# THE PORE SPACE RACE: CONFLICTS OF SUBSURFACE RIGHTS IN THE AGE OF CARBON CAPTURE AND SEQUESTRATION

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*As carbon capture and sequestration expands to meet climate goals, conflicts of subsurface rights present a significant obstacle. This article examines the ownership and regulation of pore space across Canada and the United States. It analyzes divergent common law and statutory frameworks governing pore space ownership and the management of convergent subsurface rights across various jurisdictions, with a particular focus on Alberta. The authors demonstrate how fragmented subsurface rights create legal uncertainty and assess legal mechanisms for mitigating these conflicts to enable the responsible deployment of carbon capture and sequestration.*

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## INTRODUCTION

As annual global greenhouse gas emissions continue to rise and the related effects of climate change become more acute, it is widely recognized that carbon capture and sequestration (CCS) must be rapidly deployed and scaled as part of any viable pathway for mitigating runaway global warming and constraining the worst effects of climate change.[1] Nevertheless, steep costs, lack of financial incentives, inadequate infrastructure, and conflicts between competing subsurface rights holders pose potential barriers to the widespread deployment of CCS. Overcoming the latter barrier will be particularly important in Canada and the United States, where CCS proponents and a variety of other established and emerging subsurface industries may converge on the same sections of the subsurface.

It has long been recognized that the implementation of industrial-scale CCS entails the potential for conflicts between holders of competing subsurface rights.[2] Critical to the resolution of such conflicts — and thus the widespread deployment of CCS — is the identification of the rights in question and the classification of the legal relationships between the rights holders.[3] This identification and classification exercise must account for the ever-evolving legal landscape, as the common law, statutes, and regulations in a multiplicity of jurisdictions evolve at different paces and in different directions to address the challenges and opportunities presented by CCS. For example, on 25 November 2024, the Ontario legislature tabled the *Geologic Carbon Storage Act, 2024* under Bill 228, which passed second reading before being reintroduced by the subsequent legislature on 27 May 2025 under Bill 27, the *Resource Management and Safety Act, 2025*.[4] At the time of writing, the *GCSA* was in second reading. In its current form, the *GCSA* stands to set Ontario apart from other Canadian provinces in terms of how certain subsurface rights are allocated. If Bill 27 receives royal assent, it may result in considerable differences between how subsurface rights pertinent to CCS are treated in Ontario, Canada's largest jurisdiction, and Alberta, Canada's most advanced jurisdiction for CCS development. A contrast also exists between the manner in which subsurface rights are allocated in Canada versus the US.

This article proceeds as follows: Part I reviews the legal and practical connotations of "pore space" and the ownership of such pore space at common law and under various

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1 Intergovernmental Panel on Climate Change, *Climate Change 2022: Mitigation of Climate Change*, Contribution of Working Group III to the Sixth Assessment Report of the IPCC, Priyadarshi R Shukla et al, eds (Cambridge: Cambridge University Press, 2022) at 16, 24, 28; Paul Fennell et al, "Going Net Zero for Cement and Steel" (2022) 603 Nature 574 at 576; Araceli Fernández et al, *Net Zero Roadmap: A Global Pathway to Keep the 1.5°C Goal in Reach*, 2023 Update (Paris: International Energy Agency, 2023) at 15, online (pdf): [perma.cc/S7W2-JKWC].

2 See e.g. Alexandra B Klass & Elizabeth J Wilson, "Climate Change, Carbon Sequestration, and Property Rights" (2010) 2010:2 U Ill L Rev 363 at 378, citing US Department of the Interior, *Framework for Geological Sequestration on Public Land*, Report to Congress (Washington, DC: 3 June 2009).

3 Joseph A Schremmer, "The Potential for Conflicts Between CCS Projects and Mineral Extraction" (2024) 12:2 LSU J Energy L & Resources 389 at 391.

4 Bill 27, *An Act to enact the Geologic Carbon Storage Act, 2025 and to amend various other Acts with respect to wildfires, resource safety and surveyors*, 1st Sess, 44th Leg, Ontario, 2025 (first reading 27 May 2025), Schedule 2 [*GCSA*].

statutory regimes, in both Canada and the US; Part II discusses the unitization of pore space (a concept analogous to the unitization of oil and gas fields) and the expropriation of pore space by governments, two legislative solutions that have emerged to address rights holders that prevent CCS proponents from assembling contiguous tracts of pore space; Part III reviews potential conflicts between holders of competing subsurface rights in the CCS context; and finally, Part IV canvasses how such conflicts may be mitigated or resolved.

## I. PORE SPACE OWNERSHIP

### A. DEFINING PORE SPACE

Any discussion of conflicts of subsurface rights in the context of CCS necessarily begins with the question of who owns the pore space into which captured $CO_2$ might be injected for permanent sequestration. This, in turn, requires some definition of what is meant by "pore space." The legal definitions that have emerged under CCS-specific legislation in Canada generally characterize "pore space" as the area or voids in underground geological formations that are or were formerly occupied by water or minerals, including hydrocarbons.[5] Pore space may have been "formerly occupied" by such substances in the sense that oil and gas production, water disposal, or other activities may have displaced the substances that originally occupied the pore space prior to human intervention.

Such definitions may conjure images of large voids or caverns in the subsurface but, in reality, the "pore space" in most reservoirs that are suitable for CCS typically consists of micron-scale[6] voids within and between the different constituent particles or grains of a solid rock.[7] The sum of the pore space within a specific volume of rock is referred to as its "porosity" and the connectedness of pore space within a reservoir determines its "permeability," both of which vary between geologic formations and across reservoirs. CCS proponents use the average porosity and permeability values of a reservoir to calculate the volume and rate of $CO_2$ that can be sequestered in it. By way of examples: an indicative range of the porosity of the Basal Cambrian Sandstone reservoir into which $CO_2$ is sequestered at the Quest CCS project in Alberta is 11 to 19 percent;[8] the estimated average porosities of the

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5 See the definitions of "pore space" in the *Carbon Sequestration Tenure Regulation*, Alta Reg 68/2011, s 1(i) [*CSTR*] ("the pores contained in, occupied by or formerly occupied by minerals or water below the surface of land"); *The Captured Carbon Storage Act*, SM 2024, c 20, s 1(1) [*CCSA*] ("space consisting of pores that are found in underground geological formations and are or have been occupied by minerals or water"); *GCSA*, *supra* note 4, s 1(1) ("space consisting of, (a) pores that are found in [an underground geological area] and that are or have been occupied by formation water, hydrocarbons or any other mineral, and (b) any other cavity or void in [an underground geological area], whether naturally or artificially created"); see also, *The Crown Minerals Act*, SS 1984-85-86, c C-50.2, s 27.2(1) [*CMA*] ("'spaces' means the spaces occupied or formerly occupied by a Crown mineral").

6 1 micron is equal to 0.0001 centimetres.

7 Exceptions include caverns within evaporite or "salt" bearing geologic formations that have been solution mined, as well as naturally existing karst caverns or centimetre-scale "vugs" within carbonate formations.

8 *Shell Canada Limited Application for the Quest Carbon Capture and Storage Project, Radway Field* (10 July 2012), 2012 ABERCB 008, online (pdf): AER [perma.cc/BQ34-GHMS] at para 175 [*Quest CCS*].

Leduc Formation reservoir at Bison Low Carbon Ventures' Meadowbrook CCS Hub and Enhance Energy Inc.'s Origins CCS Hub are 10.5 percent and 6 to 7 percent, respectively.[9]

In order to effectively trap and store buoyant $CO_2$ after injection, the injection reservoir must be vertically capped by one or more sealing layers, which may include shales, evaporites (that is, salt), and other low permeability lithologies. Some reservoirs, such as Alberta's Basal Cambrian Sandstone, are laterally unconfined such that $CO_2$ may migrate laterally across long distances, while the shape of other reservoirs, such as Alberta's Leduc Formation, may be closed in multiple directions and draped by sealing lithologies that prevent the long-distance lateral migration of $CO_2$. Together, the $CO_2$ injection reservoir and one or more sealing lithologies are often described as the "storage" or "sequestration complex."[10]

As the legal definitions indicate, pore space is not an empty void or vacuum into which $CO_2$ can be injected; it is always occupied by water of varying salinities, hydrocarbons, or other gases. Nor is pore space always occupied by a single substance in a given reservoir. For example, the porosity of a conventional oil or gas reservoir prior to human intervention is rarely, if ever, 100 percent saturated with oil or gas, but rather a mixture of the two, as well as an appreciable volume of water. And while saline aquifers — which are attractive targets for CCS — are nearly entirely saturated with water, the water itself contains dissolved solids which may include valuable commodities or "brine-hosted minerals" such as lithium, bromine, potassium, and calcium.

The natural emplacement of water, hydrocarbons, and other gases within pore space as rocks are buried over geologic time causes the reservoir pressure to increase. Reservoir pressure subsequently decreases when those substances are later produced at surface through wells. Conversely, when $CO_2$ is injected into the pore space of a saline aquifer or depleted oil and gas reservoir, it displaces, reacts, and mixes with the substances that originally occupied it and causes the reservoir pressure to increase. The higher the formation pressure, the greater the force that is required to inject $CO_2$ into its pore space.[11]

The foregoing is important from the standpoint that (1) pore space and reservoirs with sufficient porosity, permeability, and other characteristics necessary for the effective sequestration of $CO_2$ are finite resources that are competitively sought after; (2) notwithstanding that the law may define who owns the pore space in a given area, pore space is always occupied by water, hydrocarbons, or other gases that stand to be impacted by the injection of $CO_2$; and (3) the water, minerals, hydrocarbons, or other gases that occupy pore space may be subject to separate ownership or other interests that conflict with CCS such that

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[9] Bison Low Carbon Ventures Inc, *Meadowbrook Carbon Storage Project Application Under Directive 065 for: Disposal Scheme, Class III Disposal, Carbon Sequestration* (19 February 2025), Application No 1954561 at 13–14, online: Alberta Energy Regulator [perma.cc/7DNW-3ASB] (the 10.5 percent average also includes four datapoints from the Cooking Lake Formation that underlies and is in hydraulic communication with the overlying Leduc Formation); Enhance Energy Inc, *Application for CO2 (Class III) Disposal Scheme* (30 July 2025), Application No 1956215 at 38, online: Alberta Energy Regulator [perma.cc/S4GY-XMT9] [*Enhance Energy Directive 065 Application*].

[10] Marcia L Couëslan, Wade Zaluski & Brody Loster, "Risk-Based Design of Site Characterization and Measurement, Monitoring, and Verification Plans for Carbon Capture, Utilization, and Storage Projects" (2021) 46:3 CSEG Recorder at 8.

[11] See generally Hannes E Leetaru et al, "Understanding $CO_2$ Plume Behaviour and Basin-Scale Pressure Changes During Sequestration Projects Through the Use of Reservoir Fluid Modeling" (2009) 1 Energy Procedia 1799.

the "pore space race" is not simply a competition between CCS proponents, but may involve a broader subset of subsurface industries.

### B. PORE SPACE OWNERSHIP AT COMMON LAW

The question of who owns subsurface pore space at common law begins with the Latin maxim taught to generations of property law students, *cujus est solum ejus est usque ad coelum et ad inferos*, which roughly translates to, "whoever owns the soil, holds title all the way up to the heavens and down to the depth of the earth" (*ad coelum* doctrine).[12] Subject to the express or implied conveyance or reservation of specific subsurface interests separate from the surface estate, the *ad coelum* doctrine presumes that the owner of the surface estate also owns the subsurface, including the minerals, the pore space, and the substances within it.[13]

As compared to petroleum, natural gas, or other hard minerals, the relative nascency of CCS effectively removes the possibility that historical land transactions explicitly contemplated pore space conveyances or reservations. Consequently, the common law is left to grapple with arguments regarding whether pore space has been *implicitly* conveyed or reserved in historical transactions.[14] For example, there have been disputes regarding whether grants of "mines" as part of "mines and minerals" or the rights to a "formation" include the subsurface strata containing the minerals, and thus the pore space within those strata.[15] It may also be argued that the grant of certain mineral rights also includes the rights to the spaces excavated or vacated by the production of those minerals, including for the storage of natural gas or other commodities.[16]

Subject to arguments regarding the implicit conveyance or reservation of pore space, as a starting point in Canada and the US, it can generally be assumed that the owner of the surface estate in fee simple holds title to the pore space beneath their land at common law.[17] The *ad coelum* doctrine thus represents an impediment to CCS project development in areas

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12 See e.g. Bruce Ziff, *Principles of Property Law*, 5th ed (Toronto: Carswell, 2010) at 92.

13 See e.g. *Ball v Gutschenritter*, 1924 CanLII 40 at 71 (SCC); *Star Energy Weald Basin Limited v Bocardo SA*, [2010] UKSC 35 at para 27 [*Bocardo*]. Some US courts have nevertheless held that the *ad coelum* doctrine has no place in modern subsurface property law on the basis that its genesis did not contemplate subsurface wells: see e.g. *Coastal Oil & Gas Corp v Garza Energy Trust*, 268 SW (3d) 1 (Tex Sup Ct 2008) at 11.

14 To mitigate uncertainty in the common law, jurisdictions like Pennsylvania have enacted legislation that prohibits the severance of pore space from the surface estate absent an express conveyance: Pa Cons Stat tit 32 ch 25D § 696.4(b) ( "[n]o agreement conveying minerals, including coal, oil and gas, or other interests underlying the surface shall act to convey pore space in the stratum unless the agreement expressly includes conveyance of the pore space").

15 See e.g. *Pountney v Clayton* (1883), 11 QBD 820 at 839–40 (CA); *Batten Pooll v Kennedy* (1907), 1 Ch 256 at 265; Jack L Lyndon, "The Legal Aspects of Underground Storage of Natural Gas—Should Legislation be Considered Before the Problem Arises?" (1961) 1:6 Alta L Rev 543 at 545.

16 David R Percy, "Richard Riegert Memorial Lecture: Ownership Issues in the Production of Geothermal Energy" (2022) 60:2 Alta L Rev 523 at 527, citing *Glasgow Corp'n v Farie* (1888), 13 App Cas 657 at 678 (HL). For a more extensive discussion, see generally David A Dell, "Climate Change and Property Law" in Dennis Mahony, ed, *Law of Climate Change in Canada* (Toronto: Thomson Reuters, 2012) (loose-leaf updated 2024, release 4), ch 17.

17 Nigel Bankes, "Pore Space Ownership in Western Canada" in Ian Havercroft, Richard Macrory & Richard Stewart, eds, *Carbon Capture and Storage: Emerging Legal and Regulatory Issues* (Portland: Hart Publishing, 2018) 203 at 204 [Bankes, "Pore Space Ownership"]; Percy, *supra* note 16 at 529.

where the title to pore space within a reservoir is widely held among a number of surface owners. Similarly, over a century's worth of land transactions in jurisdictions like Alberta and Texas have been subject to reservations of valuable stone, coal, petroleum, natural gas, and other minerals such that the minerals and substances coincident with pore space may be subject to separate ownership, or "split titles."

As noted by Bruce Ziff in the context of surface landowners' entitlements to the subsurface:

> Deep below the surface the individual ownership units are narrow, having very little individual utility. And any attempt to assemble these rights can be thwarted by a problem of holdouts. As one court has glibly observed, "if ownership carries on to the point of the centre of the earth, landowners all have a lot of neighbours." More to the point, there is a potential anticommons problem, and such acute fragmentation may interfere with the needs of new technologies such as carbon capture and sequestration.[18]

Ziff's comments have proven prescient as conflicts of subsurface rights and difficulties assembling contiguous tracts of pore space have since arisen in the context of CCS. One way to sidestep the *ad coelum* doctrine and conflicts regarding implicit conveyances or reservations of pore space is for governments to enact legislation that clarifies who owns or otherwise has the rights to pore space for the purposes of CCS. In doing so, legislatures have also empowered governments to grant large swathes of pore space rights to CCS proponents. Still, regardless of who owns or has the rights to pore space, the issue of potential conflicts with other subsurface rights holders persists.

## C. PORE SPACE OWNERSHIP IN CANADA AND THE UNITED STATES

### 1. PORE SPACE OWNERSHIP IN CANADA

The ownership of and rights to pore space for the purposes of CCS are non-uniform across Canadian provinces that have enacted CCS-specific legislation. In British Columbia, there is no explicit legislative vesting of pore space ownership in the Crown. Instead, 2022 amendments to the *Petroleum and Natural Gas Act* provide that the Crown has the "right to explore for, access, develop and use storage reservoirs for the purpose of storing or disposing [$CO_2$]."[19] No compensation is payable by the government and no person has a right of action against the government for the statutory vesting of rights to storage reservoirs in the government.[20] In turn, the Minister of Energy and Climate Solutions is authorized to issue exploration licences granting the right to explore for storage reservoirs,[21] as well as storage reservoir licences granting CCS proponents the right to access, develop, or use a storage reservoir to dispose of $CO_2$.[22]

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18 Ziff, *supra* note 12 at 94, quoting Aikens LJ in *Star Energy UK Onshore Ltd v Bocardo SA*, [2009] EWCA Civ 579 at para 60 [footnotes omitted].

19 RSBC 1996, c 361, s 125.4(1) [*PNGA*]. As compared to the other Western Canadian provinces and Ontario, there is relatively little privately owned land across sedimentary basins that are prospective for CCS in British Columbia (other than certain Indigenous lands) such that the disposition of pore space rights to third parties may not pose serious hurdles relating to compensation for expropriation or constructive takings.

20 *Ibid*, s 125.4(2).

21 *Ibid*, s 126.

22 *Ibid*, s 130.

In Alberta, approximately 40 percent of surface titles are privately held.[23] Perhaps in anticipation of the difficulties CCS proponents would face in assembling contiguous tracts of pore space from a variety of those surface owners, in 2010, the Alberta government amended the *Mines and Minerals Act* to vest ownership of all pore space in the Crown, except for pore space beneath federal lands.[24] In turn, the Minister of Energy and Minerals is authorized to enter into two forms of pore space tenure agreements with CCS proponents: evaluation permits that grant the right to evaluate the geology of a particular location to determine its suitability for $CO_2$ sequestration,[25] and sequestration leases that grant the right to inject $CO_2$ into the subject reservoir for permanent sequestration.[26]

Manitoba's *The Captured Carbon Storage Act* — which was enacted in 2024 but has yet to be proclaimed into force — will similarly vest ownership of all pore space in the provincial government upon proclamation, with the exception of pore space beneath First Nation reserves and federal lands.[27] In turn, the Director under the *CCSA* will be authorized to issue exploration reservations for CCS[28] and carbon storage licences that include the right to inject $CO_2$ into the subject reservoir for sequestration.[29] The statutory vesting of pore space ownership in both the Alberta and Manitoba governments is declared in each case not to be an expropriation, and no compensation is payable by those governments in connection with the vesting clauses.[30] This importantly includes compensation to private surface owners who might otherwise have held title to the pore space beneath their lands at common law.

In Saskatchewan, 1992 amendments to *The Crown Minerals Act* established that "spaces occupied or formerly occupied by a Crown mineral" — whether leased or unleased — are the property of the Crown.[31] By extension, the Crown has the right to lease out such "spaces," including for the purposes of CCS.[32] However, Saskatchewan's legislative framework does not otherwise address pore space coincident with privately owned minerals or surface estates. Consequently, the Saskatchewan Crown arguably does not own — and presently has no statutory right to expropriate, take, lease, or otherwise dispose of — pore space that belongs to private entities at common law.[33]

The framework for the ownership of and rights to pore space under the *GCSA* stands to set Ontario apart from other Canadian provinces for (1) the proposed vesting of pore space ownership in the surface estate,[34] and (2) the authorization of government takings of privately owned pore space,[35] which may be subject to compensation payable by CCS proponents.[36] The pore space ownership provision succinctly codifies the common law approach developed

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23 AER, "Public Lands Act" (September 2024), online: [perma.cc/Z4V7-9EVA].
24 *Mines and Minerals Act*, RSA 2000, c M-17, s 15.1 [*MMA*], as amended by *Carbon Capture and Storage Statutes Amendment Act, 2010*, SA 2010, c 14 [*CCS Amendment Act*].
25 *MMA*, *supra* note 24, s 115.
26 *Ibid*, s 116.
27 *CCSA*, *supra* note 5, s 5.
28 *Ibid*, s 9.
29 *Ibid*, s 18.
30 *MMA*, *supra* note 24, s 15; *CCSA*, *supra* note 5, s 6.
31 *CMA*, *supra* note 5, s 27.2.
32 *Ibid*.
33 See Bankes, "Pore Space Ownership", *supra* note 17 at 209–10.
34 *GCSA*, *supra* note 4, s 7.
35 *Ibid*, s 8.
36 *Ibid*, s 9(3).

from the *ad coelum* doctrine as follows: "Rights to the pore space underlying the surface of real property form part of the surface rights estate, unless those rights have been reserved or separately granted or conveyed to another person."[37]

This is notable from the standpoint that southwestern Ontario — which hosts a number of large, industrial, point-sources of emissions and the greatest geologic sequestration potential in the province — is predominantly subject to private surface land ownership.[38] The statutory vesting of pore space ownership in the surface estate could thus pose unique challenges to CCS proponents in Ontario, as the consolidation of contiguous tracts of pore space rights may entail additional administrative burdens and significant transaction costs associated with dealing with multiple surface owners. Moreover, in light of the carve out in section 7 of the *GCSA* for pore space reserved or separately conveyed to a third party, CCS proponents may be forced to conduct cumbersome and costly title reviews to ensure that pore space has not been historically severed from the various surface estates they are required to transact with.

### 2. PORE SPACE OWNERSHIP IN THE UNITED STATES

As is the case in Canada, a patchwork of legal frameworks addressing the ownership of pore space in the context of CCS projects continues to develop in the US. While Congress has promoted the development of CCS projects, it has yet to pass legislation governing the use of pore space for CCS on federal lands. Further, some uncertainty persists as to whether the federal government retained the ownership of pore space when it reserved the "minerals" within the significant tracts of lands granted to homesteaders in the Western US in the nineteenth and twentieth centuries.[39]

The question of pore space ownership at the state level has largely focused on whether pore space belongs to the surface or mineral estate. Judicial consideration of this issue in states that have not enacted legislation clarifying the ownership of pore space has resulted in disparate and sometimes conflicting case law. In Texas, for example, where legislation is not determinative, some courts have held that pore space ownership pertaining to underground storage in salt caverns vests with the mineral estate.[40] Yet, other Texas courts have held that pore space ownership pertaining to underground storage rights resides with the surface estate unless explicitly conveyed to a third party. For example, in *Emeny v. United States*, the Texas

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37 *Ibid*, s 7.

38 See Bruce S Hart, "The Why, What, Who, When, and Where of Carbon Capture and Storage in Southern Ontario" (2024) 51:3 Geoscience Can 131 at 134. 136–39. For a map of privately owned land in southwest Ontario, see Government of Ontario, Ministry of Natural Resources, "Crown Land Use Policy Atlas" (2025), online: [perma.cc/PDC3-TGAA].

39 For example, courts have historically interpreted the reservation of "all coal and other minerals in the lands" in land grants under the *Stock-Raising and Homestead Act of 1916*, 43 USC § 299 broadly by focusing on what Congress intended to give away as opposed to what it intended to reserve, supporting the notion that pore space ownership over such lands remains with the federal government (see e.g. *Watt v Western Nuclear, Inc*, 462 US 36 (1983); *Rosette, Inc v United States*, 277 F (3d) 1222 (10th Cir 2002)).

40 *Mapco, Inc v Carter*, 808 SW (2d) 262 at 266, 274–76 (Tex Ct App 1991), rev'd in part 817 SW (2d) 686 (Tex Sup Ct 1991) [*Mapco*]. The Court of Appeals held that the mineral estate owner owned the storage rights in a salt cavern created for natural gas storage and was entitled to compensation for the use of the cavern for storage purposes.

Court of Claims considered the gas storage rights in the depleted oil and gas reservoir known as the Bush Dome, which famously hosted the strategic Federal Helium Reserve:

> The surface of the leased lands and everything in such lands, except the oil and gas deposits covered by the leases, were still the property of the respective landowners…. This included the geological structures beneath the surface, including any such structure that might be suitable for the underground storage of "foreign" or "extraneous" gas produced elsewhere.
>
> It necessarily follows that the 1923 oil and gas leases on the lands containing the Bush Dome did not grant to the lessee — or to the defendant as the present holder of gas rights under such leases — any right to use the Bush Dome for the storage of gas produced elsewhere.[41]

In light of the inconsistent case law in Texas, commentators have cautioned that the conservative approach would be for CCS proponents to obtain permission from both surface and mineral owners to avoid legal challenges from one or the other.[42] However, the administrative burdens and additional transaction costs that would flow from dealing with both surface and mineral owners when assembling a tract of pore space may disincentivize CCS project development in states like Texas where the surface and mineral estate are commonly severed. Indeed, the competing interests of large, incumbent oil and gas companies who hold mineral rights and are well positioned to undertake CCS projects, on one hand, and the significant number of landowners with sizeable surface estates, on the other, may explain why legislation has not been enacted to clarify pore space ownership in Texas.[43] The uncertainty has nevertheless resulted in calls for the legislature to intervene to provide CCS proponents and landowners clarity on pore space ownership and leasing rights.[44] A bill declaring that the ownership of pore space in Texas vests in the owner of the surface estate was introduced in the Texas legislature in February 2025, but it died on the house floor in June 2025.[45]

As of the time of writing, 14 states have enacted legislation codifying the surface estate's ownership of pore space. The various forms of vesting provisions in those states are outlined in Table 1, below.

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41 *Emeny v United States*, 412 F (2d) 1319 at 1323 (Ct Cl 1969) [*Emeny*] [citations omitted]. See also *Myers-Woodward, LLC v Underground Services Markham, LLC*, 699 SW (3d) 1 at 17–20 (Tex Ct App 2022), in which the Texas Court of Appeals expressly disavowed the apparent precedent in *Mapco*, *supra* note 40, holding that, "[t]here is no case law that supports a conclusion that a mineral estate owner who does not own the surface estate owns the subsurface of the property and may then use the subsurface for its own monetary gain even after extracting all the minerals.... *Mapco* did not make this leap" [citations omitted].

42 See e.g. Owen L Anderson, "Geologic CO2 Sequestration: Who Owns the Pore Space?" (2009) 9:1 Wyo L Rev 97 at 99; Madeline Mathews, "Carbon Sequestration and Pore Space Ownership in Texas" (2011) 41:2 Tex Envtl LJ 205 at 211–12.

43 See Muriel Hague, "A Hitchhiker's Guide to Carbon Capture and Sequestration Regulation in Texas and Beyond" (2024) 61:4 Hous L Rev 827 at 840–41.

44 *Ibid*.

45 US, HB 2762, *An Act Relating to the Ownership of the Pore Space Underlying the Surface of Land*, 89th Legislature, Reg Sess, Tex, 2025, s 5.252.

**TABLE 1:**
**UNITED STATES PORE SPACE VESTING PROVISIONS**

| State | Pore Space Vesting Provision |
|---|---|
| California | "Title to any geologic storage reservoir is vested in the owner of the overlying surface estate unless it has been severed and separately conveyed."[46] |
| Colorado | "If ownership of the sequestration estate has not been separately severed, conveyed, or reserved … it is presumed that ownership of the sequestration estate in the state is vested in the owner of the overlying surface estate."[47] |
| Illinois | "Title to pore space belongs to and is vested in the surface owner of the surface estate."[48] |
| Indiana | "After June 30, 2022, the ownership of pore space is vested in the surface estate of real property that is divided into a surface estate and a mineral estate unless such rights are explicitly acquired by conveyance document."[49] |
| Kentucky | "'Pore space owner' means the surface owner unless the pore space has been severed from the surface estate, in which case the pore space owner shall include all persons reasonably known to own an interest in the pore space."[50] |
| Louisiana | "Unless otherwise provided by law, the ownership of a tract of land carries with it the ownership of everything that is directly above or under it"[51] |
| Montana | "If the ownership of the geologic storage reservoir cannot be determined from the deeds or severance documents related to the property by reviewing statutory or common law, it is presumed that the surface owner owns the geologic storage reservoir."[52] |
| Nebraska | "Title to any reservoir estate underlying the surface of lands and waters is vested in the owner of the overlying surface estate unless it has been severed and separately conveyed."[53] |
| North Dakota | "Title to pore space in all strata underlying the surface of lands and waters is vested in the owner of the overlying surface estate."[54] |
| Oklahoma | "[P]ore space is real property and, until title to the pore space or rights, interests or estates in the pore space are separately transferred, pore space is property of the person or persons holding title to the land surface above it."[55] |
| Pennsylvania | "The ownership of all pore space in all strata below the surface lands and waters of this Commonwealth shall be vested in the surface property interest owner above the pore space."[56] |
| Utah | "Title to pore space underlying the surface estate is vested in the owner of the surface estate."[57] |
| West Virginia | "Title to pore space in all strata underlying the surface of lands and waters is vested in the owner of the overlying surface estate."[58] |
| Wyoming | "The ownership of all pore space in all strata below the surface lands and waters of this state is declared to be vested in the several owners of the surface above the strata."[59] |

46 Cal Pub Res Div 34 Part 8 § 71462(a).
47 US, HB 24-1346, *An Act Concerning Energy and Carbon Management Regulation in Colorado, and, in Connection Therewith, Broadening the Energy and Carbon Management Commission's Regulatory Authority to Include Regulation of Geologic Storage Operations*, 2024, Reg Sess, Colo, 2024, s 11 (enacted) [*US HB 24-1346*].
48 Ill Comp Stat ch 415 § 185/10(a).
49 Ind Code tit 14 art 39 ch 2 § 3(b).
50 Ky Rev Stat tit XXVIII ch 353 § 800(8).
51 La Civ Code art 490.
52 Mont Code Ann tit 82 ch 11 § 180(3).
53 Neb Rev Stat ch 57 § 1604(1).
54 N Dak Cent Code tit 47 ch 31 § 03.
55 Okla Stat tit 60 § 6.B.2.
56 Pa Cons Stat tit 32 ch 25D § 696.4(a).
57 Utah Code tit 40 ch 6 § 20.5(1).
58 W Va Code ch 22 art 11B § 18(a).
59 Wyo Stat Ann tit 34 ch 1 § 152(a).

A complicating factor is that some states that have codified pore space ownership explicitly allow the severance of pore space from the surface estate — including California, Colorado, Indiana, Kentucky, Montana, Nebraska, Oklahoma, Pennsylvania, and Wyoming[60] — whereas others expressly prohibit it — including North Dakota, Illinois, and West Virginia.[61] Where severance is allowed, it may enable CCS proponents to purchase pore space directly from one or more surface owners, lessening the administrative burdens of managing contractual relationships with a number of pore space lessors or unit members for the life of the project. On the other hand, the prohibition on pore space severance in the latter states will help mitigate uncertainty regarding the ownership of pore space and the attendant litigation risks, while also reducing the administrative burden on CCS proponents who may otherwise need to conduct title reviews to ensure that would-be vendors or lessors possess the necessary pore space rights. These benefits will be tempered, however, in states like North Dakota where the prohibition on pore space severances does not apply to transactions before a particular date.[62]

Notably, no state has enacted legislation that vests the title or rights to pore space in the government in contemplation of CCS. This reflects a key distinction between the US and Canada that has significant implications for CCS project development in the respective countries: the Takings Clause of the Fifth Amendment to the US Constitution and various state constitutions prohibit the taking or expropriation of private property without just compensation to property owners,[63] whereas the framers of Canada's Constitution did not entrench the protection of property rights in the nation's supreme law.[64] This omission gives governments across Canada the latitude to abrogate property rights without the need to provide just compensation: Parliament and the provincial and territorial legislative assemblies may immunize themselves from liability to pay compensation for a taking of private property so long as enabling statutes clearly express such an intention.[65] Consequently, the legislatures of provinces like British Columbia, Alberta, and Manitoba (upon proclamation) have vested pore space ownership or the rights thereto in the provincial governments while foreclosing compensation to surface owners with impunity, whereas equivalent enactments in the US would likely trigger litigation and costly compensation.

In North Dakota, for example, legislation was enacted in 2019 that stipulated the injection or migration of substances into pore space as a result of oil and gas or disposal operations does not presumptively constitute trespass, nuisance, or any other tort, and that private pore space owners are not entitled to compensation for the use of their pore space.[66] The Supreme

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60 See Table 1, *above*, and accompanying footnotes; Pa Cons Stat tit 32 ch 25D § 696.4(b); Wyo Stat Ann tit 34 ch 1 § 152(b) ("[a] conveyance of the surface ownership of real property shall be a conveyance of the pore space in all strata below the surface of such real property unless the ownership interest in such pore space previously has been severed from the surface ownership or is explicitly excluded in the conveyance").

61 See e.g. N Dak Cent Code tit 47 ch 31 § 05 ("[t]itle to pore space may not be severed from title to the surface of the real property overlying the pore space. An instrument or arrangement that seeks to sever title to pore space from title to the surface is void as to the severance of the pore space from the surface interest"). Similar provisions prohibiting severance are found at Ill Comp Stat ch 415 § 185/10(c) and W Va Code ch 22 art 11B § 18(c).

62 9 April 2009 in North Dakota (N Dak Cent Code tit 47 ch 31 § 7).

63 US Const amend V ("nor shall private property be taken for public use, without just compensation").

64 *Annapolis Group Inc v Halifax Regional Municipality*, 2022 SCC 36 at para 24.

65 *Ibid* at para 22.

66 N Dak Cent Code tit 47 ch 31 § 09.

Court of North Dakota subsequently found those provisions to be unconstitutional on the basis that they constitute a per se taking by depriving landowners of the "right to exclude oil and gas operators from trespassing and disposing waste into their pore space" and of the right to demand "compensation for physical occupation of their property."[67] Accordingly, North Dakota courts have ruled that surface owners must be compensated for the use and access of their pore space by third parties, regardless of their current use or future plans for the use of that pore space.[68]

### 3. EVALUATING THE DIFFERENT APPROACHES TO PORE SPACE OWNERSHIP

Jurisdictions in which pore space ownership or rights vest in the government offer a significant advantage to CCS proponents over those in which pore space vests with surface owners — proponents need only deal with one party to obtain pore space rights. Of the Western Canadian provinces, British Columbia, Alberta, and Manitoba (if the *CCSA* is proclaimed) offer this advantage.[69] Saskatchewan offers the same in respect of "spaces" occupied or formerly occupied by Crown minerals, but it is subject to the lingering uncertainty regarding who owns pore space or the rights thereto coincident with freehold estates.[70]

Conversely, where pore space vests in the surface estate and a particular target reservoir for CCS crosses multiple surface ownership boundaries, CCS proponents may have to negotiate consent and compensation with multiple landowners and may need to conduct onerous title reviews to ensure pore space rights have not been severed from those surface estates. In one recent example, discussed in Part II, a proponent negotiated with over 450 landowners to obtain the necessary pore space rights to one storage reservoir in North Dakota.[71] Assembling a contiguous tract of pore space from a variety of surface owners likely entails greater transaction costs as compared to the rents or fees required by a single government owner of pore space. All else equal, CCS proponents and investors may thus be more attracted to jurisdictions in which pore space ownership or rights vest in a single governmental entity, or where pore space rights can be obtained from a single private or governmental landowner with a large enough surface tract for a CCS project.[72]

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67 *North West Landowners Association v State of North Dakota*, 2022 ND 150 at paras 26–27 (Sup Ct 2022) [*NW Landowners*].

68 See e.g. *Mosser v Denbury Resources, Inc*, 2017 ND 169 (N Dak Sup Ct 2017) at paras 23–24 [*Mosser*], interpreting N Dak Cent Code tit 38 ch 11.1 § 04.

69 Unless a reservoir spans both provincial/state and federal or First Nation/Indigenous lands subject to separate pore space ownership. Still, such situations may offer a more streamlined process than jurisdictions in which there are multiple "postage stamp" privately owned surface estates.

70 See notes 18–63, above, and accompanying text.

71 See notes 95–99, *infra*, and accompanying text.

72 For example, in 2022, Talos Energy entered into a 26,000 acre (~105 $km^2$) lease with a single large Louisiana Landowner for a future CCS hub, as well as a lease with the Texas General Land Office for an approximately 40,000 acre (~186 $km^2$) parcel offshore Jefferson County, Texas (Talos Energy, News Release, "Talos Energy Announces Lease Agreement for Major Carbon Sequestration Hub in Mississippi River Industrial Corridor" (15 February 2022), online: [perma.cc/Q5DL-66LB]; Talos Energy, News Release, "Talos Energy Announces Formal Execution of Texas GLO Carbon Capture Site Lease and Establishes Strategic Alliance with Core Lab" (16 March 2022), online: [perma.cc/ZS5C-LDUY]).

The decision of states to vest pore space ownership in the surface estate is nonetheless understandable given the Fifth Amendment and equivalent state constitutional guarantees of compensation for takings or expropriation of private property. It is likely less costly to deal with holdout surface owners' pore space on a case-by-case, as-needed basis, than it is to legislatively expropriate pore space beneath all private land in a state and face a flood of litigation and claims for compensation. In the absence of an equivalent Canadian constitutional imperative, the proposed vesting of pore space ownership in the surface estate under Ontario's *GCSA* might appease surface landowners but prove challenging for the expedient development of storage reservoirs. As the Western Canadian examples show, it is within the legislature's power to vest pore space ownership or the rights thereto in the Crown and foreclose compensation to surface landowners and their successors with whom pore space ownership might reside at common law.

As a dichotomy continues to develop in the US between jurisdictions that do and do not allow the severance of pore space ownership from the surface estate, it is surprising that Ontario is proposing to allow severance. This may likely lead to additional administrative burdens and transaction costs for CCS proponents who will need to engage in more extensive due diligence to confirm whether pore space and surface estates remain intact. It also increases the risk of third-party claims to pore space ownership on the basis of implied severances in historical land transactions.

The foregoing is not to say that the frameworks in jurisdictions in which pore space ownership or rights vest in governments are perfect. This approach has undoubtedly attracted significant interest and investment in CCS in Alberta, for example, by enabling the Ministry of Energy and Minerals to grant would-be CCS hub developers massive, contiguous tracts of pore space rights across the province. However, it remains to be seen how many of those projects advance to commercial operations and approach their full sequestration capacity. In the meantime, there is a risk that a number of hub projects for which pore space rights have been granted do not advance or meet their full sequestration potential, resulting in significant swathes of stranded pore space rights until they revert to the Crown.[73] The other more pressing issue is that, where pore space and mineral ownership are consolidated in governments, those governments may grant overlapping tenure rights to pore space and other minerals, which can lead to conflicts of subsurface rights. Such conflicts are explored further through the example of Alberta in Part III.

As foreshadowed in this jurisdictional survey, where pore space ownership vests in the surface estate, CCS proponents may encounter holdouts when attempting to assemble contiguous tracts of pore space, particularly where surface estates are widely held among many landowners. This is the "anticommons" problem predicted by Ziff.[74] Part II discusses

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[73] Since the Government of Alberta's issuance of evaluation permits for 25 CCS hub projects throughout 2021 to 2022, at the time of writing, at least four projects have been cancelled, six have graduated beyond the evaluation permit phase to the sequestration lease phase, and two projects have obtained final regulatory approval from the AER, to the authors' knowledge. In Alberta, evaluation permits have a term of five years and sequestration agreements have an initial term of 15 years, which may be renewed for a further 15 years at the Minister's discretion (*CSTR*, *supra* note 5, ss 4, 10–11).

[74] Ziff, *supra* note 12 at 94.

two legislative solutions to holdouts and related issues that have emerged where pore space is widely held among surface owners: pore space unitizations and expropriation.

## II. PORE SPACE UNITIZATION AND EXPROPRIATION

### A. PORE SPACE UNITIZATIONS

Unitization in the context of CCS refers to the process of combining multiple tracts of pore space ownership within the same reservoir or field to facilitate a common sequestration scheme. Variously referred to as an "amalgamation,"[75] "integration,"[76] "collective storage,"[77] or "pooling,"[78] unitization is the corollary to the vesting of pore space ownership in surface owners because, without unitization or the ability to expropriate pore space, a single landowner may be able to scuttle a CCS project by withholding consent to the use of their pore space. Accordingly, as the lone Canadian province poised to vest pore space ownership in the surface estate, Ontario is also the first province that has introduced legislation that would enable compulsory pore space unitization.[79] Likewise, almost all the US jurisdictions cited in Table 1, above, that have vested pore space ownership in surface estates have also enacted some form of compulsory unitization whereby the approval of CCS operations can proceed without the consent of one or more pore space owners.[80]

The *GCSA* would empower the Ontario Land Tribunal to order the unitization of pore space rights upon a CCS proponent's application if satisfied that the following conditions are met:

1. "[U]nitization would facilitate the optimal use of storage repositories";

2. The permit applicant has "made a good-faith effort to obtain the consent of all landowners to convey their rights to the pore space";

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75 See e.g. N Dak Cent Code tit 38 ch 22 § 10.

76 See e.g. Ind Code tit 14 art 39 ch 2 § 4.

77 See e.g. Pa Cons Stat tit 32 ch 25D § 696.5.

78 See e.g. Ky Rev Stat tit XXVIII ch 353 § 806.

79 "Pore space unit agreements" are available in Alberta for small-scale and remote CCS projects; however, such agreements are meant to address the varying interests and subsurface activities within a location as opposed to different tracts of pore space ownership given that the Crown owns almost all the pore space in Alberta (*MMA*, *supra* note 21, ss 15.1(3), 102(1)). Similarly, "unitization agreements" are available in British Columbia in respect of storage reservoirs, but such agreements are likewise ostensibly meant to address multiple disposal operations (including CCS) in a given storage reservoir as opposed to the unitization of pore space rights given the Crown holds the underlying rights to storage reservoirs (*PNGA*, *supra* note 19, s 114).

80 Cal Pub Res Div 34 Part 8 § 71461; *US HB 24-1346*, *supra* note 47; Ill Comp Stat ch 415 § 185/15; Ind Code tit 14 art 39 ch 2 § 4; Ky Rev Stat tit XXVIII ch 353 § 806; US, HB 966, *Act No 645*, 2024, Reg Sess, La, 2024 (enacted) [*US HB 966*]; Mont Code Ann tit 82 ch 11 Part 2; Neb Rev Stat ch 57 § 1612; N Dak Cent Code tit 38 ch 22 § 08; Pa Cons Stat tit 32 ch 25D § 695.5; Utah Code tit 40 ch 11 § 11; W Va Code ch 22 art 11B § 19; Wyo Stat Ann tit 35 ch 11 §§ 315–16. Oklahoma has not yet enacted compulsory unitization for CCS but has recommended that legislation be modeled after oil and gas unitization (US, Office of the Secretary of Energy & Environment, *SB 200: Oklahoma Carbon Capture & Geological Sequestration Report* (Oklahoma: Office of the Secretary of Energy & Environment, 2023) at 7, online: [perma.cc/S2RG-2L33]).

3. The applicant has obtained the consent of pore space owners who represent the majority of the pore space within the unit area; and

4. Non-consenting landowners will be equitably compensated.[81]

The foregoing conditions are also required for most versions of unitization procedures in the US, reflecting the likely source of inspiration for Ontario's proposed legislation. There is nevertheless a notable distinction: the minimum level of consent required of affected pore space owners for unitization to proceed in Ontario (greater than 50 percent) is the lowest among the surveyed jurisdictions.[82] Kentucky requires the consent of at least 51 percent of pore space owners;[83] while Montana, Nebraska, and North Dakota require 60 percent;[84] Indiana and Utah require 70 percent;[85] California, Colorado, Illinois, Louisiana, Pennsylvania, and West Virginia require 75 percent;[86] and Wyoming requires 80 percent.[87] The minimum level of consent is a concept borrowed directly from compulsory oil and gas unitizations, and the greater level of consent required in the US likely reflects the inviolability of private property rights under the Fifth Amendment and equivalent state constitutions.

Ontario's proposed unitization framework would also empower the Ontario Land Tribunal to prescribe a particular apportionment of the costs and benefits associated with the operation of a unit area,[88] but otherwise leaves the contours of the cost-benefit allocation and all other aspects of unitization orders to regulations.[89] The concept of cost and benefit sharing between unit members is also a feature of unitizations in the oil and gas context in which the production of a unitized pool or field is optimized and consolidated under one operator and the costs and revenues are allocated in accordance with each unit member's share of the unitized mineral rights.

However, CCS and oil and gas production are fundamentally different operations with distinct economic drivers such that the sharing of the costs and benefits of a unitized reservoir may not be suitable for CCS. In particular:

- The benefits derived from CCS are bespoke to the commercial arrangements of a CCS proponent, and the various types of carbon credits that may be generated through CCS may not be fungible or easily divisible among multiple unit members

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81 *GCSA*, *supra* note 4, s 13(3).

82 Subsection 13(3)(c) of the *GCSA*, *supra* note 4, stipulates that a unitization order may not be issued unless "the person or persons requesting the order have obtained consent from landowners whose ownership interest represents the majority, as determined in accordance with the regulations, of the rights to the unit area's pore space." The authors assume that the reference to "the majority" means greater than 50 percent; however, it remains to be seen whether regulations will define "the majority" by a higher threshold.

83 Ky Rev Stat tit XXVIII ch 353 § 806(2).

84 Mont Code Ann tit 82 ch 11 § 204(1); Neb Rev Stat ch 57 § 1610(13); N Dak Cent Code tit 38 ch 22 § 08.

85 Ind Code tit 14 art 39 ch 2 § 4(c)(3); Utah Code tit 40 ch 11 § 11(4).

86 Cal Pub Res Div 34 Part 8 § 71461(a)(2); *US HB 24-1346*, *supra* note 80, s 11; Ill Comp Stat ch 415 § 185/15(b); *US HB 966*, *supra* note 80 at §1104.2.B; Pa Cons Stat tit 32 ch 25D § 696.5(a)(2); W Va Code ch 22 art 11B § 19(c)(2).

87 Wyo Stat Ann tit 35 ch 11 § 316(c).

88 *GCSA*, *supra* note 4, s 13(2).

89 *Ibid*, s 13(7).

(for example, under Ontario's Emissions Performance Standards program, covered industrial emitters can net-out sequestered $CO_2$ from their reportable emissions, but the program does not allow offset credits to be generated by $CO_2$ sequestration);[90] conversely, the benefits of unit operations in the oil and gas context are in the form of highly fungible commodities for which the proceeds can be readily distributed among unit members;

- Cost-benefit sharing in the oil and gas context is partly justified on the basis that, absent unitization, multiple mineral owners would deploy money and resources to obtain their share of the minerals in a common reservoir, raising competitive drainage and conservation issues (in the authors' view, it is much less likely that multiple pore space owners or their lessees would be vying to inject $CO_2$ in the same reservoir in such close proximity as to interfere with each other's operations); and

- CCS operations can be prohibitively expensive, requiring well-capitalized proponents, whereas private pore space owners may not have the financial wherewithal to fund their proportional share of unit operations.[91]

Despite the potentially awkward application of unitization to CCS, a number of US jurisdictions have some form of cost-benefit sharing applicable to CCS unit operations. For example, in Wyoming, non-consenting surface owners may apply for inclusion in a unitization application or order and, if approved, they are entitled to a proportionate share of all economic benefits received by unit members since the inception of the unit.[92] Prior to receiving those economic benefits, such non-consenting surface owners must pay their proportionate share of the costs borne by the unit members. Similarly, Utah's legislation provides that non-consenting pore space owners must pay their share of costs attributable to their ownership tract, including for construction and maintenance, estimated closure costs, and related project costs, in exchange for their share of the profits.[93]

A recent order of the Industrial Commission of North Dakota directing the amalgamation of pore space within a proposed storage reservoir is particularly illustrative of the potential administrative burdens and transaction costs associated with unitizations where pore space vests in the surface estate.[94] The order was issued on 12 December 2024, following hearings that took place from 11 June 2024 to 13 June 2024 in respect of a number of applications related to Summit Carbon Solutions' Midwest Carbon Express project. With reference to the requirement that CCS proponents make good faith efforts to obtain the consent of all pore space owners within the storage reservoir,[95] the order notes that the proponent negotiated with over 450 landowners for one of three different storage reservoirs subject to the order, resulting in pore space agreements for over 146,500 acres (~600 $km^2$), representing 89.14 percent

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90 *Greenhouse Gas Emissions: Quantification, Reporting and Verification*, O Reg 390/18, s 12.

91 Individual pore space owners' share of the costs of CCS could also simply be deducted from their corresponding share of the benefits of unit operations; however, the benefits generated through CCS are likely to be smaller and less fungible than revenues from oil and gas unit operations such that deductions for a pore space owner's operating costs may not be practical.

92 Wyo Stat Ann tit 35 ch 11 § 316(g).

93 Utah Code tit 40 ch 11 § 10.

94 *Summit Carbon Storage #1, LLC*, Case no 30870 (12 December 2024), Order No 33530, online: Industrial Commission of North Dakota [perma.cc/3VJX-ZDMD] [*Order No 33530*].

95 N Dak Cent Code tit 38 ch 22 § 08(4).

consent among pore space owners.[96] Those negotiations resulted in the proponent conceding a 50 percent increase to the royalty rate and the inclusion of other landowner-friendly clauses.[97] The order also notes that tract participation only involves current surface owners as the proponent "did not find instances of pore space being severed from the surface estate as allowed prior to April 9, 2009," which is the date after which pore space severances are prohibited in North Dakota.[98] This presumably indicates that the proponent conducted title reviews to confirm the absence of pore space severances.

### B. PORE SPACE EXPROPRIATIONS

Some US jurisdictions also provide for the expropriation or taking of privately owned pore space to facilitate CCS projects. For example, in 2023, Arkansas amended its underground natural gas storage legislation to include $CO_2$, which now enables CCS proponents to condemn (that is, expropriate) "any subsurface stratum or formation in any land which the Oil and Gas Commission finds to be suitable and in the public interest for the underground storage of [$CO_2$]."[99] After obtaining a certificate that sets out the Commission's affirmative findings of suitability and public interest, the proponent may exercise the right of eminent domain by filing a petition for the approval of the circuit court.[100] However, few states have enacted pore space-specific expropriation procedures and the overall trend in the US seems to favour pore space unitizations to facilitate CCS.[101] In Louisiana, for example, the legislature passed two bills in 2024, which repealed the ability of CCS proponents to acquire pore space rights by expropriation and introduced pore space unitization procedures, respectively.[102]

In Canada, Ontario is the only province that has proposed legislation that provides for pore space expropriations.[103] Specifically, the *GCSA* would empower the Government of Ontario to make regulations designating private lands under which the rights to pore space vest in the Ontario Crown for the purposes of CCS, provided that such "takings" are in the public interest and the pore space "underlies lands that are both owned or controlled by the Crown and privately owned."[104] The authors interpret the latter condition to mean pore space beneath privately owned lands that are adjacent to Crown lands, which reflects the fact that hydraulic communication within a given reservoir may extend across pore space ownership boundaries. Here, the Ontario legislature appears to be foreshadowing situations in which it will be necessary to consolidate all pore space within a given reservoir under Crown ownership to optimize sequestration and prevent trespass or interference through the

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96 *Order No 33530*, *supra* note 94 at para 27.

97 *Ibid*.

98 *Ibid* at para 22.

99 Ark Code Ann tit 15 ch 72 § 604(a); see definition of "gas" at § 602(2), which now includes "carbon oxides."

100 Ark Code Ann tit 15 ch 72 §§ 604–05.

101 For other examples of expropriation (eminent domain) for CCS, see Ind Code tit 32 art 24 ch 5 § 2; Ala Code tit 9 ch 17 § 154.

102 US, HB 492, *Act No 620*, 2024, Reg Sess, La, 2024 (enacted); US, HB 966, *supra* note 80.

103 Here, the authors distinguish between statutory provisions in provinces like British Columbia, Alberta, and Manitoba that vest pore space ownership or rights in the Crown — which some may construe as expropriations despite accompanying provisions that deem otherwise — versus the *GCSA* provisions that authorize the future expropriation of pore space on a case-by-case basis.

104 *GCSA*, *supra* note 4, s 8(3)(b).

migration of $CO_2$ or pressure fronts from Crown-owned pore space to privately owned pore space. Upon a Crown taking of pore space under the *GCSA*, the Crown would then have the ability to grant pore space rights to CCS proponents, which differs from the US jurisdictions referred to above in which pore space rights would vest directly in the proponent upon the exercise of eminent domain.[105]

Ontario Crown takings of pore space would be deemed not to be expropriations or injurious affections, and no compensation would be payable to the Crown.[106] However, the Government of Ontario would be authorized to make regulations specifying compensation to be paid by CCS proponents to private landowners whose pore space is taken, signalling that pore space takings might be prompted by the request of such proponents.[107] The *GCSA* is nevertheless clear that surface owners would not be presumptively entitled to compensation in the event of a taking, which would arguably be unconstitutional in the US and may reflect the Ontario legislature's sensitivity to the potential costs of requiring compensation to every landowner affected by a pore space taking.[108]

The proposed availability of both pore space takings and unitizations under the *GCSA* raises the question of which mechanism may be best suited to assembling a contiguous block of pore space rights in Ontario. In areas where the pore space of a contiguous reservoir only underlies privately owned land, unitization would likely be the only recourse in the face of non-consenting landowners. Where the pore space of a contiguous reservoir underlies both privately owned and Crown land, both options may be available. In the latter situation, unitization may be more flexible than a pore space taking as unitization applies to the pore space within a single, discrete storage reservoir, whereas the current drafting of the *GCSA* suggests takings would apply to all pore space beneath designated surface lands.[109] The taking of pore space across the entire vertical section of the subsurface is significantly more invasive than a discrete unitization of a storage reservoir beneath a surface owner's land and would arguably require greater compensation for loss of future uses of the entire subsurface section. As both pore space takings and unitizations could be subject to discretionary compensation to surface landowners, CCS proponents will likely want some certainty as to the potential quantum of compensation that they may be required to pay to surface owners prior to pursuing either option.

Both pore space unitizations and expropriations offer the benefit of foreclosing future liability to surface landowners for trespass or interference resulting from the migration of $CO_2$ or pressure within a unitized reservoir or expropriated pore space. As discussed in Part IV, however, CCS operators may still face liability and conflicts with other subsurface rights holders whose interests stand to be impacted by CCS operations.

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105 *Ibid*, ss 8–9. In the event a regulation designating a pore space taking is revoked prior to $CO_2$ injection, the pore space would then vest in the current surface owner (*ibid*, s 8(4)).

106 *Ibid*, s 10.

107 *Ibid*, s 9(3).

108 *Ibid*, s 9(4).

109 *Ibid*, s 8(1) ("rights to *pore space underlying the identified lands* are taken by the Crown" [emphasis added]).

## III. CONFLICTS OF SUBSURFACE RIGHTS

This section begins with an overview of dominant and servient estates in land and ends with a discussion of the potential conflicts that may arise between holders of competing subsurface rights. Included in that discussion is the potential for conflicts between CCS projects on one hand, and a selection of other subsurface operations on the other, including oil and gas exploration and production, subsurface storage, disposal, and brine-hosted mineral extraction. While this discussion is focused on Alberta, many of the issues canvassed may be applicable to other jurisdictions.

### A. THE DOMINANT AND SERVIENT ESTATES

In jurisdictions where mineral rights have been severed from the surface estate, disputes regarding the priority of CCS and other operations within the same sections of the subsurface may arise. For example, if pore space vests in the surface estate and has been leased to a CCS operator, but the mineral estate holder has separately leased out the oil and gas rights covering the same tract, the oil and gas lessee may wish to drill through a sequestration complex to access oil and gas beneath it or use the same pore space to dispose of produced water. US jurisdictions that have vested pore space ownership in the surface estate have attempted to address the issue by clarifying that the mineral estate is dominant for the purposes of determining priority in the context of CCS.[110]

Such pronouncements are an extension of the common law, which holds that the conveyance of mineral rights from the surface estate includes the rights to access and use the surface estate as may be reasonably necessary or incidental to producing the minerals under an implied easement.[111] This has been interpreted to include the right to dispose of water and oilfield waste produced incidental to oil and gas, and to inject $CO_2$ or water into a reservoir for enhanced oil recovery, but not the rights to store natural gas or inject $CO_2$ purely for sequestration.[112] Thus, notwithstanding that Ontario's *GCSA* is silent on the priority between the surface and mineral estates for the purpose of CCS, the common law raises questions of whether the surface estate — in which pore space will vest if the *GCSA* is enacted — will be servient to the dominant mineral estate.[113]

The dominance of the mineral estate over the surface estate at common law has nevertheless been constrained by the accommodation doctrine in the US, which holds that

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[110] See e.g. N Dak Cent Code tit 47 ch 31 § 08; Pa Cons Stat tit 32 ch 25D § 696.4(d)(2); W Va Code ch 22 art 11B § 18(e); Wyo Stat Ann tit 34 ch 1 § 152(e).

[111] *Alberni Land Co v Registrar-General of Titles*, 1918 CanLII 854 at 143 (BCCA); Dell, *supra* note 16, § 17:49; *NW Landowners*, *supra* note 67 at para 27; *Callahan v Martin*, 3 Cal (2d) 110 at 127 (Cal Sup Ct 1935). For a more extensive discussion of the doctrine of easement by necessity, see Schremmer, *supra* note 3 at 408–13.

[112] Dell, *supra* note 16, § 17:49; Bankes, "Pore Space Ownership", *supra* note 17 at 204–05; *Emeny*, *supra* note 41 at 1323. Nor does an implied easement apply to activities within adjacent tracts of land. In *Bocardo*, for example, the United Kingdom Supreme Court held that the defendant's oil and gas wells that deviated under the plaintiff's surface land constituted trespass because, although the government held title to the petroleum and the defendant held a valid lease of said petroleum, the plaintiff surface owner still held title to the stratum beneath its land pursuant to the *ad coelum* doctrine and had not consented to the well being drilled beneath its land (*supra* note 13).

[113] Subject to further regulations and the rights of the tenants of the surface estate who took their leasehold interests prior to the severance of the mineral estate (Schremmer, *supra* note 3 at 408).

"the rights implied in favor of the mineral estate are to be exercised with due regard for the rights of the owner of the servient estate."[114] In a recent review of the accommodation doctrine in the context of CCS, Joseph Schremmer distilled the conditions that would require the dominant estate to accommodate the servient estate through an alternative surface use as follows: "(i) there is an existing use by the servient estate, (ii) that would be precluded or impaired by the dominant's estate's intended use, and (iii) there are alternative practices available to the dominant estate that are usual, customary, and reasonable."[115]

The "existing use" condition has been widened to include planned uses that have not been implemented but are part of a broader project commenced by the surface estate holder or its lessee, and where a mineral estate holder or its lessee knew about the planned use of the surface estate.[116] Thus, where a CCS operator has obtained pore space rights from the surface estate, it may be arguable that the mineral lessee of the same tract may not be able to drill through or dispose of produced water in the same pore space that the CCS operator intends to use as a sequestration complex if the sequestration complex can reasonably be avoided or there are other viable disposal zones within the same tract. While tending to favour the party that is first in time, any application of the accommodation doctrine in the US or Canada would necessarily depend on the specific facts of each case.

The enforcement of the dominant and servient estates' rights at common law is complicated where, in addition to the mineral and surface estates, a distinct pore space estate has been created through the legislative vesting of pore space ownership or rights in the government or the conveyance of pore space from the surface estate to a third party. In Alberta, for example, there may be separate surface and mineral owners, as well as the pore space estate held by the Crown.

Further, a number of jurisdictions have adopted statutes, regulations, or rules that modify or override the common law principles governing priority of subsurface uses, and others may likely follow with the advancement of CCS projects. A comprehensive review of how conflicts will be moderated in those jurisdictions that have modified the common law principles is beyond the scope of this article. Instead, the following section focuses on the vanguard example of Alberta, where numerous historical and emerging subsurface resource interests exist, CCS project development is comparatively advanced, and there are a variety of common law and legislative modifications that will guide the adjudication of conflicts of subsurface rights.

## B. CONFLICTS OF SUBSURFACE RIGHTS IN ALBERTA

### 1. SOURCES OF POTENTIAL CONFLICTS

Alberta is endowed with a bounty of geological resources for which there is a long history of conflicts of subsurface rights dating to the early days of resource extraction and the initial

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114 *Getty Oil Co v Jones*, 470 SW (2d) 618 (Tex Sup Ct 1971) at 621 [*Getty Oil*].

115 Schremmer, *supra* note 3 at 415, citing *Getty Oil*, *supra* note 114 at 622–67.

116 Schremmer, *supra* note 3 at 416, citing *Valence Operating Co v Texas Genco, LP*, 255 SW (3d) 210 at 218 (Tex App Ct 2008) and *Diamond Shamrock Corp v Phillips*, 511 SW (2d) 160 (Ark Sup Ct 1974).

conveyancing practices of the owners of mines and minerals.[117] The disputes that have occurred over the past century predominantly arose from widely held mineral rights — the boundaries of which subsurface reservoirs and minerals rarely follow — and split titles arising from the thousands of conveyances of different constituent resources that make up the broader bundle of "mines and minerals."[118] Regulatory and judicial resolutions of historical disputes provide the foundation with which future conflicts of subsurface rights are likely to be decided.

For example, in *Borys v. Canadian Pacific Railway Co*, the Judicial Committee of the Privy Council considered whether the reservation of "petroleum" in a conveyance of land in fee simple from the Canadian Pacific Railway Company (CPR) to Mr. Borys included the rights to natural gas in the Leduc Woodbend Field.[119] Following the conveyance, CPR leased the petroleum rights beneath Borys' surface estate to the discoverer of the Woodbend Field, Imperial Oil Ltd. (Imperial).[120] The Privy Council upheld the finding of the Alberta Court of Appeal that "petroleum" included solution gas that exsolves from oil as reservoir pressure and temperature decline, but primary gas caps that exist at undisturbed reservoir conditions are distinct from petroleum and thus were not included in the CPR reservation.[121]

In the split title scenario in *Borys*, the Privy Council also agreed with the Alberta Court of Appeal that the reservation of "petroleum" in the original conveyance "necessarily implies the existence of power to recover it and of the right of working."[122] The Court of Appeal held that, subject to the "observance of all relevant provisions and regulations," Imperial was entitled to drill through the primary gas caps and recover some of Borys' gas incidental to oil production.[123] The 75-year-old *Borys* precedent still guides the adjudication of subsurface rights in Alberta today[124] and is now reflected under sections 58 and 59 of the *MMA*. Specifically, the *MMA* provides that holders of subsurface rights — including mineral rights, storage rights, pore space rights for CCS, and geothermal rights — may work through the pore space and all minerals within and outside the tract to which their rights extend to the extent necessary to access their respective resource without permission from or compensation to other subsurface rights holders, subject to applicable acts and regulations.[125]

As in the *Borys* case, the potential for future conflicts of subsurface rights involving CCS and other established and emerging industries remains rooted in (1) the widely held nature of

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117 See e.g. *Fuller (Plaintiff) Appellant v Garneau (Defendant) Respondent*, 1920 CanLII 720 (ABCA), rev'd 1921 CanLII 22 (SCC). See commentary in CC McCaul, "Exceptions and Reservations as Defects of Title" (1924) 2:3 Can Bar Rev 145 at 154–55.

118 Nigel Bankes, "Disputes Between the Owners of Different Subsurface Resources" in Donald N Zillman et al, eds, *The Law of Energy Underground: Understanding New Developments in Subsurface Production, Transmission, and Storage* (Oxford: Oxford University Press, 2014) 433 at 433 [Bankes, "Subsurface Resources"].

119 1953 CanLII 414 (JCPC) [*Borys* JCPC].

120 *Ibid* at 67.

121 *Borys v Canadian Pacific Railway Company*, 1952 CanLII 337 at 230 (ABCA) [*Borys* ABCA]; *Borys* JCPC, *supra* note 119 at 73–74.

122 *Borys* JCPC, *supra* note 119 at 75.

123 *Borys* ABCA, *supra* note 121 at 230.

124 See e.g. *Signalta Resources Limited v Canadian Natural Resources Limited*, 2023 ABKB 108 at paras 779–83, aff'd 2025 ABCA 306 [*Signalta*].

125 *MMA*, *supra* note 24, ss 58–59. Section 59, however, does not explicitly confer the right of CCS operators to work through pore space and minerals outside the ownership tract.

mineral rights in Alberta (that is, Crown versus freehold mineral ownership), and (2) split title situations that continue to arise from the disposition of rights to different resources and subsurface activities in the same subsurface tracts. The following sections briefly introduce the nature of these sources of potential conflicts.

a. Widely Held Mineral Rights

The history of mineral ownership in Alberta is rooted in Confederation and the settlement of Western Canada. Following the enactment of the *British North America Act, 1867*,[126] and the *Rupert's Land Act, 1868*,[127] the Hudson's Bay Company (HBC) transferred Rupert's Land to the Union of Canada in 1870 and was granted up to 50,000 acres of land in fee simple around its trading posts and one-twentieth of the fertile belt in what would become the provinces of Alberta, Saskatchewan, and Manitoba.[128] In the 1880s, the Canadian government also granted 25 million acres of land in fee simple to the CPR for the purpose of settling the West.[129]

The Canadian government also granted lands to homesteaders without reservation until 1887, at which point it began reserving mines and minerals to the Crown.[130] Likewise, both the HBC and CPR sold tracts of their lands to settlers in the late 1800s and early 1900s. The CPR began reserving coal from the lands it sold to settlers in 1902, then coal and petroleum in 1905, and finally all mines and minerals in 1912, while the HBC began reserving mines and minerals from its grants in 1908.[131]

As a result, there are thousands of freehold mineral titles in Alberta, including split titles to different resources beneath the same surface tract. Today, the Crown in right of Alberta owns over 80 percent of the subsurface minerals; the successors to the HBC, CPR, and other railway companies hold approximately 7.28 percent of the subsurface minerals; private individuals hold approximately 0.55 percent; and the Government of Canada holds approximately 9.20 percent of minerals beneath federal lands.[132] As discussed in Part I, however, the provincial Crown owns the pore space coincident with those minerals rights, with the exception of pore space beneath federal lands, overriding potential arguments regarding the implicit conveyance of pore space ownership in historical land transactions.[133]

Figure 1 depicts the spatial distribution of non-Crown mineral ownership in Alberta. The adjacency of different tracts of mineral ownership is one source of potential conflict as CCS operations may intersect multiple tracts of mineral ownership. In particular, the dense concentration of freehold minerals in the lower third of Alberta is a prominent source of

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126 30 & 31 Vict, c 3 (UK).

127 31 & 32 Vict, c 105 (UK).

128 See Chester Martin, *"Dominion Lands" Policy*, ed by Lewis H Thomas (Toronto: McClelland and Stewart, 1973) at 5.

129 *Alberta Energy Company Ltd v Goodwell Petroleum Corporation Ltd*, 2003 ABCA 277 at para 34 [*Goodwell*]; *Anderson v Amoco Canada Oil and Gas*, 2004 SCC 49 at paras 3–7 [*Anderson*].

130 John Ballem, *The Oil and Gas Lease in Canada*, 4th ed (Toronto: University of Toronto Press Incorporated, 2008) at 12.

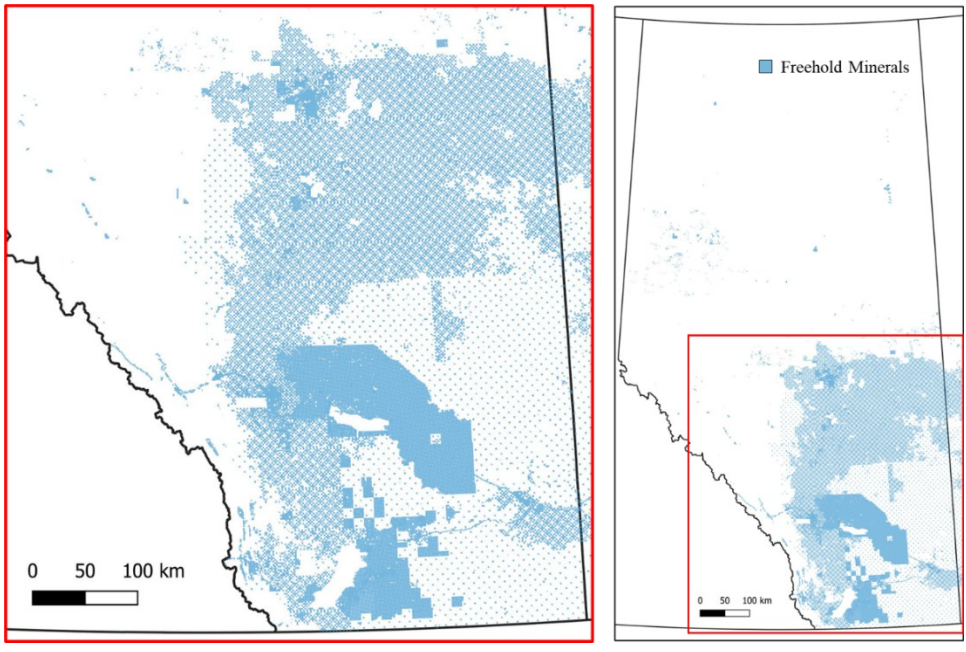
131 *Goodwell*, *supra* note 129 at para 34; *Anderson*, *supra* note 129 at paras 3–7; Bankes "Subsurface Resources", *supra* note 118 at 434.

132 Alberta, *Mineral Ownership Fact Sheet* (Edmonton: Government of Alberta, 2020), online: [perma.cc/V6MB-V73G].

133 *MMA*, *supra* note 24, s 15.1; see *supra* note 24 and accompanying text.

potential conflict as those freehold rights coincide with reservoirs that are the focus of legacy conventional oil and gas operations, lithium extraction from brines, gas storage, disposal operations, and CCS.

**FIGURE 1:**
**NON-CROWN (FREEHOLD) MINERALS IN ALBERTA**




b. Split Titles and the Rights to Different Resources and Subsurface Activities

The second overarching source of subsurface conflicts that CCS operators in Alberta may face is the Crown's practice of granting the rights to different resources and subsurface activities to separate entities. Tenure rights to Crown-owned petroleum and natural gas (PNG)),[134] bitumen,[135] brine-hosted minerals such as lithium,[136] geothermal resources,[137] and pore space for CCS[138] are administered under separate enactments, giving rise to split titles to those resources where the Crown has granted overlapping tenure rights. Further, the rights

134 *Petroleum and Natural Gas Tenure Regulation*, Alta Reg 263/1997. PNG includes helium (Alberta, "Helium: Facts and Figures" (Edmonton: Government of Alberta, 2023), online (pdf): [perma.cc/99H4-L8T4]).
135 *Oil Sands Tenure Regulation, 2020*, Alta Reg 92/2020.
136 *Metallic and Industrial Minerals Tenure Regulation*, Alta Reg 265/2022 [*MIMTR*].
137 *Geothermal Resource Tenure Regulation*, Alta Reg 251/2021.
138 *CSTR*, *supra* note 5.

to dispose of or store substances in the subsurface, or to produce saline water for other subsurface operations, may be granted separate from the foregoing tenure rights.[139]

In *Goodwell*, the Court of Appeal lamented the Alberta government's practice of leasing the rights to PNG separate from the rights to bitumen in the oil sands areas of northeast Alberta, as it gave rise to the gas-over-bitumen disputes of the late 1990s and early 2000s.[140] Whereas those disputes concerned priority and sterilization issues regarding the recovery of different hydrocarbons, the Province now faces increasingly complex split title scenarios with the emergence of new subsurface industries, including brine-hosted mineral extraction, geothermal, and CCS.

### 2. ALBERTA CCS PROJECTS

Since at least the early 2000s, the deep, regional-scale saline aquifers and depleted oil and gas fields of the Alberta Basin have been identified as highly favourable targets for CCS.[141] However, the legislative amendments that established the framework for industrial-scale CCS in the province — including the vesting of pore space in the Crown — were not enacted until 2010.[142] On 27 May 2011, Shell Canada Limited was issued six contiguous sequestration leases spanning 39 ⅓ townships (3,625 $km^2$) of pore space below the top of the Elk Point Group northeast of Edmonton for the Quest CCS project, which involves the sequestration of $CO_2$ captured from hydrogen manufacturing units at the Scotford Upgrader.[143] The final regulatory approval for the Quest sequestration scheme was issued on 10 July 2012,[144] and over 9 million tonnes of $CO_2$ have been injected into the 35 to 40 metre thick Basal Cambrian Sandstone reservoir since operations commenced in 2015.[145]

The Quest project has been relatively non-contentious with respect to conflicts of subsurface rights. This can be attributed to a number of factors, including, among other things:

1. The Basal Cambrian Sandstone reservoir sits on top of the Precambrian basement at depths spanning 1,800 to 2,100 metres and was penetrated by only four legacy wells that were abandoned decades prior to the commencement of CCS operations;[146]

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139 For example, Crown PNG Agreements entail produced water disposal rights, subject to obtaining a disposal licence from the AER; if an operator wishes to inject produced water into undisposed Crown minerals, they must obtain a separate Crown Mineral Activity Authorization (Alberta, Ministry of Energy and Minerals, Bulletin 2019-01, "Mineral Rights Information" (Edmonton: Energy and Minerals, 2019).

140 *Goodwell*, *supra* note 129 at paras 2–4; for an overview of the essence of the gas-over-bitumen disputes, see *Signalta*, *supra* note 124 at paras 760–61.

141 See Stefan Bachu et al, *Suitability of the Alberta Subsurface for Carbon-Dioxide Sequestration in Geological Media*, Earth Sciences Report 00-11 (Edmonton: Alberta Energy and Utilities Board, Alberta Geological Survey, 2000).

142 *CCS Amendment Act*, *supra* note 24.

143 *Quest CCS*, *supra* note 8 at para 10; Shell Canada Energy, *Quest Carbon Capture and Storage Project: Annual Summary Report* (Edmonton: Government of Alberta, 2023) at 1 [*Shell Canada 2023*].

144 *Quest CCS*, *supra* note 8.

145 *Shell Canada 2023*, *supra* note 143 at 1-1.

146 *Quest CCS*, *supra* note 8 at paras 115, 126.

2. The sequestration complex is devoid of hydrocarbons, with the nearest hydrocarbon pool more than 1,000 meters above it;[147]

3. The laterally unconfined nature of the aquifer renders it unsuitable for natural gas storage;[148]

4. The area is tectonically quiet with no major faults at risk of reactivation and induced seismicity;[149]

5. There are no salt storage caverns within proximity of the injection wells that pose a threat to the seal integrity of the sequestration complex;[150]

6. There are only a handful of freehold mineral owners with rights that overlap the sequestration complex in the southern part of the lease area, relatively far away from the injection wells;[151] and

7. Alberta Energy and Minerals has reserved from disposition all Crown minerals within the Quest lease area, effectively removing the potential for oil and gas or brine-hosted mineral exploration.[152]

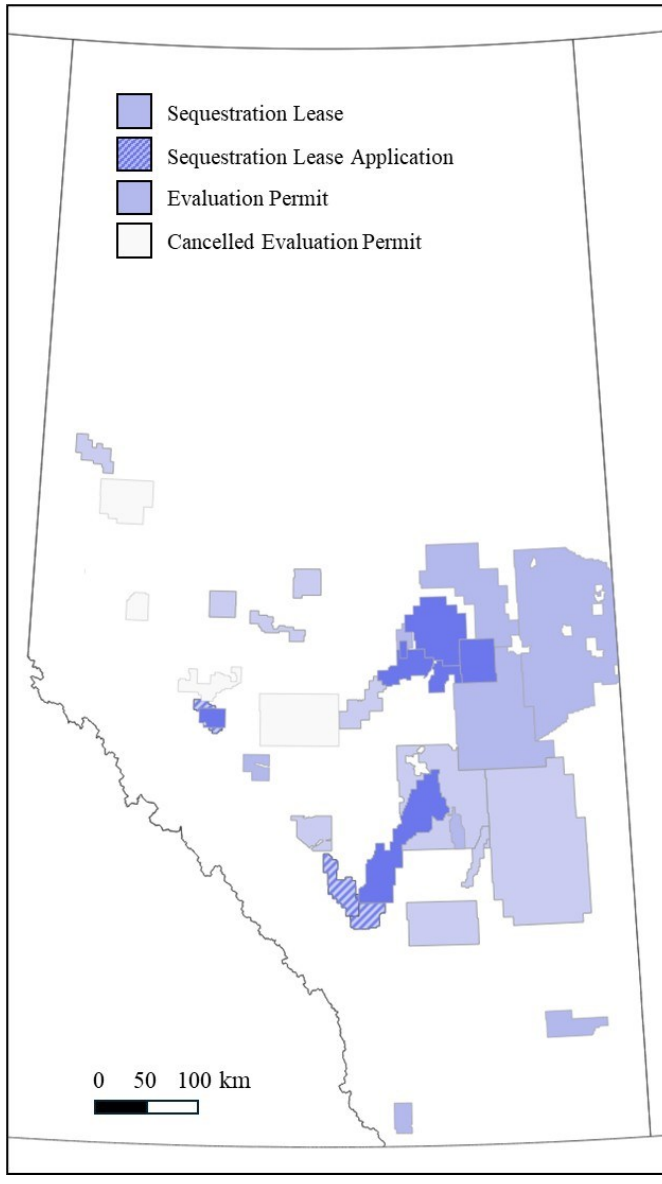
Quest may have been an anomaly in that CCS projects that have been issued pore space tenure rights since Quest was permitted may increasingly intersect other subsurface interests, including emerging subsurface industries such as brine-hosted mineral extraction and geothermal. Throughout 2021 and 2022, the Government of Alberta undertook a competitive process for the selection of "carbon storage hub" projects to facilitate the sequestration of $CO_2$ captured from multiple emitters.[153] This resulted in the issuance of evaluation permits for 25 CCS hub projects.[154] The target of 12 of those projects included Devonian-aged carbonate reservoirs in the Wabamun, Winterburn (Nisku Formation) and Woodbend groups (Leduc, and Cooking Lake formations); 11 included the Basal Cambrian Sandstone of the Elk Point Group; two included the Permian-aged Belloy Formation; and two included the Mississippian-aged Turner Valley Formation.[155]

At the time of writing, at least four CCS hub projects that were originally selected have been cancelled, six have graduated beyond the evaluation permit phase to the sequestration

147 *Ibid* at paras 121, 131–32, 180, 187.
148 *Ibid* at paras 131, 188.
149 *Ibid* at para 118.
150 *Ibid* at para 133. The evaporite (i.e., salt) formations that overlie the Basal Cambrian Sandstone serve as seals for the sequestration complex.
151 *Ibid* at para 123.
152 *Ibid* at para 122; Alberta Energy and Minerals, *Restriction Detail Report*, CCS 0006 01 Shell Canada Limited - Quest CCS (Edmonton: Government of Alberta, 2010), online (pdf): [perma.cc/8DRX-3TTY].
153 For an overview of the development Alberta's CCS hub approach, see Kerri Howard et al, "Pore Space as a Resource: A Discussion of the Policy and Regulatory Framework for Carbon Capture, Utilization, and Storage", (2023) 61:2 Alta L Rev 183 at 198–99.
154 *Ibid* at 198.
155 See Government of Alberta, "Carbon Capture, Utilization and Storage - Carbon Sequestration Tenure", online: [perma.cc/HF2Y-4MK9] (at the time of writing, only 24 hubs were represented, with the Grande Prairie CCS Hub having been removed).

lease phase, and two projects have obtained final regulatory approval of the proposed sequestration schemes from the Alberta Energy Regulator (AER).[156] A map depicting the location of the current CCS hub projects as of the time of writing is included in Figure 2, below.[157]

**FIGURE 2. ALBERTA CCS HUB PROJECTS**




[156] *Class III Scheme of Bison Low Carbon Ventures Inc* (19 February 2025), Approval No 13419, online: Alberta Energy Regulator [perma.cc/69DB-QXY9]; *Class III Scheme of Enhance Energy Inc* (20 July 2024), Approval No 13463, online: Alberta Energy Regulator [perma.cc/NG9Y-8QR4].

[157] To view the most current distribution of Crown pore space tenure, see Government of Alberta, "Carbon Sequestration and Pore Space", online: <gis.energy.gov.ab.ca/Geoview/CarbonSequestration>

As one or more of Alberta's CCS hub projects progress through commercial negotiations and regulatory approvals, proponents may face a variety of potential conflicts of subsurface rights. Some of those potential conflicts and the statutes, regulations, and rules that will shape them are briefly discussed in the following section.

### 3. POTENTIAL CONFLICTS IN ALBERTA

#### a. CCS and Oil & Gas

In 2023 and 2024, there were approximately 23,000,000 hectares (230,000 $km^2$) of land subject to approximately 65,000 active Crown PNG agreements in Alberta.[158] To avoid direct operational conflicts between CCS and PNG interests, the *Oil and Gas Conservation Act*[159] and AER's *Directive 065: Resources Applications for Oil and Gas Reservoirs*[160] stipulate that CCS proponents must demonstrate that the injection of $CO_2$ will not have a detrimental effect on hydrocarbon recovery, and consent may be required from existing Crown PNG lessees and freehold mineral owners whose interests intersect the anticipated final extent of the $CO_2$ plume plus 1.6 km.[161]

Accordingly, CCS proponents may inject $CO_2$ into both saline aquifers and depleted oil and gas reservoirs, provided they do not interfere with oil and gas recovery. To mitigate the recapture of $CO_2$ or loss of storage integrity once a CCS project is permitted, the Crown may be able to restrict dispositions of PNG tenure that would intersect a sequestration complex.[162] However, where a CCS project intersects freehold minerals, those freeholders and their lessees may still retain the right to drill into and through a sequestration complex indefinitely.[163] Further, in situations where a sequestration complex is in proximity to low-permeability oil and gas reservoirs, the hydraulic fracturing of those reservoirs may pose a risk to $CO_2$ storage integrity if fractures propagate into the sequestration complex or if faults that penetrate the sequestration complex are reactivated (that is, induced seismicity).[164]

#### b. CCS and Subsurface Storage

The Ministry of Energy and Minerals' disposition of CCS tenure rights may be complicated by the separate ownership of storage rights to PNG or, in future, hydrogen. Amendments to the *MMA* in 1994[165] and 2010[166] established that subsurface storage rights reside with the owner of PNG (that is, either Crown or freehold mineral owners),[167] while the ownership of pore space for the purposes of CCS is vested in the Crown.[168] This includes the

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158 Government of Alberta, "Tenure statistics" (2025), online: [perma.cc/35LK-ME3C].
159 RSA 2000, c O-6, s 39 [*OGCA*].
160 (Calgary: AER, 12 November 2024), Unit 4, online (pdf): [perma.cc/E69R-FCE6] [*Directive 065*].
161 *Directive 065*, *supra* note 160, unit 4.
162 See *supra* note 152 and accompanying text.
163 *Quest CCS*, *supra* note 8 at para 123; *MMA*, *supra* note 24, s 58.
164 See e.g. *Enhance Energy Directive 065 Application*, *supra* note 9 at 72 (Figure 39 shows historical, basement seated, magnitude 2.17 and 2.41 ml earthquakes with a focal points near the Leduc Formation edge within a 20 km radius of the proposed $CO_2$ injection well).
165 *Mines and Minerals Amendment Act*, SA 1994, c 22.
166 *CCS Amendment Act*, *supra* note 24.
167 *MMA*, *supra* note 24, s 57.
168 *Ibid*, s 15.1.

storage rights to solution-mined salt caverns, which reside with the mineral owner.[169] In situations where the Crown has granted CCS rights to pore space within freehold mineral tracts, conflicts may thus arise between freehold storage rights and CCS leases of Crown-owned pore space.

Such conflicts will be mitigated to an extent by the *OGCA* and *Directive 065*, which restrict the AER's authority to approve $CO_2$ sequestration schemes that would interfere with an existing use of the subsurface for the storage of oil or gas.[170] Recently, however, concerns have been raised regarding the sterilization of prospective storage reservoirs with the advancement of CCS hub projects targeting the Basal Cambrian Sandstone. In the east central part of the province, for example, the Prairie Evaporite, Cold Lake Salt, and Lotsberg Salts overlie the Basal Cambrian Sandstone and have historically been utilized for gas and liquids storage. Those salts may serve as secondary and tertiary seals for $CO_2$ injected into the Basal Cambrian Sandstone,[171] limiting the potential future use of those salts for cavern storage operations.[172]

c. CCS and Disposal

As water disposal may be necessarily incidental to the production of oil and gas, disposal rights generally accompany freehold and Crown PNG leases.[173] The rights to conduct subsurface disposal operations that are not subject to Crown PNG tenure agreements are administered through Crown Mineral Activity Authorizations.[174] With increasing need for subsurface disposal of water and other waste products from conventional and unconventional oil, gas, and bitumen extraction, we can also anticipate competition for pore space between disposal operations and emerging industries focused on saline aquifers, such as brine-hosted mineral extraction, geothermal, and CCS.[175] Where CCS and water disposal operations are co-located, as with hydraulic fracturing in proximity to sequestration complexes, the injection

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169 *Ibid*, s 57.

170 *OGCA*, *supra* note 160, s 39; *Directive 065*, *supra* note 160, unit 4.

171 At Shell's Quest CCS project, for example, the Lotsberg Salts and Prairie Evaporite serve as secondary seals (*Quest CCS*, *supra* note 8 at para 138).

172 In November 2024, for example, a coalition of First Nations requested the designation of the Pathways CCS hub for a federal impact assessment under section 9(1) of the *Impact Assessment Act*, SC 2019, c 28 based, in part, on perceived adverse impacts on their ability to develop salt storage caverns: Tribal Chiefs Ventures Pathways Working Group, *Request for Designation of Project*, 159929E (Ottawa: Canada Impact Assessment Registry, 28 November 2024) at 8, 13, online (pdf): [perma.cc/V85N-WEYT].

173 See *supra* notes 104–06, regarding the dominance of the mineral estate.

174 Alberta, *Crown Mineral Activity (CMA) Authorizations* (Edmonton: Government of Alberta, 2023), online (pdf): [perma.cc/SLK9-B42H].

175 See e.g. *Pure Environmental Waste Management Ltd, Regulatory Appeal of Approval WM 211 for Pure Environmental Waste Management Ltd.'s Hangingstone Facility* (27 February 2020), 2020 ABAER 004 at paras 104–05, online: Alberta Energy Regulator [perma.cc/Q3EH-JYVK] (Suncor opposed the applicant's waste disposal operations in the Keg River Formation on the basis that, in part, those operations would consume the limited and valuable disposal capacity that Suncor depended on for future bitumen operations). In another instance, having shut-in productive oil wells due to insufficient capacity for disposal of produced water (*Canadian Natural Resources Limited, Application for Disposal, Lloydminster Field* (28 July 2014), 2014 ABAER 008 at para 20, online: Alberta Energy Regulator [perma.cc/GBQ5-BTLR]), the applicant applied for authorization to dispose of produced water in the Dina Formation after encountering difficulties injecting in the underlying Moberly and Cooking Lake formations (*ibid* at para 4); the application was opposed by EnerT on the basis that additional disposal would prejudice its own disposal operations in the Dina Formation (*ibid* at para 64).

of large volumes of water for disposal may pose a risk of induced seismicity with the reactivation of existing faults that have the potential to jeopardize $CO_2$ storage integrity.

d. CCS and Brine-Hosted Minerals

The Government of Alberta's practice of granting overlapping tenure rights to pore space for CCS hubs and brine-hosted minerals such as lithium presents an acute source of conflict as proponents in both emerging industries advance projects pursuant to those rights. In particular, the Devonian-aged saline aquifers of the Leduc and Nisku formations contain moderately elevated concentrations of lithium and have been extensively staked by private companies in Alberta seeking to exploit direct lithium extraction technologies to produce lithium compounds for lithium-ion batteries.[176] CCS hub proponents have also been issued evaluation permits and sequestration leases to a number of those same saline aquifers.[177]

With rising interest in the exploration and development of critical minerals like lithium in the province, Alberta launched a critical minerals strategy in 2021 to promote the development of mineral resources other than oil and gas, which was followed by the enactment and coming into force of the *Mineral Resources Development Act* in 2021 and 2023, respectively.[178] The *MIMTR* was also re-enacted in an amended form under the *MMA* in 2023, bifurcating the tenure rights to rock-hosted and brine-hosted metallic and industrial minerals.[179]

The bifurcation under the *MIMTR* enabled the existing holders of the rights to Crown brine-hosted minerals to obtain five-year brine-hosted minerals licences.[180] Brine-hosted mineral licensees and parties who do not hold transitional licenses can apply for 10-year brine hosted minerals leases where the rights are available, which grant "the exclusive right to win, work and recover brine-hosted metallic and industrial minerals that are the property of the Crown."[181] Similar to Crown PNG leases, brine-hosted minerals leases can be extended indefinitely beyond the primary term in respect of stratigraphic zones that are deemed to be productive.[182]

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176 For an overview of the rising interest in lithium-brine resources for battery-electric vehicles and Alberta's lithium potential, see Rudiger Tscherning & Brady Chapman, "Navigating the Emerging Lithium Rush: Lithium Extraction from Brines for Clean-tech Battery Storage Technologies" (2021) 39:1 J of Energy & Natural Resources L 13.

177 To view the most current distribution of Crown metallic and industrial mineral tenure and its overlap with Crown pore space tenure, see Government of Alberta, "Metallic and Industrial Minerals", online: [perma.cc/6YHT-V456] [Alberta MIM Tenure].

178 Alberta, Ministry of Energy, *Renewing Alberta's Mineral Future: A Strategy to Re-energize Alberta's Minerals Sector* (Edmonton: Government of Alberta, 2021) online (pdf): [perma.cc/YLH5-4AYF]; *Mineral Resources Development Act*, SA 2021, c M-16.8 [*MRDA*].

179 *MIMTR*, *supra* note 136, s 85. Prior to the coming into force of the current form of the regulation, all metallic and industrial minerals — whether present in solid rock (rock-hosted) or dissolved in saline groundwater (brine-hosted) — were subject to a single tenure instrument: either a metallic and industrial minerals permit (*Metallic and Industrial Minerals Tenure Regulation,* Alta Reg 145/2005, Part 1) or lease (*ibid*, Part 3).

180 *MIMTR*, *supra* note 136, ss 73, 77. Brine-hosted minerals licences fall under the transitional provisions of the new *MIMTR* and are designed to bridge the gap between former metallic and industrial mineral permits and brine-hosted tenure rights.

181 *Ibid*, ss 49, 51, 79.

182 *Ibid*, s 52.

The *MIMTR* and *MRDA*, together with the *Brine-hosted Mineral Development Rules* and *Mineral Resource Development Regulation* enacted under the *MRDA*, established the framework for brine-hosted mineral exploration and development in Alberta.[183] The *MRDA* also consolidates the regulation of brine-hosted mineral exploration and development under the AER, which subsequently issued *Directive 090: Brine-Hosted Mineral Resource Development*.[184]

The issue of overlapping brine-hosted mineral rights and pore space rights for CCS most recently came to a head in the application of a CCS hub proponent for approval under *Directive 065* of a $CO_2$ sequestration scheme in the Leduc Formation southwest of Clive, Alberta.[185] A prominent lithium company with Crown brine-hosted mineral licences to the same saline aquifer and over 30 freehold mineral owners submitted statements of concern in response to the application, asserting that the injection of $CO_2$ into the aquifer would adversely affect their mineral interests.[186]

The lithium company's statement of concern noted it raised its concerns with the CCS hub proponent for three years prior to the application and asserted that, among other things, the injection of $CO_2$ into the saline aquifer will "significantly, adversely and irreversibly change" (1) the brine chemistry through the formation of carbonic acid (that is, acidification); (2) the gas-to-water ratio of the brine, resulting in the production of $CO_2$ with brine (that is, recapture); and (3) the permeability of the reservoir through the acidification of pore waters, causing the surrounding carbonate rock matrix to dissolve and recrystallize, occluding the reservoir's porosity and restricting brine production rates.[187] In essence, the concerns raised by the lithium company and other freeholders centered on sterilization of the lithium resource.

The AER decided not to hold a hearing to consider the concerns raised by the lithium company and freeholders and proceeded to approve the proposed sequestration scheme under *Directive 065*.[188] Its decision was premised, in part, on the fact that the only brine-hosted mineral activity in the subject aquifer at that time was conducted pursuant to brine-hosted mineral licences, whereas brine-hosted mineral leases would be required for commercial production. The AER thus characterized the prospects of economic brine-hosted mineral recovery as "speculative."[189] Further, the AER dismissed concerns regarding the cumulative

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183 *Brine-hosted Mineral Resource Development Rules*, Alta Reg 17/2023; *Mineral Resource Development Regulation*, Alta Reg 264/2022.

184 Alberta Energy Regulator, *Directive 090: Brine-Hosted Resource Development* (Calgary: AER, 7 February 2025), online: [perma.cc/GJR7-PHCK] [*Directive 090*].

185 *Enhance Energy Directive 065 Application*, *supra* note 9 at 72.

186 E3 Lithium Ltd, *E3 Objection to Enhance CO2 Sequestration Application 1956215*, SOC No 32667 (13 January 2025), online: [perma.cc/L5QQ-MXEB] [*E3 SOC*]. See also Freehold Petroleum & Natural Gas Owners Association, *FHOA Statement of Concern re Enhance Energy Inc Application 1956215*, SOC 32650 (13 January 2025), online: [perma.cc/28Y7-2REB].

187 *Ibid* at 2–3.

188 AER, *Disposition Letter re E3 Lithium Ltd Statement of Concern re Enhance Energy Inc Application 1956215*, SOC 32667 (30 July 2025), online: Alberta Energy Regulator [perma.cc/TBV8-R6AF]; AER, *Disposition Letter to PrairieSky Royalty Ltd Statement of Concern re Enhance Energy Inc Application 1956215*, SOC 32656 (30 July 2025), online: Alberta Energy Regulator [perma.cc/ZBK8-AFPM]; *Class III Scheme of Enhance Energy Inc* (20 July 2025), Approval No 13463, online: Alberta Energy Regulator [perma.cc/ZS6Y-6GNM].

189 *Ibid*.

effects of future injection wells contemplated by the proposed sequestration scheme on the basis that potential additional wells were beyond the scope of the subject application.[190]

The statements of concern submitted by freeholders also raised a novel issue regarding the ownership of brine-hosted minerals coincident with freehold mineral rights, which are interspersed in a dense checkerboard pattern across the subject Leduc aquifer. Nigel Bankes has posited that the rights to brine-hosted minerals belong to the province as a result of the historical vesting of all water in the provincial Crown under the *Water Act*.[191] Among other things, Bankes' position also relies on the *obiter* suggestion of the Supreme Court of Canada in *Anderson* that hydrocarbons dissolved in connate water under original reservoir conditions may belong to the Crown pursuant to the *Water Act*'s vesting provision.[192] The AER's decision dismissing the concerns raised by the lithium company and freehold mineral owners did not directly address this ownership issue.

If the Crown indeed owns all brine-hosted minerals across the province by virtue of its title to water, that will certainly resolve the claims of freeholders to the lithium and other brine-hosted minerals in saline aquifers, resulting in less opposition to CCS projects that intersect those aquifers. Regardless of whether Bankes' ownership theory is correct, the consequences would be difficult to square with the Alberta government's treatment of brine-hosted minerals coincident with freehold minerals. Following the government's promotion of brine-hosted minerals like lithium over the past several years and the legislature's enactment of a novel tenure system bespoke to those resources, to the authors' knowledge, Alberta Energy and Minerals has not issued tenure to brine-hosted minerals that coincide with freehold minerals, presumably on the assumption that it does not own those rights. This has resulted in noncontiguous tracts of Crown brine-hosted mineral tenures interspersed amongst freehold mineral tracts across parts of the province, prompting some lithium companies to enter into separate freehold brine leases.[193] The Government of Alberta thus faces the difficult task of deciding whether to clarify the ownership of brine-hosted minerals through legislation or leave the issue to the AER and the courts, the resolution of which risks further delays to the approval of CCS projects.

In the event brine production for the extraction of lithium or other minerals and $CO_2$ sequestration proceed in the same aquifer, *Directive 090* provides that the brine producer must propose a minimum setback for its wells from the brine-hosted mineral lease boundary to avoid adversely affecting adjacent subsurface operations, including $CO_2$ injection.[194]

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190 AER, *Disposition Letter re FHOA Statement of Concern re Enhance Energy Inc Application 1956215*, SOC 32650 (30 July 2025), online: Alberta Energy Regulator [perma.cc/9DGN-6CG7] [AER, *FHOA Letter*].

191 Nigel Bankes, "Who Owns Brine-Hosted Minerals in Alberta?" (14 February 2025) online (blog): [perma.cc/W6W8-359D] [Bankes, "Brine-Hosted Minerals"]; *Water Act*, RSA 2000, c W-3, s 3.

192 *Anderson*, *supra* note 129 at para 13. The Supreme Court's comment was made with reference to the Alberta Court of Appeal's determination that, unlike natural gas that exsolves from petroleum as reservoir pressure is drawn down and the petroleum is produced, natural gas that exsolves from water does not belong to the petroleum owner because water is a distinct substance with a separate legal status (*Anderson v Amoco Canada Oil and Gas*, 2002 ABCA 162 at para 53).

193 See Alberta MIM Tenure, *supra* note 177; E3 Lithium Ltd, News Release, "E3 Lithium and Imperial Finalize Freehold Mineral Land for E3's Clearwater Project" (3 March 2025) online: [perma.cc/FK4Z-ZP5R].

194 *Directive 090*, *supra* note 184, s 3.

However, *Directive 090* does not address minimum setbacks from the location of the adjacent operations themselves, which may be conducted under a carbon sequestration lease that overlaps a brine-hosted mineral lease. Nor do the *OGCA* or *Directive 065* address minimum setbacks for the area of influence of a $CO_2$ sequestration scheme from adjacent brine-hosted mineral operations. The present regulatory regime thus appears to be inadequate for mitigating interference between CCS and brine-hosted mineral operations that may converge on the same sections of Alberta's subsurface.

## IV. MITIGATING AND RESOLVING CONFLICTS

As CCS projects increasingly intersect other subsurface interests, the mitigation and resolution of conflicts of subsurface rights will be critical to the success of those projects. Canadian and US jurisdictions have developed different approaches to addressing conflicts arising from CCS. This section begins with a discussion of statutory regimes that provide for compensation to affected mineral and pore space owners whose rights intersect a CCS project. In the absence of such a statutory scheme and where the Crown owns the pore space (that is, where there is no statutory right or mechanism for compensation to pore space owners), third-party rights holders may intervene in regulatory applications for the approval of CCS operations or request regulatory intervention once operations have commenced. If such intervention is unsuccessful and the regulator approves operations that adversely impact each other, the only remaining recourse may be to the courts. To mitigate potential conflicts and litigation at the outset of a project, CCS proponents may also seek to enter into commercial agreements with third parties before or after acquiring pore space rights.

### A. COMPENSATION REGIMES

Compensation regimes vary across jurisdictions and are inextricably linked to constitutional protections for property rights, or the lack thereof. As noted in Part I, the Fifth Amendment to the US Constitution expressly prohibits the taking of private property for public use without just compensation. Furthermore, the constitutions of the various states also generally protect property rights, adding an additional layer of protection for the holders of such rights. Canada does not have a constitutional equivalent, which has enabled provinces to effect takings without compensation. Consequently, the availability of compensation to a holder of a right to pore space varies greatly across Canada and the US. The following sections briefly canvass the spectrum of compensation regimes (and the lack thereof) through the examples of North Dakota, Manitoba, Ontario, and Alberta.

#### 1. NORTH DAKOTA

The example of North Dakota Senate Bill 2344 illustrates the connection between the right to compensation for the use of pore space and the constitutionally entrenched protections for property rights in the US.[195] Among other things, Senate Bill 2344 permitted oil and gas operators to use subsurface pore space and denied surface owners the right to exclude others from the pore space under their land or to demand compensation for the use of that pore space.[196] The North Dakota Supreme Court held that (1) surface owners have a

[195] US, SB 2344, *An act to create and enact section 47-31-09 of the North Dakota Century Code*, 66th Leg Assem, Reg Sess, N Dak, 2019.

[196] *NW Landowners*, *supra* note 67 at para 3.

constitutionally protected property interest in the pore space below their land,[197] and (2) the provisions of Senate Bill 2344 that prohibited surface owners from demanding compensation for the physical occupation of their pore space amounted to an unconstitutional taking under both the state and federal constitutions.[198]

Long before the introduction of Senate Bill 2344, North Dakota law had established that surface owners have a property interest in the pore space below their estates.[199] The enactment of legislation in 2009 vesting title to pore space in the overlying surface estate merely codified the existing law.[200] State law also grants surface owners the right to compensation for the use of their pore space where that pore space is used for disposal and storage operations associated with the production of oil and gas.[201] In the CCS context, state law holds a CCS operator liable for any damage stored $CO_2$ may cause, including damage caused by $CO_2$ that escapes from the sequestration complex or any equipment ancillary thereto, while the CCS operator holds title to the $CO_2$.[202]

### 2. MANITOBA

Upon the *CCSA* being proclaimed into force, the pore space below the surface of all land in Manitoba will vest in the government and no compensation will be payable by the government as a result of the legislative vesting.[203] However, prior to obtaining a carbon storage licence, a CCS proponent will have to notify the holders of all other subsurface interests that intersect the proposed licence area and obtain either a compensation hearing waiver from an interested party or a compensation order fixing the amount payable to an affected person.[204] Compensation orders are to be issued following a hearing of the CCS proponent, the affected persons, and the director under the *CCSA* before a "subsurface rights compensation board."[205] Compensation will only be payable in circumstances where the board is satisfied that the storage of captured $CO_2$ will have a "material adverse impact on the affected person's interest."[206]

The requirement for a "material adverse impact" contrasts with the law in North Dakota, where mere "damage" is sufficient to warrant liability on the part of the CCS operator. The compensation process in Manitoba accompanies provisions of the *CCSA* that prohibit other drilling and well completions, mineral extraction, and injection operations within the carbon storage licence area.[207] While those prohibitions may be subject to discretionary exceptions, the presumptive sterilization of other freehold subsurface rights differs from Alberta where,

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197 *Ibid* at para 22.
198 *Ibid* at para 27.
199 *Ibid* at para 22.
200 N Dak Cent Code tit 47 ch 31 § 03; *NW Landowners*, *supra* note 67 at paras 20, 22; *Mosser*, *supra* note 68 at para 16.
201 N Dak Cent Code tit 38 ch 11.1 § 04; *NW Landowners*, *supra* note 67 at para 27; *Mosser*, *supra* note 68 at para 24.
202 N Dak Cent Code tit 38 ch 22 § 16.
203 *CCSA*, *supra* note 5, ss 5–6.
204 *Ibid*, s 18(1)(b).
205 *Ibid*, ss 54–56.
206 *Ibid*, s 57(2).
207 *Ibid*, s 59(1).

subject to complying with regulatory requirements, subsurface rights holders may work through third party interests to access the full extent of their rights.[208]

Manitoba's subsurface rights compensation board would be novel to Canada and has yet to be fully fleshed out. While it offers a dispute resolution mechanism for potential conflicts, compensation awards may be costly and disincentivize CCS project proponents. However, the statutory threshold requirement for a "material adverse impact" on an affected person's interest has the potential to play a gatekeeping role by, for example, requiring an affected person to demonstrate interference with their reasonable and foreseeable use of the subsurface.[209] Proving that the subsurface underlying the affected person's lands was simply invaded — either by an injection well, injected $CO_2$, or the resulting pressure front — may not be sufficient to support a claim for compensation.

### 3. ONTARIO

As noted in Part II, Ontario's draft *GCSA* deems that the rights to pore space form part of the surface estate, unless those rights have been severed from that surface estate.[210] The Ontario government may nevertheless promulgate regulations pursuant to which the government can acquire the rights to pore space under any land in the province adjacent to a Crown surface tract without the consent of the holder of the rights to that pore space.[211] The Ontario government may also issue regulations governing any compensation to be paid by the authorization holder to the pore space owners whose rights have been taken by and vested in the government.[212] Such regulations may include: the amount of any compensation or the manner of determining the amount of any compensation; the manner in which the compensation must be paid and the times at which it must be paid; and a requirement of confirmation that compensation has been paid.[213] An owner whose rights to pore space were taken by and vested in the Ontario government is not entitled to any compensation except that compensation, if any, required by the regulations.

The Ontario government will also have an opportunity to play a gatekeeping role by stipulating that compensation is only payable where there is a reasonable and foreseeable use of expropriated pore space into which $CO_2$ will be injected. The *GCSA* does not, however, address compensation to the holders of other subsurface interests whose operations may intersect a CCS project. To mitigate conflicts, the Ontario government could conceivably exercise its authority to make regulations under the *GCSA* that prohibit the issuance of research and evaluation or storage licences to designated public pore space, including existing gas storage areas, oil and gas reservoirs, or water disposal reservoirs.[214] Given the abundance of freehold surface tracts in southwest Ontario, however, conflicts may still arise where oil and gas or water disposal operations intersect privately owned pore space.

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208 *Borys* ABCA, *supra* note 121 at 237; *MMA*, *supra* note 24, ss 58–59; see also *Quest CCS*, *supra* note 8 at para 123.

209 *Cf*, *Chance v BP Chemicals Inc*, 670 NE 2d 985 at 992 (Ohio Sup Ct 1996) [*Chance*].

210 *GCSA*, *supra* note 4, s 7.

211 *Ibid*, s 8.

212 *Ibid*, s 9(3).

213 *Ibid*.

214 *GCSA*, *supra* note 4, s 11(4).

### 4. ALBERTA

In Alberta, there is no established legislative regime for compensation to parties whose subsurface interests are adversely affected by CCS operations. Those parties whose subsurface interests stand to be impacted by a CCS project may not be given standing to raise their affected interests until *after* pore space rights for CCS have been granted by Alberta Energy and Minerals. And, absent a direction from the executive branch, the AER would lack jurisdiction to award, approve, or deny compensation to third parties affected by CCS operations.[215] Indeed, in the foregoing example of brine-hosted mineral rights holders' opposition to a proposed $CO_2$ sequestration scheme in Alberta, the AER declined to address concerns regarding compensation for damages resulting from the sterilization of brine-hosted mineral resources on the basis that it lacked the jurisdiction to do so.[216] Accordingly, parties have limited recourse for compensation: they may request payment from the proponent in exchange for their cooperation, or seek regulatory intervention or bring a court claim once an adverse impact materializes.

## B. REGULATORY INTERVENTION

In Alberta, the AER is responsible for the full life cycle regulation of CCS projects, from the licencing of evaluation and injection wells[217] to the approval and oversight of monitoring, measurement, and verification plans,[218] the approval of sequestration schemes,[219] and the approval of closure plans and their execution upon the cessation of $CO_2$ injection.[220] The AER is not, however, involved in the administration of tenure rights to pore space — its role is limited to regulating the activities conducted under evaluation permits and sequestration leases in the public interest after they are issued by the Ministry of Energy and Minerals. Consequently, conflicts between CCS proponents and the holders of competing subsurface rights may be in the making prior to the AER's involvement. It is therefore necessary to look at the AER's broader statutory mandate to understand its role in managing potential conflicts. While this section focuses at a high level on the developing example of Alberta, similar principles may be applicable in other jurisdictions in which split titles prevail and multiple industries converge on the same pore space.

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215 *OGCA*, *supra* note 160, s 99 authorizes the Lieutenant Governor in Council to direct the AER to prepare a scheme for compensation for those rights holders who are injured or suffer a loss as a result of any orders issued under the Act, which could ostensibly apply to orders in respect of CCS activities. See also, *Goodwell*, *supra* note 129 at para 28.

216 AER, *FHOA Letter*, *supra* note 190.

217 *MMA*, *supra* note 24, ss 115–16.

218 *Ibid*. Pursuant to a Ministerial Order, the receipt, approval, and monitoring of compliance with MMV Plans have been delegated from the Ministry of Energy and Minerals to the AER (Ministerial Order MSD: 060/2023 (not published in the Alberta Gazette at time of writing) [MO 060/2023].

219 *MMA*, *supra* note 24, s 117; *OGCA*, *supra* note 160, s 39.

220 *MMA*, *supra* note 24, s 116; pursuant to MO 060/2023, *supra* note 218, the receipt, approval, and monitoring of compliance with closure plans have been delegated from the Ministry of Energy and Minerals to the AER.

### 1. THE AER'S STATUTORY MANDATE AND ACCOMMODATIVE APPROACH

The AER's overarching mandate set out in the *Responsible Energy Development Act* is "to provide for the efficient, safe, orderly and environmentally responsible development of energy resources in Alberta."[221] "Energy resources" and "mineral resources" are governed by the various "energy resource enactments" enumerated under *REDA*, including, for the purposes of the present discussion: (1) the *OGCA*, which, in addition to oil and gas, includes helium, CCS, disposal, and gas storage operations; (2) the *MRDA*, which applies to brine-hosted mineral development; and (3) the *Geothermal Resource Development Act*.[222]

While certain aspects of those energy resource enactments from which the AER derives its authority may appear to be in tension as CCS projects face conflicts with other energy and mineral resources, in the authors' view, they should be treated as a single statutory regime for subsurface resource development. This principle was enunciated in *Giant Grosmont Petroleums Ltd. v. Gulf Canada Resources Ltd.*, wherein the Alberta Court of Appeal applied enactments governing bitumen resources, on one hand, and conventional oil and gas, on the other, to one of several gas-over-bitumen disputes of the late 1990s and early 2000s: "[T]he Energy Statutes create a single regulatory regime and each statute within that regime should be read in the context of the others and with a view to the overall scheme."[223]

Resource conservation and the prevention of the waste of Alberta's energy or mineral resources are overarching themes of the *OGCA*,[224] *MRDA*,[225] and *GRDA*.[226] In *Giant Grosmont*, the Court of Appeal held that the same conservation purpose under the Energy Statutes in question formed "a pervasive and uniting theme" that goes "to the very root of the [regulator's] purpose and existence."[227] From this standpoint, it may be argued that the AER should deprioritize CCS projects for which $CO_2$ injection poses a risk of sterilizing tangible energy and mineral resources like oil and gas or brine-hosted minerals, or interfering with their recovery. The *OGCA* also specifically directs that the AER cannot approve $CO_2$ sequestration schemes that would interfere with oil and gas recovery or conservation, or existing uses of the subsurface for oil or gas storage.[228] The same legislative prohibition does not yet exist in respect of interference with brine-hosted minerals or geothermal resources, which may reflect the fact that the commerciality of those industries has yet to be proven in Alberta, and thus has not warranted legislative amendments that align with oil and gas conservation requirements. For example, at time of writing, lithium interests in Alberta were largely held under Crown licences that grant exploration rights as opposed to brine-hosted mineral leases that grant the right of production. Thus, it may be argued that the nascent brine-

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221 SA 2012, c R-17.3, s 2(1)(a) [*REDA*].
222 *Geothermal Resource Development Act*, SA 2020, c G-5.5 [*GRDA*]; see *REDA*, *supra* note 221, s 1.
223 2001 ABCA 174 at para 22, leave to appeal to the SCC refused, [2001] SCCA No 484[*Giant Grosmont*]; see also *Goodwell*, *supra* note 129 at para 27.
224 *OGCA*, *supra* note 160, s 4.
225 *MRDA*, *supra* note 178, s 2.
226 *GRDA*, *supra* note 222, s 3.
227 *Giant Grosmont*, *supra* note 223 at para 29.
228 *OGCA*, *supra* note 160, ss 39(1.1).

hosted mineral industry is merely prospective and should not interfere with the approval of CCS projects with line-of-sight to commercial operations.[229]

Still, to the extent the AER treats the energy resource enactments as part of a single regulatory scheme, it will arguably need to consider the compatibility of CCS operations with the other objectives of those enactments. For example:

1. Whether the approval of a sequestration scheme would afford each mineral resource owner the opportunity to obtain their share of the production of energy or mineral resources;[230]

2. Whether the development and conservation of energy and mineral resources coincident with a sequestration lease can be effectively managed through conditions to the approval of a sequestration scheme;[231] and

3. Whether the approval of a sequestration scheme would provide for the economic, orderly, efficient, and responsible development of mineral resources co-located with the sequestration complex in the public interest.[232]

Historically, the AER's approach to permitting adjacent or overlapping operations has been to accommodate all parties to ensure each is able to reasonably exercise their subsurface rights, while deferring any interference or trespass claims to the courts. One example is the AER's 2013 decision in Kallisto Energy Corp.'s application for an oil well licence in the Elkton Formation adjacent to TransCanada Corporation's Crossfield Natural Gas Storage Unit, in an area subject to both Crown and freehold mineral rights.[233] The freeholders supported Kallisto's application, for they stood to benefit from the delineation of the oil pool.[234] TransCanada objected on the basis that Kallisto's well would jeopardize the integrity of its gas storage operations and Kallisto could potentially produce TransCanada's stored gas.[235] Recognizing that Kallisto and TransCanada held subsurface rights that might result in operational conflict, the AER struck a middle ground by approving Kallisto's application on the condition that the well would not be fracture stimulated.[236]

The AER also enunciated important principles relevant to future subsurface conflicts as follows:

> The scope and extent of Kallisto's rights under its mineral lease, including any permissible interference with another person's property as contemplated in *Alberta Energy v. Goodwell*, is for the courts to decide. The panel further notes that *Alberta Energy v. Goodwell* refers to potential compensation for damage to property,

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229 Indeed, this was precisely the basis for the AER's dismissal of the concerns of a brine-hosted lithium company and freehold mineral owners to a proposed sequestration scheme in 2025: see note 188, above, and accompanying text.

230 *Ibid*, s 4(d); *MRDA*, *supra* note 178, s 2(d).

231 *MRDA*, *supra* note 178, s 2(f); *GRDA*, *supra* note 222, s 3(d).

232 *OGCA*, *supra* note 160, s 4(c); *MRDA*, *supra* note 178, s 2(a); *GRDA*, *supra* note 222, s 3(a).

233 *Kallisto Energy Corp, Application for a Well Licence, Crossfield East Field* (23 July 2013), 2013 ABAER 013, online: Alberta Energy Regulator [perma.cc/U59F-EXYR] [*Kallisto Energy Corp*].

234 *Ibid* at para 6.

235 *Ibid* at para 5.

236 *Ibid* at para 92.

> which is outside the AER's jurisdiction and may be appropriate if Kallisto goes beyond the rights of its mineral lease.
>
> …
>
> Regarding the potential for trespass and conversion, the panel notes that a well licence does not permit such activity and that any remedy for tortious action would be within the jurisdiction of the courts.
>
> …
>
> The panel recognizes that a [well] licence does not transfer ownership over a third party's private property. The well licence simply permits Kallisto to exercise its rights in accordance with Alberta's oil and gas regulatory scheme.[237]

The AER's accommodative approach and deference to the courts demonstrated in the preceding example may not be practical where interference with other subsurface resources cannot be avoided through regulatory conditions imposed on CCS operations. The analogous gas-over-bitumen disputes discussed in the following section offer insights into how regulatory intervention in the age of CCS might proceed.

### 2. THE TERMS AND CONDITIONS OF LEASES AND RELATED INSTRUMENTS

In *Goodwell*, the Alberta Court of Appeal considered a decision of the AER's predecessor, the Energy and Utilities Board (EUB), to shut in horizontal bitumen wells on the basis that they were producing initial gas-cap gas overlying the bitumen deposits, the rights to which were held by a third party under a Crown PNG lease.[238] The EUB took the simple view that the bitumen rights holder had no right under the well licences to produce initial gas-cap gas because it did not hold the corresponding Crown PNG rights. In quashing the EUB's shut-in order, the Court of Appeal affirmed the precedent set in *Borys* that the right to win, work, recover, and remove the leased bitumen entitled the bitumen operator to recover initial gas-cap gas incidental to bitumen production.[239]

In addition to applicable statutes and regulations that constrain the *Borys* precedent, the Court placed specific emphasis on "the rights granted as well as the rights that were not granted" under the terms of the applicable leases and related instruments, including well licences and recovery schemes approved by the regulator.[240] Absent specific restrictions on the right to recover initial gas-cap gas incidental to bitumen production under the leases in question, or breaches of the applicable statutes and regulations, the EUB had no jurisdiction to shut-in the bitumen wells.[241]

We can therefore anticipate that the AER will carefully review the terms of Crown agreements prior to approving sequestration schemes, particularly those that are opposed by other subsurface rights holders. In this regard, the granting clause under Alberta Energy and

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237 *Ibid* at paras 33–35.
238 *Goodwell*, *supra* note 129 at paras 9–18.
239 *Ibid* at para 72.
240 *Ibid* at paras 72, 78, 104.
241 *Ibid* at para 105.

Minerals' Template Carbon Sequestration Agreement for CCS hub projects grants "the right to drill wells, conduct evaluation and testing and inject captured carbon dioxide into deep subsurface reservoirs within the Location for the purposes of sequestration."[242] Notably, the granting clause also articulates the following restrictions:

> This agreement does not grant the right to win, work or recover any minerals or geothermal resources found within the Location, and the Agreement Holder shall take reasonable steps to conserve minerals and geothermal resource found within the location by ensuring recovery of the minerals and geothermal resource is impaired only to the extent necessary to conduct approved sequestration activities.[243]

The uncapitalized term "minerals" is not defined under the Template Sequestration Agreement. Nevertheless, in the authors' view, the Alberta government likely intended "minerals" to include oil and gas, as well as brine-hosted minerals such as lithium, as brines occupy the pore space of saline aquifers and depleted oil and gas fields into which the lessees of those agreements are likely to inject $CO_2$. Indeed, most, if not all, of the CCS hub projects for which the Template Sequestration Agreement was explicitly drafted target saline aquifers, some of which are associated with legacy oil and gas reservoirs.[244]

Based on the foregoing rights and restrictions under the granting clause of the Template Sequestration Agreement, in the author's view, it is incumbent upon the AER to scrutinize whether a proposed or approved sequestration scheme would unreasonably interfere with oil and gas, brine-hosted mineral, or geothermal operations, or sterilize one or more of those resources. As discussed above, this conservation analysis may not be prioritized where parties objecting to a sequestration scheme do not yet hold rights of production under a lease, but merely rights to explore under a licence.[245] Nevertheless, if conservation concerns materialize, the AER could potentially (1) deny applications in favour of less invasive alternatives, (2) impose conditions on sequestration scheme approvals and well licences designed to ensure reasonable steps are taken to conserve certain minerals and geothermal resources that may be co-located with the sequestration lease, or (3) impose further

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242 Government of Alberta, "Carbon Sequestration Agreement Template" (2024), art 5(1), online (pdf): [perma.cc/ZBN5-TTB2] [*Template Sequestration Agreement*].

243 *Ibid*, art 5(2).

244 The authors' recognize that this contextual interpretation may not be consistent with Nigel Bankes' position that brine-hosted minerals form part of the water estate (Bankes, "Brine-Hosted Minerals", *supra* note 191); however, the apparent intention of the Alberta government to include brine-hosted minerals within the plain meaning of "minerals" under the Template Sequestration Agreement reinforces the assumption that, in the eyes of the government, brine-hosted minerals belong to the mineral estate (*supra* note 193 and accompanying paragraph).

245 See note 188, above, and accompanying text. In *Goodwell*, however, the Court of Appeal dismissed the argument that the dates of overlapping Crown leases of bitumen and PNG were relevant to the priority of competing rights, instead focusing on the rights granted under each (*supra* note 129 at paras 76–78): "The natural gas lessee's gas rights are always subject to the known and inevitable consequences of bitumen recovery (some initial gas-cap gas production), and the dates of the leases are not relevant" (*ibid* at para 78). Extending this principle to the CCS context, the fact that a CCS operator may be first in time in respect of its lease and operations within a reservoir would not absolve the CCS operator of its obligation under its lease to take reasonable steps to conserve minerals and geothermal resources.

restrictions on CCS operations after they have commenced and an adverse impact on minerals or geothermal resources materialize.[246]

Determining what constitutes "reasonable steps to conserve minerals and geothermal resource" will be a novel exercise for the AER and the parties before it. Such analysis will likely depend heavily on the geological and geochemical characteristics of the subject sequestration reservoir, as well as any valuable resources that reside within its pore space. Should the AER continue to field objections to sequestration schemes from third-party rights holders or face requests for intervention once sequestration operations commence, one of the things it could do is initiate a general inquiry though which it would hear the submissions of all interested parties on the shared use of pore space by multiple industries.

The AER is vested with the power to "conduct inquiries and prepare studies and reports in respect of any matter relating to energy resources or the injection of substances into underground formations."[247] The same inquiry powers were invoked under predecessor legislation by the EUB when it was faced with the gas-over-bitumen disputes in the late 1990s, which kicked off one of the longest strings of related regulatory proceedings, appeals, and lawsuits in Alberta's history.[248] The EUB's inquiry found that the production of gas overlying bitumen deposits could have detrimental effects on the production of bitumen, and that conservation policy favoured the shut-in of gas producers in certain circumstances.[249] The EUB subsequently issued Interim Directive 99-1 (ID 99-1), establishing the requirements for applications to produce gas in designated oil sands areas, which prohibited the production of initial gas-cap gas associated with bitumen absent a specific authorization.[250] Subsequent proceedings also resulted in the shut-in of hundreds of gas wells.[251] Compensation to shut-in gas producers became a salient issue in the early 2000s, resulting in an CAD$85,000,000 compensation agreement between the Alberta Crown and certain gas producers that leveraged public funds and royalty credits against bitumen production.[252]

The conflicts that have emerged and may continue to emerge as CCS and other subsurface industries converge on the same pore space in Alberta are markedly different than the gas-over-bitumen disputes. For one, CCS involves the disposal of an undesirable foreign substance, which may adversely affect prospective, naturally occurring resources. Conversely, the natural gas and bitumen at issue in the late 1990s and early 2000s were both

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246 The AER has broad authority under section 39(1)(d) of the *OGCA*, *supra* note 160, to impose conditions on sequestration schemes. Among other regulatory tools, the AER can also amend its directives to affect the conservation of different resources or other mandates with which it is empowered under the energy resource enactments. AER Directives are generally incorporated as mandatory requirements of operators and licensees under regulations promulgated under energy resource enactments. For example, the requirements of *Directive 065*, *supra* note 160 — which governs applications for sequestration schemes — are incorporated by reference under section 15.005(c) of the *Oil and Gas Conservation Rules*, Alta Reg 151/1971. Likewise, the requirements of *Directive 090*, *supra* note 184 — which governs brine-hosted mineral development — are incorporated by reference throughout the *Brine-hosted Mineral Resource Development Rules*, *supra* note 171.

247 *REDA*, *supra* note 221, s 17.

248 Alberta Energy and Utilities Board, *EUB Inquiry Gas/Bitumen Production in Oil Sands Areas*, (Edmonton: Alberta Energy and Utilities Board, 1998) [*EUB Inquiry Report*]; see *BP Canada Energy Company v Alberta (Energy and Utilities Board)*, 2004 ABCA 32 at paras 14–30 [*BP Canada*].

249 *EUB Inquiry Report*, *supra* note 248 at 51–52.

250 See *BP Canada*, *supra* note 248 at paras 17–18.

251 *Ibid* at paras 19–28.

252 Allan L McLarty & George V Lepine, "The Gas/Bitumen Dispute: The Clash of Fact, Technology, Policy and Law" (2004) 42:1 Alta L Rev 113 at 114, 134–35.

valuable and known commodities that could be readily extracted from the subsurface at that time. Nevertheless, the gas-over-bitumen disputes demonstrate the potential risks facing CCS proponents and other subsurface rights holders if their overlapping interests and rights are adjudicated by the regulator: certain parties may be shut-in or face onerous operational restrictions; resources may be sterilized; and drawn-out regulatory proceedings, appeals, and lawsuits may transpire.

### C. JUDICIAL INTERVENTION

As noted in the preceding sections, absent a legislated compensation scheme, third parties whose subsurface interests stand to be adversely impacted by CCS operations will have limited recourse once those operations have been approved by the regulator.[253] However, in the event CCS operations breach the terms of a sequestration lease, well licences, sequestration scheme approvals, or applicable statutes and regulations, a third party may have a cause of action to the extent such breaches result in adverse impacts on their interests. For example, in the recent Alberta case of *Signalta*, the defendant bitumen lessee failed to make an application under ID 99-1 and notify the PNG lessee prior to producing initial gas-cap gas incidental to bitumen production. Justice Sidnell found the defendant liable for trespass and conversion and unjust enrichment for damages arising from the unlawful production of the initial gas-cap gas.[254]

On the other hand, CCS operators may have a cause of action in the event third-party operators cause a release of sequestered $CO_2$ while the CCS operator held title to that $CO_2$, particularly if the release is attributable to the third party's breach of applicable laws or the terms of its well licences or scheme approvals. For example, the CCS operator may seek damages to compensate for the value of any carbon offset or performance credits clawed-back as a result of $CO_2$ leakage from faults, fractures, or wellbores attributable to a third party's operations.[255]

An exhaustive review of the potential causes of action that may be brought by or against CCS operators in the event damages to subsurface property arise in the context of CCS is beyond the scope of this article.[256] Instead, this section provides a high-level overview of one salient cause of action that could conceivably arise in Alberta in the event a CCS operator causes damage to a third party's subsurface interests in connection with one or more breaches of law or applicable instruments: subsurface trespass.

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253 See *Goodwell*, *supra* note 129 at para 78 ("[a] lessee whose rights are affected by a known and inevitable consequence of the production of some other mineral [or, in the present context, the injection of $CO_2$] cannot enjoin recovery of that mineral").

254 *Signalta*, *supra* note 124 at paras 786–93.

255 For example, recipients of federal CCS tax credits in the US are liable for dollar-for-dollar repayment for any $CO_2$ that escapes from a sequestration complex (26 USC § 45Q(f)(4); 26 CFR § 1.45Q-1(h)(2)(iii)). It is presently unclear how tax or performance credits would be treated in the event of a release of sequestered $CO_2$ in Canada.

256 Other causes of action may include private nuisance, conversion, and general negligence.

### 1. TRESPASS

A concise description of the tort of trespass is the "unlawful entry upon the property of another."[257] In the CCS context, commentators have noted that "injecting a substance that migrates under another's land is *prima facie* a trespass absent a licence or some other form of entitlement."[258] While there is a paucity of judicial authority for subsurface trespass in the context of CCS in Canada and the rest of the common law world, future causes of action are likely to be shaped by the applicable statutes, regulations, and instruments governing CCS operations.[259] And while those considerations will be bespoke to each jurisdiction, courts may borrow principles developed in analogous common law contexts.

For example, in *Chance*, the defendant, BP Chemicals Inc. (BP), operated three water disposal wells that injected waste byproducts from the manufacture of industrial chemicals into the subsurface beneath the Lima Refinery in Ohio.[260] BP held surface rights to the land on which the refinery was built and disposal rights to the underlying subsurface. The plaintiffs held surface estates near the refinery which, absent a statutory vesting provision to the contrary, presumably included the rights to subsurface pore space. They alleged that their property had been damaged when the injected waste byproducts laterally migrated into the substrata underlying their respective lands, and sought recovery for trespass, nuisance, negligence, strict liability, and fraudulent concealment.

The Ohio Supreme Court held that the plaintiffs' subsurface rights were not absolute: just as property owners must accept some limitations on their ownership rights extending above the surface of their realty (for example, commercial aircraft flying through the airspace above the land), so too must they accept some limitations on their ownership rights extending below the surface of their realty.[261] The Court also declined to apply the so-called "negative rule of capture" doctrine advanced by BP,[262] which the Supreme Court of Texas had previously articulated in the context of water disposal or secondary oil and gas recovery as follows:

> Just as under the rule of capture a land owner may capture such oil or gas as will migrate from adjoining premises to a well bottomed on his own land, so also may he inject into a formation substances which may migrate through the structure to the land of others, even if it thus results in the displacement under such land of more valuable with less valuable substances.[263]

Striking a middle ground, the *Chance* Court held that, while the appellants' subsurface rights may include the right to exclude invasions of the substrata underlying their property, such invasions must actually interfere with their "reasonable and foreseeable use of the subsurface" in order to constitute an actionable trespass.[264] The plaintiffs bore the burden of proving either physical damage or interference with the reasonable and foreseeable use of their property, each of which required proximate causation in respect of the injection of waste

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257 *Chance*, *supra* note 209 at 991.
258 See Nigel Bankes et al, "The Legal Framework for Carbon Capture and Storage in Alberta" (2008) 45:3 Alta L Rev 585 at 605, n 94.
259 *Bocardo*, *supra* note 13 at para 24.
260 *Chance*, *supra* note 209.
261 *Ibid* at 992.
262 *Ibid* at 991.
263 *Railroad Commission of Texas v Manziel*, 361 SW 2d 560 at 568 (Tex Sup Ct 1962).
264 *Chance*, *supra* note 209 at 992.

byproducts.[265] Now, almost 30 years later, the *Chance* precedent stands to be varied as CCS-related conflicts emerge in the US, where constitutional protections for private property rights and more recent CCS-specific legislation may entitle pore space owners and mineral rights holders to compensation for the physical invasion of pore space and the displacement or sterilization of minerals by injected $CO_2$.

The *Chance* precedent was also explicitly rejected by the Supreme Court of the United Kingdom in *Bocardo*.[266] The case dealt with three wells that had been directionally drilled by the defendant oil and gas company's predecessor beneath the plaintiff surface owner's land to access an oil reservoir for which the oil and gas company held the Crown mineral rights.[267] Bocardo sued Star Energy for trespass. Though the petroleum did not belong to the surface estate,[268] the Court applied the *ad coelum* doctrine, holding that "the owner of the surface is the owner of the strata beneath it," such that Bocardo's title extended down to the strata through which the three wells passed.[269] Thus, the drilling of Star Energy's wells through Bocardo's land without authorization constituted a *prima facie* trespass.[270] Further, the *Bocardo* Court rejected the *Chance* Court's finding "that some type of physical damage or interference with the use of the land must be shown," finding that it "would lead to much uncertainty … [and] overlooks the point that, at least so far as corporeal elements such as land and the strata beneath it are concerned, the question is essentially one about ownership."[271] Thus, in the UK, subsurface trespass claims need not show that specific damage has occurred.

While the *Chance* and *Bocardo* precedents provide some insight into how courts may decide claims for subsurface trespass in the CCS context, each case will depend on the application of specific facts to the statutes, regulations, and instruments governing both the subject CCS operations and the claimant's rights. In Alberta, for example — where subsurface ownership rights are not absolute and pore space is vested in the Crown — CCS operators are unlikely to be found liable for trespass in relation to operations that were conducted in accordance with: (1) the applicable energy resource enactments and regulations thereunder, including AER Directives; and (2) the terms and conditions of the subject sequestration lease, well licences, and sequestration scheme. On the other hand, if, for example, $CO_2$ migrates beyond the boundaries of a sequestration lease, or $CO_2$ or the antecedent pressure front migrate beyond any maximum radius approved by the AER, any resulting impact on other subsurface rights holders could potentially ground a trespass claim. Similarly, if the AER or Alberta Energy and Minerals establish standards for what constitutes "reasonable steps to conserve minerals and geothermal resource" under the terms of sequestration leases and CCS operators fail to meet those standards, the holders of any mineral or geothermal rights that are affected may have a cause of action for trespass.

While tempting to import the *Chance* standard that trespass must be grounded by an interference with the "reasonable and foreseeable use of the subsurface," it remains to be seen

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265 *Ibid* at 993.
266 *Bocardo*, *supra* note 13 at paras 22–26.
267 *Ibid* at paras 1–3.
268 Petroleum rights are conferred on the Crown pursuant to the *Petroleum Act 1998*, 1998 c 17, s 2.
269 *Bocardo*, *supra* note 13 at para 27.
270 *Ibid* at paras 35–36.
271 *Ibid* at para 26.

how Alberta or other Canadian and US courts would approach damages if one or more of the foregoing breaches are established in the CCS context.[272] The *Chance* standard was developed in the context of the alleged invasion of pore space, the extent of which the pore space owner was unable to establish as a matter of fact.[273] Nor was it clear that there were reasonably foreseeable uses of the subsurface coincident with the pore space that was allegedly trespassed. Third-party rights holders will therefore likely need to demonstrate some factual evidence of damage to subsurface property directly resulting from CCS operations to succeed in a claim for trespass.

### D. NEGOTIATED RESOLUTIONS

In practice, CCS proponents and other subsurface rights holders may enter into private arrangements to mitigate subsurface conflicts, particularly in the absence of a legislated compensation regime. Approaches to contractual drafting will vary based on jurisdiction and whether the pore space into which captured $CO_2$ is intended to be injected is publicly or privately owned. This section briefly comments on the rights a CCS proponent may wish to acquire and potential terms of such arrangements.

In Ontario and jurisdictions across the US where pore space vests in the surface estate, a CCS proponent would need to privately acquire the rights to use the subsurface for the sequestration of $CO_2$.[274] This may be achieved through a lease or an easement obtained from the relevant owners of the surface or severed pore space estates.[275] In jurisdictions such as Alberta, where ownership of pore space is vested in the Crown and pore space tenure agreements are issued in a form and on the basis prescribed by regulation, CCS proponents need only deal with one governmental entity to obtain pore space rights. In either circumstance, CCS proponents may seek limited rights to access and use surface lands (to the extent not provided for by statute) and, ideally, certain restrictions on the surface or mineral owners' subsurface activities to ensure those activities do not interfere with CCS operations.

For example, in light of potential subsurface conflicts discussed throughout this article, CCS proponents targeting sequestration reservoirs with active or anticipated potential for profitable mineral production may be incentivized to seek a formal waiver of rights from a mineral owner or its lessees. Among other things, such waivers may foreclose the rights to (1) oppose any applications for well licences or sequestration scheme approvals, and (2) drill into, through, or in proximity to the sequestration complex or produce minerals therefrom. Where such "no-drill-through" rights would not be implicated by the mineral owner's independent operations outside the immediate vicinity of sequestration operations, a CCS proponent may also seek to enter into a co-development arrangement with the mineral owner. Such arrangements may clarify each party's rights and responsibilities for development in

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272 *Chance*, *supra* note 209 at 992.
273 *Ibid* at 992–93.
274 Subject to the enactment and coming into force of the *GCSA* in Ontario.
275 Keith B Hall, *Drafting and Negotiating Instruments to Acquire Pore Space Rights for CCS,* in *Natural Resources and Energy Law Institute*, Vol 69 (Westminster, Co: Foundation for Natural Resources and Energy Law, 2023) at 10–11.

such areas, including limitations on the liability of each party when conducting operations in or around the sequestration complex.[276]

Regardless of the arrangements being sought, a CCS proponent will generally require such contractual rights for an extended period of time — in some instances, prior to required regulatory approvals for the CCS project being granted or a final investment decision to proceed with the project being made. For the purposes of acquiring these rights, the holders of other subsurface rights that stand to be impacted by a CCS project may require a form of upfront, guaranteed compensation in return for granting a CCS proponent the "option" to restrict the exercise of their rights, together with the right to terminate the arrangement where the CCS proponent does not proceed with the sequestration project. This compensation may be based on fixed fees or fees that vary based on the income of the CCS project, or a combination of both.

Additionally, private pore space owners may request upfront, guaranteed payment for the use of their pore space, analogous to a bonus under a typical oil and gas lease.[277] The owner may also seek additional payments for keeping the arrangement with the CCS proponent in place over an extended period — akin to annual rental payments under an oil and gas lease — or otherwise negotiate separate payment of a fee that is tied to the volume of $CO_2$ injected or the economic value of the tax or performance credits and any revenue that the sequestration project generates.[278]

Despite the potential availability of contractual resolutions to existing or potential conflicts of subsurface rights, the administrative and transactional costs to CCS proponents of entering into such arrangements may introduce additional hurdles to the widespread deployment of CCS.

## V. CONCLUSION

The widespread deployment of CCS in Canada and the US in the near-term hinges not only on economic viability, but also on the resolution of complex legal, regulatory, and policy issues surrounding subsurface rights. This article has explored a number of those issues and identifies that potential conflicts over pore space ownership, unitization, expropriation, and convergent subsurface resource interests must be carefully managed by legislators, regulators, and CCS proponents if CCS is to fulfill its potential as a climate mitigation tool.

The question of pore space ownership remains foundational, yet jurisdictions vary widely in their treatment of this issue. The vesting of pore space ownership or rights in the government in jurisdictions like Alberta, British Columbia, and Manitoba simplifies the acquisition of pore space rights. Conversely, the vesting of pore space ownership in private surface estates in the US creates transactional burdens, the potential for holdouts, and title

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[276] For example, directional drilling to a bottom-hole location beneath or adjacent to the sequestration complex (*ibid* at 13–14).

[277] *Ibid* at 24. Such bonus may be structured as a one-time payment (for example, reflecting a flat fee per acre) or the CCS proponent may be required to make additional bonus payments when the sequestration project reaches certain benchmarks (for example, upon commencement of injections).

[278] For an extensive discussion regarding the potential market value of pore space rights (in the US) and examples as to the quantum of such payments, see *ibid* at 35–37.

uncertainty — particularly where severance of pore space from the surface estate is allowed. This divergence is rooted in the prohibition on the taking or expropriation of private property without just compensation under the Fifth Amendment of the US Constitution and the absence of a Canadian constitutional imperative.

Pore space unitizations and expropriations offer mechanisms for assembling contiguous tracts of pore space rights when surface ownership is fragmented. Ontario's proposed *GCSA* would make it the first Canadian jurisdiction to enable compulsory pore space unitization. While unitization has the potential to streamline CCS project development where the pore space of a target sequestration reservoir vests in numerous surface estates, it represents a potential administrative and transactional barrier to CCS deployment. Further, the compensation and oil-and-gas-style cost-sharing mechanisms under certain unitization procedures may prove to be unsuitable for CCS. Pore space expropriations are more direct than unitizations but pose similar costs issues for CCS proponents in respect of compensation.

The potential for conflicts of subsurface rights as CCS and a variety of other subsurface interests converge on the same pore space is significant and growing. Alberta, Canada's leading jurisdiction for CCS, illustrates how CCS projects may intersect oil and gas, water disposal, gas storage, and emerging industries like brine-hosted mineral development. Despite the Crown's ownership of pore space in Alberta, the otherwise widely held and fractured mineral interests across the province and the Crown's practice of granting overlapping tenure rights have created a complex regulatory and legal dynamic ripe for conflict. In order to ensure that CCS and other subsurface industries continue to thrive in Alberta, clearer conflict resolution frameworks are required at the legislative, regulatory, and policy levels.

The mitigation and resolution of subsurface conflicts in the context of CCS must account for the interplay between property law, regulatory mandates, and compensation regimes — all of which are jurisdiction-specific. In Alberta, the AER will play a critical role in managing the potential interference of CCS operations with other subsurface interests, failing which interested parties may turn to the courts. To avoid drawn-out regulatory proceedings and litigation, CCS proponents may be incentivized to negotiate agreements with other subsurface rights holders. Any such incentive will nonetheless be weighed against the potential costs of securing such agreements with third-party rights holders.

As competition for pore space continues to increase, it is incumbent upon governments and regulators to proactively manage conflicts in a manner that balances the timely deployment of CCS and the integrity of other established and emerging subsurface industries in the public interest.