandoning operations are set out in *Directive 020: Well Abandonment*; however, no timelines for abandonment are included (except for some instances involving test wells).⁶⁶ Surface abandonment timelines exist following downhole abandonment and testing, but this is of minimal relevance where abandonment is delayed.⁶⁷

Reclamation of well sites

The *Environmental Protection and Enhancement Act (EPEA)* requires “operators” to conserve and reclaim “specified land”.⁶⁸ Well sites are included in this requirement and the end goal for reclamation is to have the lands return to “equivalent land capability”.⁶⁹ Equivalent land capability is defined as “the ability of the land to support various land uses after conservation and reclamation is similar to the ability that existed prior to an activity being conducted on the land, but that the individual land uses will not necessarily be identical”.⁷⁰ Reclamation of a well site includes the well related aspects along with “associated facilities and infrastructure” which may include access roads, temporary access roads, temporary work space, borrow sites, campsites, remote sumps, remote cement returns pits, log decks/storage areas and land treatment areas.⁷¹ While there are a variety of policy documents related to

Reclamation criteria for well sites in Alberta

The Government of Alberta has set out various policy and guidance documents regarding the “standard” of reclamation, including:

- 2010 Reclamation Criteria for Wellsites and Associated Facilities for Cultivated lands
- 2010 Reclamation Criteria for Wellsites and Associated Facilities for Forested Lands
- 2010 Reclamation Criteria for Wellsites and Associated Facilities for Native Grasslands.
- Acceptable Salinity, Sodicity and pH Values for Boreal Forest Reclamation.

None of the policies or regulations around reclamation address the need for timely reclamation nor do they set any timelines on when reclamation must be initiated or completed.

⁶³ *Supra* note 52 at s.27 (3).

⁶⁴ *Ibid.* at s.27.

⁶⁵ *Ibid.* at s.28.

⁶⁶ Energy Resources Conservation Board, *Directive 020 -Well Abandonment*, (Calgary: Energy Resources Conservation Board, Revised Edition, June 9, 2010). Online: ERCB <<http://www.ercb.ca/docs/documents/directives/Directive020.pdf>>.

⁶⁷ *Ibid.* at p. 41.

⁶⁸ *Environmental Protection and Enhancement Act*, R.S.A. 2000, c. E-12 at s.137.

⁶⁹ *Conservation and Reclamation Regulation*, Alta. Reg. 115/1993.

⁷⁰ *Ibid.* at s.1(e).

⁷¹ See Alberta Environment and Sustainable Resource Development, *2010 Reclamation Criteria for Well Sites and Associated Facilities: Application Guidelines* (Edmonton: Government of Alberta, 2011), online: Alberta Environment and Sustainable Resource Development <<http://environment.gov.ab.ca/info/library/8355.pdf>>.

reclamation of land, none put specific timelines on the initiation or completion of reclamation.⁷²

This absence of timelines may hinder the ability of achieving “equivalent land capability”, from an ecological and biodiversity perspective, where species prevalence and recovery may be impacted by delayed reclamation and related cumulative effects.

Liability for suspension and abandonment

The *Oil and Gas Conservation Act* and *EPEA* maintain operator liability for well sites.⁷³ Physical abandonment of a well or facility does not relieve the legal liability of the licensee, approval holder or working interest participant to abandon and reclaim the site, or to cover the costs of doing that work.⁷⁴

The Board may assess costs and penalties related to abandonment and reclamation and this constitutes a “debt payable” to the party which carried out the work or to the Board, as the case may be.⁷⁵ The order prescribing the abandonment and reclamation and relevant costs to each party may be registered at the Court of Queen’s Bench and may be entered as a judgment and enforced as such.⁷⁶

Liability to complete or abandon a well and reclaim the well site is triggered where a licence is cancelled or suspended.⁷⁷

The duty to reclaim specified land under *EPEA* lies with the “operator”. This liability remains until a reclamation certificate is issued and for any additional time prescribed under the *Conservation and Reclamation Regulation*.⁷⁸ For well sites this is 25 years from the issuance of the certificate.⁷⁹

D. Abandonment and reclamation timing in other jurisdictions

Abandonment timing in other jurisdictions

Prescribing timelines for the abandonment of well sites is an important aspect of ensuring that a well site, related infrastructure and related impacts are dealt with in a timely fashion. A key consideration of invoking abandonment timelines is to minimize the amount of resources abandoned in place, i.e., to ensure that the resource is extracted to the greatest extent practicable. This does not necessitate open-ended and discretionary suspension timing. Rather, it requires an

⁷² See Alberta Environment and Sustainable Resource Development, *Reclamation Criteria for Wellsites and Associated Facilities – 1995 update*, online: Alberta Environment and Sustainable Resource Development <<http://environment.gov.ab.ca/info/library/6855.pdf>> and Government of Alberta, *A Guide To: Reclamation Criteria for Wellsites and Associated Facilities –2007 –Forest Lands in the Green Area Update* (Edmonton: Government of Alberta, 2007), online: Alberta Environment and Sustainable Resource Development <<http://environment.gov.ab.ca/info/library/7749.pdf>>.

⁷³ *Supra* note 52 at s.29.

⁷⁴ *Ibid.* at s.30(1). Costs associated with abandonment and reclamation must be paid by “working interest participants” in accordance with the proportionate share of the facility or well.

⁷⁵ *Ibid.* at ss. 30(4)&(5).

⁷⁶ *Ibid.* at s.30(6).

⁷⁷ *Ibid.* at s.16(3).

⁷⁸ See s.15 of the *Conservation and Reclamation Regulation*, *supra* note 67.

⁷⁹ See s.15(2) and s.142 of *EPEA*, *supra* note 66, regarding when an environmental protection order may be issued following the issuance of a reclamation certificate.

efficient system of determining whether continued suspension of a site is justified, and oversight and timelines to promote timely production of the resource. Several jurisdictions in the US have put in place abandonment regulations, as set out in Table 1 (below).

Reclamation timing in other jurisdictions

Timely abandonment is merely the first stage of alleviating various impacts related to well sites and related infrastructure. Table 2 outlines several jurisdictions’ approaches to reclamation timelines.⁸⁰

Table 1: Abandonment timelines of select states.

| Jurisdiction | Abandonment timeline | Comments/Source |
|--------------|---|--|
| New Mexico | 90 days where well is not usable for beneficial purposes ⁸¹ or 1 year where well has not been continuously active ⁸² | Temporary abandonment is allowed for up to five years. |
| Pennsylvania | Deemed abandoned after 12 months except where granted inactive status ⁸³ | An "Abandoned well" is defined as “any well that has not been used to produce, extract or inject any gas, petroleum or other liquid within the preceding 12 months, or any well for which the equipment necessary for production, extraction or injection has been removed, or any well, considered dry, not equipped for production within 60 days after drilling, redrilling or deepening, except that it shall not include any well granted inactive status. ⁸⁴ The owner or operator is required to plug the well upon abandonment. ⁸⁵ Inactive status |

⁸⁰ The Western Organization of Resource Councils recommended that reclamation be conducted within 2 years of well abandonment as a minimum standard. The “best practice” was recommended to be 6 months for the completion of abandonment. Western Organization of Resource Councils, *Filling the Gaps, How to Improve Oil and Gas Reclamation and Reduce Taxpayer Liability* (August 2005), at 26, online: Western Organization of Resource Councils <<http://www.worc.org/userfiles/file/Filling%20the%20Gaps.pdf>>.

⁸¹ See Plugging and Abandonment of Wells, NMAC, §19.15.25.8, online: New Mexico Commission of Public Records <<http://www.nmcpr.state.nm.us/nmac/parts/title19/19.015.0025.htm>>.

⁸² The regulations also prescribe abandonment where the well drilling has been suspended for 60 days. See Plugging and Abandonment of Wells, NMAC §19.15.25.8.B(1).

⁸³ See *Oil and Gas Act* (Act 223), s. 601.103, online: Pennsylvania Department of Environmental Protection <http://www.portal.state.pa.us/portal/server.pt/community/laws%2C_regulations_guidelines/20306>.

⁸⁴ *Ibid.* at s. 601.103.

⁸⁵ Pa. Code, Title 25, §78.91, online: Pa. Code <<http://www.pacode.com/secure/data/025/025toc.html>>.

| | | |
|-----------|---|---|
| | | Upon application, department is mandated to grant inactive status for a period of 5 years where prescribed requirements met. ⁸⁶ Monitoring of the well is required along with annual reporting. ⁸⁷ Must be abandoned within 5 years or may get year to year extension of inactive status. ⁸⁸ |
| Colorado | 6 months with possible extension | Timeline applies where a well has ceased production or injection and the well is incapable of production or injection. ⁸⁹ |
| Ohio | 1 year after completion or where no production has been reported for two or more reporting periods (i.e., cumulative 2 years). ⁹⁰ Temporary inactive status is possible. | Must obtain active wells status or plug. Low producing wells may be required to apply for temporary inactive status. Temporary Inactive Status An application for temporary inactive status may be required where there is less than one hundred thousand cubic feet of natural gas or fifteen barrels of crude oil produced per annum. ⁹¹ The status must be renewed annually. ⁹² Any well which becomes “incapable of production” shall be plugged unless written permission is granted by the Chief. ⁹³ |
| Tennessee | Plugged <1 year from date that well | An extension of 90 days may be granted. ⁹⁵ |

⁸⁶ *Ibid.* These prescribed instances are (1) the condition of the well is sufficient to prevent damage to the producing zone or contamination of fresh water or other natural resources or surface leakage of any substance;(2) the condition of the well is sufficient to stop the vertical flow of fluids or gas within the well bore and is adequate to protect freshwater aquifers, unless the department determines the well poses a threat to the health and safety of persons or property or to the environment; (3) the operator anticipates future use of the well for primary or enhanced recovery, future gas storage, or the operator anticipates the construction of a pipeline, for approved disposal or other appropriate uses related to oil and gas well production; and (4) the applicant satisfies the bonding requirements of sections 203 and 215, except that the department may require additional financial security for any well on which an alternative fee is being paid in lieu of bonding under section 215(d).

⁸⁷ *Ibid.* at s.601.204(b).

⁸⁸ *Ibid.* at s.601.204(d).

⁸⁹ *Colorado Oil and Gas Commission Amended Rules*, §319b,(3), online: Colorado Oil and Gas Commission, <http://cogcc.state.co.us/RR_Docs_new/rules/300Series.pdf> which states “A well which has ceased production or injection and is incapable of production or injection shall be abandoned within six (6) months thereafter unless the time is extended by the Director upon application by the owner. The application shall indicate why the well is temporarily abandoned and future plans for utilization. In the event the well is covered by a blanket bond, the Director may require an individual plugging bond on the temporarily abandoned well. Gas storage wells are to be considered active at all times unless physically plugged.”

⁹⁰ Ohio Revised Code, §1509.062 and §1509.11 online: Ohio Laws and Rules <<http://66.161.141.164/orc/1509>>.

⁹¹ *Ibid.* at §1509.062(A)(2).

⁹² *Ibid.* at §1509.062 (G).

⁹³ *Ibid.* at §1509.12.

| | | |
|--|---|--|
| | ceases producing 12 barrels of oil/annum or 25 mcf of gas /month. ⁹⁴ | |
|--|---|--|

Table 2: Reclamation timelines of select states

| Jurisdiction | Reclamation timeline | Legislative/regulatory structure/provisions. |
|--------------|---|---|
| New Mexico | < 1 year (and as soon as practical) *not to “equivalent land capability” | The operator must ⁹⁶ <ul style="list-style-type: none"> • level the location, • remove deadmen and other junk, and • take other measures necessary or required by the division to restore the location to a safe and clean condition. <p>Upon plugging and “clean up restoration operations” the operator provides the department with notice and an inspection takes place.⁹⁷</p> |
| Pennsylvania | < 9 months after plugging a well | Owner or operator must “remove all production or storage facilities, supplies and equipment and restore the well site.” ⁹⁸ <p>The restoration period may be extended by the department for an additional six months upon application of the well owner or operator providing evidence of inability to comply due to adverse weather conditions or lack of essential fuel, equipment or labor.⁹⁹</p> <p>A report must be submitted by the operator within 60 days after the restoration of the site.¹⁰⁰</p> |
| Colorado | < 3 months for crop land (“reclamation work”) | Director may grant an extension where unusual circumstances are encountered, but every reasonable effort must be made to complete the reclamation before the next local growing season. ¹⁰² |

⁹⁵ *Ibid.*

⁹⁴ Rules of Tennessee State Oil and Gas Board, *Well Plugging and Abandonment*, Chapter 1040-2-9, §1040-2-9-.04, online: <<http://www.tn.gov/sos/rules/1040/1040-02/1040-02-09.20120115.pdf>>.

⁹⁶ *Supra* note 81 at §19.15.25.10.D.

⁹⁷ *Ibid.* at §19.15.25.10.F, online <<http://www.nmcpr.state.nm.us/nmac/parts/title19/19.015.0025.htm>>.

⁹⁸ *Supra* note 83 at s. 601-206(d).

⁹⁹ *Ibid.* at s. 601-206(g).

¹⁰⁰ Pa. Code, §78.65(3). Also see *Pennsylvania’s Plan for Addressing Problem Abandoned Wells and Orphaned Wells*. Online: Pennsylvania Department of Environmental Protection <<http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8294>>.

| | | |
|--------------|--|---|
| | < 12 months for non-crop land. ¹⁰¹ | <p>Reclamation</p> <p>Well sites and associated production facilities: “All debris, abandoned gathering line risers and flowline risers, and surface equipment shall be removed within three (3) months of plugging a well. All access roads to plugged and abandoned wells and associated production facilities shall be closed, graded and recontoured. ... All such reclamation work shall be completed within three (3) months on crop land and twelve (12) months on non-crop land after plugging a well or final closure of associated production facilities. The Director may grant an extension where unusual circumstances are encountered, but every reasonable effort shall be made to complete reclamation before the next local growing season”.¹⁰³</p> |
| Ohio | <p>< 6 months</p> <p>Time may be curtailed or extended but not for greater than 6 months except where certain weather or labour conditions apply.¹⁰⁴</p> | <p>“The owner or the owner's agent shall remove all production and storage structures, supplies, and equipment, and any oil, salt water, and debris, and fill any remaining excavations. Within that period the owner or the owner's agent shall grade or terrace and plant, seed, or sod the area disturbed where necessary to bind the soil and prevent substantial erosion and sedimentation.”¹⁰⁵</p> <p>Waiver of reclamation obligations are possible.</p> |
| North Dakota | < 1 year | <p>Post plugging – the “well site, access road, and other associated facilities constructed for the well shall be reclaimed as closely as practicable to original condition.”¹⁰⁶</p> |
| California | < 60 days “well site restoration” of | All construction materials, cellars, production pads, and piers shall be removed and the resulting excavations filled |

¹⁰² *Ibid.*

¹⁰¹ Colorado Oil and Gas Conservation Commission Rules, *Reclamation Regulation*, §1004.a, online: Colorado Oil and Gas Conservation Commission, <http://cogcc.state.co.us/RR_Docs_new/rules/1000Series.pdf>.

¹⁰³ *Ibid.* at 600, online: Colorado Oil and Gas Conservation Commission, <http://cogcc.state.co.us/RR_Docs_new/rules/600Series.pdf>.

¹⁰⁴ Ohio Revised Code §41509.072 online: Ohio Department of Natural Resources, <<http://www.dnr.state.oh.us/Portals/11/publications/pdf/oil%20and%20gas%20laws%20and%20rules.pdf>>.

¹⁰⁵ *Ibid.*

¹⁰⁶ North Dakota Administrative Code, *Oil and Gas Conservation* at §43-02-03-34.1, online: Department of Mineral Resources <<https://www.dmr.nd.gov/oilgas/rules/rulebook.pdf>>.

| | | |
|-------------------------------------|--|---|
| | <p>plugging and abandonment¹⁰⁷</p> <p>Lease restoration initiated < 3 months and complete < 1 year.¹⁰⁸</p> | <p>with earth and compacted properly to prevent settling; well locations shall be graded and cleared of equipment, trash, or other waste materials, and returned to as near a natural state as practicable.¹⁰⁹ (does not cover access roads)</p> |
| Tennessee | <p>< 30 days of plugging, permanent vegetative cover must be planted on all disturbed areas.¹¹⁰</p> | <p>Access roads are subject to reclamation requirements unless the landowner swears (by affidavit) that a “road will continue to be used for other legitimate purposes and maintained in usable condition, which condition reduces erosion to a practical minimum, by the surface owner”.¹¹¹</p> |
| Federal (Bureau of Land Management) | <p>< 6 months of well completion or plugging (weather permitting).¹¹²</p> | |

¹⁰⁷ California Code of Regulations Title 14, *Development, Regulation, and Conservation of Oil and Gas Resources*, §1776(a), online: State of California Department of Conservation <ftp://ftp.consrv.ca.gov/pub/oil/publications/PRC04_January_11.pdf>.

¹⁰⁸ *Ibid.* at §1776(e).

¹⁰⁹ *Ibid.*

¹¹⁰ *Tenn. Code Anno.* §60-1-703 (5), online: Lexisnexis <<http://www.lexisnexis.com/hottopics/tncode/>>.

¹¹¹ *Ibid.*

¹¹² *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, the Gold Book* (4th Ed, 2007) online:

<http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY_AND_RESOURCE_PROTECTION_/energy/oil_and_gas.Par.18714.File.dat/OILgas.pdf>.

E. Policy objectives promoted by timelines

Placing timelines on abandonment and reclamation of well sites will promote laudable policy objectives by ameliorating the impacts of otherwise unproductive sites. Timelines will bring efficiency, safety and orderliness to energy development in the province. For oil and gas wells and related infrastructure, impacts begin on the date of breaking ground to drill a new well and end when the reclamation certificate is issued (assuming no extended liabilities exist at the site). For this reason, all aspects of timing around activities are relevant from an environmental standpoint. Recognizing the value of oil and gas to our society, the focus of regulatory timing is most easily placed on the time between (a) suspension and abandonment of a well and (b) between the abandonment and reclamation of the site (and associated infrastructure).

The policy objectives that are supported by placing timelines on abandonment and reclamation of well sites include:

- Minimizing environmental impairment – through minimizing the duration of disturbance, access to sites and risks of contamination;
- Convergence with existing policy directions around cumulative effects management;
- Minimizing Crown liability risks;
- Minimizing conflicts with landowners who want timely reclamation;
- Increasing safety on private and public lands;
- Increasing due diligence in well transfers; and
- Foster research and innovation in reservoir depletion and reclamation to facilitate increased return on investments.

Minimize environmental impairment

A key policy outcome of placing timelines on the abandonment and reclamation of well sites is the reduction of disturbance and minimization of environmental impairment that accompanies these developments. Placing regulatory timelines on abandonment and reclamation will ensure impacts are minimized earlier rather than later. These impacts include minimizing the direct disturbance on the landscape caused by the well site and related roads, curbing access to areas by closure and reclamation of roads/trails, and minimizing the risk of ongoing contamination or the spread of contamination through delay.

Convergence with existing policy directions around cumulative effects management

The Government of Alberta has indicated a policy change towards managing cumulative environmental effects (the cumulative effects management system or CEMS).¹¹³ This system, if it is to be effective, must ensure that environmental impacts are addressed in a timely fashion to minimize the ongoing ecological footprint of activities, particularly where productivity has diminished to minimal levels. Regional plans under the *Alberta Land Stewardship Act* are also focused, in part, on managing cumulative effects. The *Lower Athabasca Regional Plan (LARP)* contemplates “timely and progressive reclamation” of disturbed lands to address the cumulative effects of disturbance in that region.¹¹⁴

Without specific regulatory instruments to facilitate it, timely reclamation is unlikely to occur. A voluntary approach to timely reclamation is unlikely to be successful, as illustrated by recent statistics. There are limited incentives to facilitate timely abandonment and reclamation at this time. Indeed, where reclamation and abandonment costs are high, there may be a strong incentive to delay reclamation for purely economic reasons. Reclamation timing may be one mechanism to implement biodiversity management frameworks under the *LARP*.

Minimize Crown liability risk

The regulatory system around abandonment and reclamation is aimed at having the industry pay the full costs. Generally, industry has paid for these costs although there have been recent subsidies to the reclamation of orphan sites. Specifically, the Government of Alberta contributed \$30 million dollars used to abandon and reclaim orphan sites.¹¹⁵

In addition, Crown liability risk is heightened where unreclaimed sites and roads enable ongoing access to public lands. These risks include safety related risks on publicly accessible roads and safety concerns which are accentuated in remote areas.

Minimize conflicts with landowners who want timely reclamation

Timely abandonment and reclamation through regulations, when in congruence with landowner objectives, will minimize the likelihood of conflicts between private landowners and operators. Under the current system there are few avenues for landowners who would seek to have wells abandoned and reclaimed in a timely fashion. Surface lease agreements have not dealt with abandonment and reclamation timing, likely due to the fact that companies are rightly hesitant to confer decisions of this nature to a landowner. A regulatory structure where ongoing suspension of wells must be periodically justified is an appropriate approach and respects individuals’ property rights.

¹¹³ See “CEMS transformation in Alberta Environment”, Alberta Environment and Sustainable Resource Development, online: <<http://environment.alberta.ca/01766.html>>.

¹¹⁴ Government of Alberta, *Lower Athabasca Regional Plan, 2012-2022*, online: Alberta Environment and Sustainable Resource Development <<https://www.landuse.alberta.ca/LandUse%20Documents/Lower%20Athabasca%20Regional%20Plan%202012-2022%20Approved%202012-08.pdf>> at 26.

¹¹⁵ *Supra* note 2.

While the new *Responsible Energy Development Act* enables regulatory enforcement of private agreements it is unlikely to be effective in dealing with past developments. It may also have minimal relevance to future development unless landowners advocate for the inclusion of timelines (or other related triggers) in surface lease agreements.

Increasing safety on public and private lands

Timelines on abandonment and reclamation will minimize safety concerns that arise from the ongoing access and maintenance of these sites. This includes the safety of industry participants and the broader Alberta public which may be subjected to heightened risks associated with un-abandoned and unreclaimed sites.

Increase due diligence in well transfers

By placing timelines on abandonment and reclamation it is anticipated that the level of due diligence involved in the purchase and transfer of these sites will be increased. This increase in the level of due diligence and assessment of potential contamination is likely to occur due to the quicker realization of the liability becoming payable. Under the current system there remains the risk of companies attaining assets with significant liabilities they may not be able to cover (due, in part, to the inadequacy of Alberta's program for requiring security under Directive 11).¹¹⁶ Curtailing the time in which an operator may recover assets from a well site will force companies into a more realistic assessment of the return and liabilities associated with each well.

Foster research and innovation in reservoir depletion and reclamation to facilitate increased return

An ancillary policy outcome resulting from timely abandonment may be increased research and development effort by operators to increase return from a well site. By placing timelines on abandonment and allowing extensions on well suspension when justified, reservoir evaluation and technological innovation to deplete resources may be promoted.

F. Reclaiming today – recommended regulatory amendments

Placing regulatory timelines on abandonment and reclamation will assist in reaching environmental, social and economic outcomes. Delays in reclamation of well sites and associated infrastructure maintain impacts on the environment. The current voluntary system illustrates inadequate reclamation effort and justifies a regulatory response. Current policies and regulations related to abandonment and reclamation appear ineffective in promoting timely reclamation. Policies around when security for reclamation and abandonment is required (i.e., the *LLR* program) and relative ease of well licence transfers appear to allow, if not accentuate, delays in reclamation of sites.

¹¹⁶ Historically this has likely taken place in Alberta to an extent, as the orphan fund has covered some sites with significant abandonment, reclamation and remediation liabilities. See Barry Robinson "Well Abandonment and Reclamation in Alberta: The Failure of the Licensee Liability Rating Program. Paper prepared for the Well & Pipeline Abandonment, Suspension and Reclamation Conference, Canadian Institute, February 9-10, 2010, online: Ecojustice <<http://www.ecojustice.ca/publications/reports/well-abandonment-and-reclamation-in-alberta>>. This issue has also been identified in other jurisdictions such as Pennsylvania; see Austin. L. Mitchell and Elizabeth A. Casman, "Economic Incentives and Regulatory Framework for Shale Gas Well Site Reclamation in Pennsylvania" (2011) *Environmental Science & Technology* 45(22): 9506-9514.

Placing timelines on abandonment and reclamation of well sites and related infrastructure in Alberta requires amendments to several regulations, including:

- *Oil and Gas Conservation Regulation*;
- *Pipeline Regulation*;
- *Conservation and Reclamation Regulation*; and
- *Public Lands Act Administration Regulation*.

The proposed timelines for abandonment and reclamation are similar for both public and private land; however, the private land regulatory changes enable participation by the surface landowner where the well site and related infrastructure is located. Due to the current number of well sites which are suspended or abandoned it is recognized that transitional provisions will be required.

The timelines for abandonment and reclamation would run independently of the mineral lease itself. Therefore amendments to regulations under the *Mines and Minerals Act* are not required. One might characterize the approach as leaving tenure rights in place while requiring efficient production through the use of abandonment timelines.

Figures 3 and 4 outline the timelines proposed for abandonment and reclamation of well sites.

Figures 3: Recommended timelines for abandonment and reclamation of well sites on Crown land.

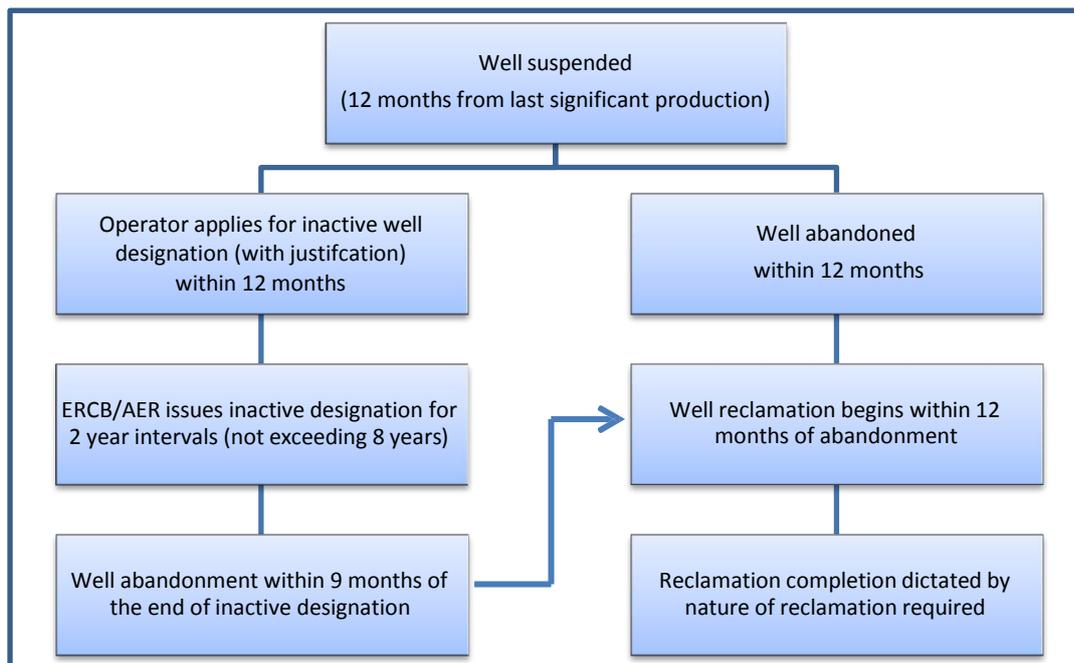
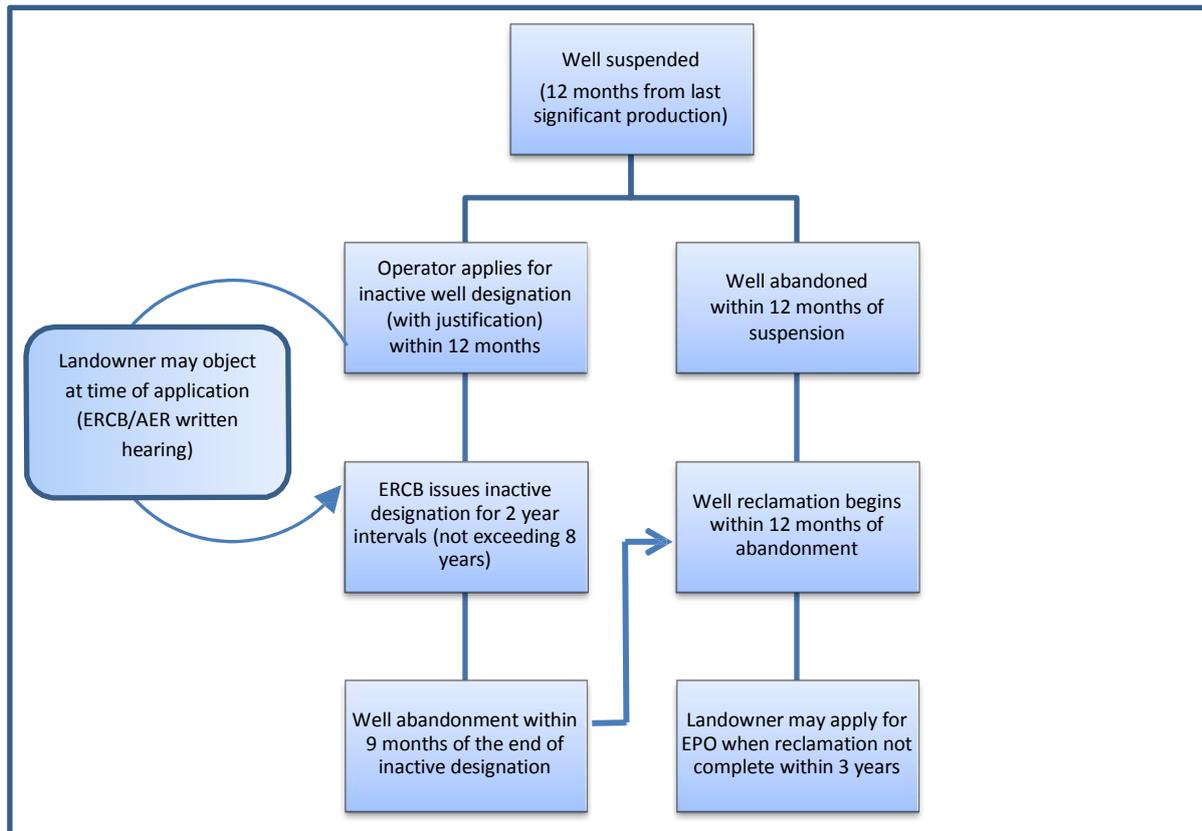


Figure 4: Recommended timelines for abandonment and reclamation of well sites on private land.



Proposed amendments to the *Oil and Gas Conservation Regulation*

Section 1.020(2) 1.1 is added

“Associated pipeline” means a pipeline which is associated with a well or facility that is not used for any other well or facility.

Section 3.012 is renumbered s.3012(1).

Section 3.012(2) is added following s. 3.012(1).

3.12 (2) Notwithstanding subsection (1) a licensee shall abandon a well within 12 months of suspension of a well except where:

(a) the licensee has applied to the Board to have the well designated as an inactive well, and

(b) the licensee has contacted the owner of the land on which the well is situated and the landowner does not object to the well being designated as inactive; and

the Board has designated the well as inactive.

3.012(3) Where the licensee has applied to designate a well as inactive and a landowner objects to the designation of the well the Board will conduct a written hearing in relation to the application wherein the parties may make representations to the Board in accordance with the requirements established by the Board.

3.012(4) Where the Board refuses to designate a well as inactive pursuant to 3.012(2) it shall provide written notice of refusal to the licensee and the licensee shall abandon the well within 9 months from the date of the notice.

3.012(5) An application to have a well designated as inactive under 3.012(2) must be submitted to the Board within 12 months following the date of well suspension.

3.012(6) The date of well suspension is the date provided by notice to the Board pursuant to s.3.020(5).

Section 3.013(3) is added

3.013(3) The licensee shall notify the Board and any operator of an associated pipeline in writing within 30 days of abandonment of the well identifying the date of the abandonment.

Section 3.020(4) is added

3.020(4) A licensee shall notify the Board in writing within 30 days of suspending a well in accordance with the requirements established by the Board.

Note: Timelines and process for the hearing will be dealt with as written hearings.

Sections 3.030(1) & (2) are added

3.030 (1) Inactive wells

A well that has been designated as inactive under sections 3.012(2) or 3.012(3) may remain designated as inactive for 2 years following the date of the designation.

3.030 (2) A well designated as inactive under s.3.030 (1) may be designated by the Board as inactive for an additional time, not exceeding 2 years, upon application of licensee, but a well may not be designated as inactive for greater than 8 consecutive years.

3.030 (3) The Board shall not grant an extension to the inactive status of a well under s.3.030 (2) where the Board is of the opinion that recovery of additional resources by continued operation of the well is not likely.

Proposed amendments to the Pipeline Regulation

Section 82(9)(g.1) is added

operator must initiate abandonment of pipeline defined as an associated pipeline under the Oil and Gas Conservation Regulation within 6 months of being notified pursuant to section 3.013(3) of the Oil and Gas Conservation Regulation.

Section 82(9)(g.2) is added

operator must complete

Proposed amendments to the Conservation and Reclamation Regulation

Section 1(a) is replaced

(a) "Abandoned well" means a well abandoned in compliance with s. 3.012 and 3.013 of the Oil and Gas Conservation Regulation.

Section 1(a.1) is added

(a.1) "Act" means the Environmental Protection and Enhancement Act

Section 2 is replaced

Objective

2 The objective of conservation and reclamation of specified lands is to return the specified land to an equivalent land capability *in a timely fashion*.

Section 3.2 is added

3.2 Time for initiating and completing reclamation

3.2 (1) (a) An operator must initiate reclamation of specified land for a well within the Green Area within 12 months of abandonment of the well.

(b) The operator shall provide the Director notice of the date on which reclamation was initiated under s.3.2(1).

(c) The Director may prescribe a date by which reclamation shall be completed by providing notice to the operator or by prescribing the duration of time in which reclamation must be complete in a prescribed geographic region.

(d) The Director may issue an environmental protection order prescribing dates for the completion of reclamation activities where the Director is of the opinion that the reclamation is not being undertaken in a timely fashion.

3.2(2)(a) The operator must initiate reclamation of specified land for an abandoned well within the White Area within 12 months.

(b) The operator shall provide the Director notice of the date on which reclamation was initiated under s.3.2(2).

(c) Where the operator fails to apply for a reclamation certificate within 3 years of initiating reclamation within the White Area the owner of the land may apply to the Director to request the issuance of an Environmental Protection Order prescribing dates for the completion of reclamation activities.

3.3 Where an operator fails to initiate or complete reclamation in compliance with this regulation or any standards, criteria and guidelines established under s.3(1) the Director may issue an environmental protection order directing that the operator complete the required reclamation within a period of time outlined in the order.

3.4(1) Where an operator is prevented by weather or other operational constraints the operator may apply to the Director to extend the time to initiate reclamation, such time not exceeding 6 months from the date of abandonment as determined under s.3.2 of this regulation.

3.4(2) The operator must make the application within the times prescribed under sections 3.2(1) and 3.2(2).

Proposed amendments to the *Public Land Administration Regulation*

Section 102.1 is added

102.1 Notwithstanding the terms and conditions of a mineral surface lease, the holder of the disposition or any other person responsible for the abandonment and reclamation of the lease area must undertake the abandonment and reclamation of the lease site within the timelines specified in the Oil and Gas Conservation Regulation and the Conservation and Reclamation Regulation.

Section 153.1(1) is added

153.1(1) The director must reject an application for an approval to assign or transfer a disposition of land that is the subject of reclamation timelines as prescribed by s.3.2 of the Conservation and Reclamation Regulation unless the director is of the opinion that the assignee or transferee will meet the timelines as prescribed.

Transition provisions

The above amendments must be accompanied by a transitional provision to allow for orderly and efficient abandonment and reclamation of the backlog of existing sites. A generic transition provision should be inserted in the above cited regulations to the following effect:

- Establishing a date from which the regulatory timelines must be followed;
- Establishing a requirement from operators to generate an abandonment and reclamation timing plan for submission to the Regulator;
- Establishing a review process to be undertaken by the Regulator to guide the contents and acceptance of the abandonment and reclamation timing plan; and
- Establishing that those well sites included in the abandonment and reclamation timing plan are excluded from the regulatory timelines as set out above.

Bibliography

Legislation

California Code of Regulations, Title 14, Development, Regulation, and Conservation of Oil and Gas Resources, online: State of California Department of Conservation <ftp://ftp.consrv.ca.gov/pub/oil/publications/PRC04_January_11.pdf>.

Colorado Oil and Gas Conservation Commission Rules and Regulations, online: Colorado Oil and Gas Conservation Commission <http://cogcc.state.co.us/RR_Docs_new/rules/>.

Conservation and Reclamation Regulation, Alta. Reg. 115/1993.

Environmental Protection and Enhancement Act, R.S.A. 2000, c. E-12.

Oil and Gas Conservation, N.D.A.C., online: Department of Mineral Resources <<https://www.dmr.nd.gov/oilgas/rules/rulebook.pdf>>.

Ohio Revised Code, Title 15, online: Ohio Laws and Rules <<http://66.161.141.164/orc/1509>>.

Oil and Gas Act (Act 223), online: Pennsylvania Department of Environmental Protection http://www.portal.state.pa.us/portal/server.pt/community/laws%2C_regulations_guidelines/20306

Oil and Gas Conservation Act, R.S.A. 2000, c. O-6.

Oil and Gas Conservation Regulation, Alta. Reg. 151/1971.

Pa. Code, Title 25, Chapter 78.

Pipeline Regulation, Alta. Reg. 91/2005.

Plugging and Abandonment of Wells, NMAC, Title 19, Chapter 15, online: <<http://www.nmcpr.state.nm.us/nmac/parts/title19/19.015.0025.htm>>.

Public Lands Administration Regulation, Alta. Reg. 187/2011.

Rules of Tennessee State Oil and Gas Board, Well Plugging and Abandonment, online: Government of Tennessee <<http://www.tn.gov/sos/rules/1040/1040-02/1040-02-09.20120115.pdf>>.

Tenn. Code Anno., online: Lexisnexis <<http://www.lexisnexis.com/hottopics/tncode/>>.

Jurisprudence

Pennine Petroleum Corporation v. Anthony J. Bruder and Lorraine E. Bruder, Transcript of Hearing, Action No.: 080600757, May 26, 2009, Lethbridge, Alberta.

Government Documents

Alberta Environment, *Acceptable Salinity, Sodicitiy and pH Values for Boreal Forest Reclamation* (Edmonton: Alberta Environment, 2000), online: Alberta Environment <<http://environment.gov.ab.ca/info/library/6862.pdf>>.

Alberta Environment, *2010 Reclamation Criteria for Wellsites and Associated Facilities for Cultivated lands* (Updated June 2011), online: Alberta Enviornment <http://www.environment.gov.ab.ca/info/library/8362.pdf>

Alberta Environment, *2010 Reclamation Criteria for Wellsites and Associated Facilities for Native Grasslands* (Edmonton: Alberta Environment), online: Alberta Environment <<http://environment.gov.ab.ca/info/library/8366.pdf>>.

Alberta Environment and Sustainable Resource Development, “CEMS transformation in Alberta Environment”, online: Alberta Environment and Sustainable Resource Development <<http://environment.alberta.ca/01766.html>>.

Alberta Environment and Sustainable Resource Development, “Oil and Gas Reclamation”, online: <<http://www.environment.alberta.ca/02862.html>>, accessed August 2, 2012.

Alberta Securities Commission, *Standards of Disclosure for Oil and Gas Activities – Consolidated*, online: Alberta Securities Commission <http://www.albertasecurities.com/securitiesLaw/Regulatory%20Instruments/5/2232/3282674-v22-NI_51-101_AMENDMENT_2009-2010.pdf> .

Bureau of Land Management, *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, the Gold Book* (4th Ed, 2007) online: <http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS_REALTY_AND_RESOURCE_PROTECTION/_energy/oil_and_gas.Par.18714.File.dat/OILgas.pdf>.

Energy Resources Conservation Board, *Licensee Liability Rating (LLR) Program and Licence Transfer Process* (Revised, 2009), Directive 006, online: ERCB <<http://www.ercb.ca/directives/Directive006.pdf>>

Energy Resources Conservation Board, *Licensee Liability Rating (LLR) Program Updated Industry Parameters and Liability Costs* (2005) Directive 011, online: ERCB <<http://www.ercb.ca/directives/Directive011.pdf>>.

Energy Resources Conservation Board, *Recommendations to Limit the Public Risk from Corporate Insolvencies Involving Inactive Wells* (Calgary: Energy Resources Conservation Board, 1989).

Energy Resources Conservation Board, *Requirements for Site-Specific Liability Assessments in Support of the ERCB's Liability Management Programs* (Revised, 2012), Directive 001, online: ERCB <<http://www.ercb.ca/directives/Directive001.pdf>>

Energy Resources Conservation Board, *Suspension Requirement for Wells*, Directive 013 (July 24, 2007), online: Energy Resources Conservation Board <<http://www.ercb.ca/directives/Directive013.pdf>>.

Energy Resources Conservation Board, *Well Abandonment*, Directive 020 (Revised Edition June 9, 2010), online: ERCB <<http://www.ercb.ca/docs/documents/directives/Directive020.pdf>>.

Government of Alberta, *Draft Lower Athabasca Regional Plan, 2011-2021*, online: Land-use Framework <https://www.landuse.alberta.ca/Documents/LARP_Draft_Lower_Athabasca_Regional_Plan-2011-08.pdf>.

Government of Alberta, *Enhancing Assurance: Developing an integrated energy resource regulator*, (Edmonton: Government of Alberta 2011), online: Department of Energy <<http://www.energy.alberta.ca/Org/pdfs/REPEnhancingAssuranceIntegratedRegulator.pdf>> (accessed August 13, 2012).

Government of Alberta, *2010 Reclamation Criteria for Wellsites and Associated Facilities for Forested Lands* (updated June 2011), online: Alberta Environment, <<http://environment.alberta.ca/documents/2010-Reclamation-Criteria-for-Wellsites-and-Associated-Facilities-for-Forested-Lands.pdf>>.

Government of Alberta, *Update report on Alberta Environment and Sustainable Resource Development's upstream oil and gas reclamation certificate program*, (Edmonton: Government of Alberta, 2012), online: Alberta Environment and Sustainable Resource Development, <<http://environment.alberta.ca/01109.html>>.

Secondary sources

Aldridge, C.L. and M. S. Boyce. 2007. Linking occurrence and fitness to persistence: habitat-based approach for endangered Greater Sage-grouse. *Ecological Applications* 17(2): 508-526.

Boutin, S., *Expert report on woodland caribou Rangifer tarandus caribou in the Traditional Territory of the Beaver Lake Cree Nation*, July 5, 2012, online: Woodward and Company <http://woodwardandcompany.com/media/pdfs/BLCTT_-_Stan_Boutin_Report_-_5_July_2010_final.pdf>.

Dyer, S.J., O'Neill, J.P., Wasel, S.M., "Avoidance of industrial development by woodland caribou" (2001) 65 *Journal of Wildlife* 3.

GlobalForestWatch, *Castle Area Forest Land USE Zone: Linear Disturbances, Access Densities and Grizzly Bear Habitat Security Areas* Online: GlobalForestWatch <http://www.globalforestwatch.ca/pubs/2011Forests/02Castle/Castle_report_GFWC.pdf>.

Hamilton, L.E., Dale, B.C. and Paskowski, C.A., "Effects of Disturbance Associated with Natural Gas Extraction on the Occurrence of Three Grassland Songbirds" (2011) 6 *Avian Conservation and Ecology* 1.

Holloran, M. 2005. Greater sage-grouse (*Centrocercus urophasianus*) population response to natural gas field development in western Wyoming (PhD Thesis). University of Wyoming, Laramie, WY

Kaiser, R. 2006. Recruitment by greater sage-grouse in association with natural gas development in western Wyoming (Masters Thesis). Department of Zoology and Physiology, University of Wyoming, Laramie, WY.

Linke, J., S.E. Franklin, F. Huettmann, G.B. Stenhouse, "Seismic cutlines, changing landscape metrics and grizzly bear landscape use in Alberta" (2005) *Landscape Ecology* 20:811-826
Kirby Gordon Smith, *Woodland Caribou Demography and Persistence Relative to Landscape Change in West-central Alberta* online: Foothills Research Institute <<http://foothillsresearchinstitute.ca/pages/Publications/PublicationByProgram.aspx?program=747>>

Lyon, L.J. "Road density models describing habitat effectiveness for elk" (1983) *Journal of Forestry*, 81.

Mitchell, A.L. and Casman, E.A., "Economic Incentives and Regulatory Framework for Shale Gas Well Site Reclamation in Pennsylvania" (2011) 45 *Environmental Science & Technology* 22 at 9506.

Nielsen, S.E., G.B. Stenhouse, M.S. Boyce, "A habitat-based framework for grizzly bear conservation in Alberta" (2006) *Biological Conservation* 130:217-229.

Orphan Well Association, *2011/2012 Annual Report*, online: Orphan Well Association <<http://www.orphanwell.ca/OWA%202011-12%20Ann%20Rpt%20Final.pdf>>.

Pennsylvania Department of Environmental Protection, *Pennsylvania's Plan for Addressing Problem Abandoned Wells and Orphaned Wells*, online: Pennsylvania Department of Environmental Protection <<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-48262/550-0800-001.pdf>>.

Petroleum Technology Alliance of Canada, *Linear features, forestry and wolf predation of caribou and other prey in West Central Alberta* (2010) Final report to the Petroleum Technology Alliance of Canada (PTAC) Online: College of Forestry and Conservation <http://www.cfc.umt.edu/heblab/pdfs/hebblewhite%20and%20musiani%20ptacfinalreport_low_resolution.pdf>.

Polfus J.L., Hebblewhite, M. and Heinemeyer, K., "Identifying indirect habitat loss and avoidance of human infrastructure by northern mountain woodland caribou" (2011) *Biological Conservation* 144: 2637-2646, online: College of Forestry and Conservation <http://www.cfc.umt.edu/HebLab/PDFS/BC_Polfus_AtlinCaribouRSF_2011.pdf>.

Robinson B., "Well Abandonment and Reclamation in Alberta: The Failure of the Licensee Liability Rating Program." Paper prepared for the Well & Pipeline Abandonment, Suspension and Reclamation Conference, Canadian Institute, February 9-10, 2010, online: Ecojustice <<http://www.ecojustice.ca/publications/reports/well-abandonment-and-reclamation-in-alberta>>

Robinson, G. and Elliott, D., "National Instrument 51-101 (NI 51-101) Reserves Reconciliation – Part 2, a Review of Technical Revisions in Annual Information Form Filings for End 2003" (2005) *Journal of Canadian Petroleum Technology* 44:2.

Semeniuk, C.A.D., *et al.* "Incorporating behavioral-ecological strategies in pattern-oriented modeling of caribou habitat use in a highly industrialized landscape" (2012) *Ecological Modeling* 243; 18-32 Online: College of Forestry and Conservation <<http://www.cfc.umt.edu/HebLab/PDFS/Semeniuk%20et%20al%202012%20EcoMod.pdf>>.

Walker, B., D. Naugle and K. Doherty "Greater sage-grouse population response to energy development and habitat loss" (2007) *The Journal of Wildlife Management* 71: 2644-2654.

Waller, J. S., and D. Mace. "Grizzly bear habitat selection in the Swan Mountains, Montana" (1997) *Journal of Wildlife Management* 61:1032-1039.

Whittington, J., et al. "Caribou encounters with wolves increases near roads and trails: a time-to-event approach" (2011) *Journal of Applied Ecology*, In Press, July 19, DOI: 10.1111/j.1365-2664.2011.02043.x, online: College of Forestry and Conservation <http://www.cfc.umt.edu/HebLab/PDFS/JAE_Whittington_Wolf-CaribouEncounters_2011.pdf>.