

Going Old-School: Helium Exploration in SW Saskatchewan

David P. B. Allen
North American Helium

Summary

North American Helium Inc's (NAH) history in helium exploration and development (E&D) in SW Saskatchewan is reminiscent of the early days of oil and gas exploration when wildcatters set out in 1901 to explore the yet-to-be-proven corner of the province. Since that time, over 64,000 wells have been drilled and 3 billion BOE of oil and gas have been produced by industry (Fig. 1). Some 122 years later, the Cambrian section in SW Saskatchewan remains largely unexplored due to hydrocarbon source rock limitations. However, in recent years, interest in the Cambrian section

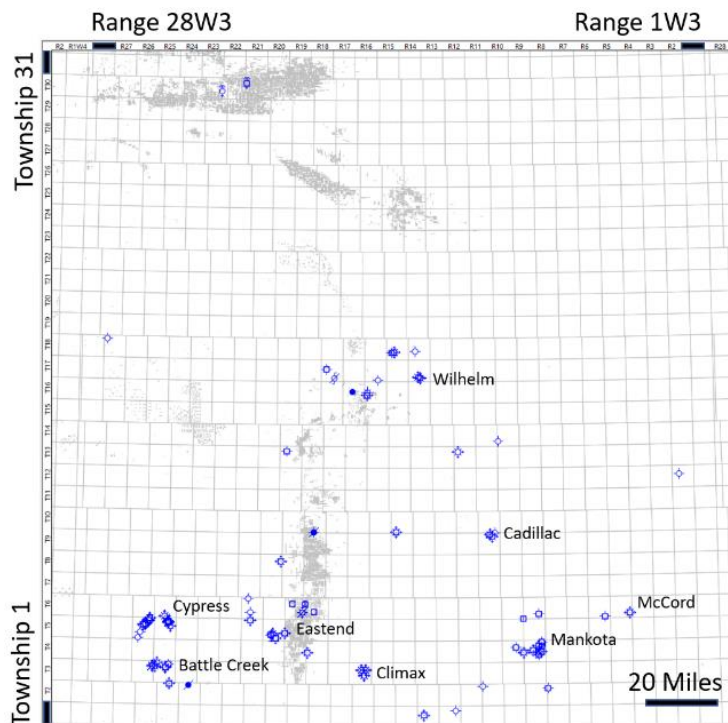


Figure 1- Map of portion of SW Saskatchewan where majority of drilling and positioning activity for helium has occurred over past 8 years. Precambrian well penetrations are shown in blue. Notable helium activity areas identified with labels.

has grown in response to a growing continental need for helium, created by the sell-off of helium reserves held in storage by the US Bureau of Land Management in Amarillo, Texas. In SW Saskatchewan, prior to 2016 only 53 wells had been drilled to the Pre-Cambrian resulting in a well density of only 1 well per 670-square miles. Since that time, NAH has drilled 50 wells and discovered 19 new helium pools (Fig. 2). The current density of wells penetrating the Precambrian stands at approximately 1 well per 345 square miles, revealing the Cambrian section as still being materially under-explored.

In SW Saskatchewan, maturation of the helium industry from exploration, through to production, has been rapid. For NAH, growth has been accelerated beyond the pace of days-gone-by by the availability of: (1)

expansive legacy subsurface datasets (trade seismic data, publicly available old government maps, extensive shallow well control), (2) nearly complete undisposed helium rights, (3) a skilled and uniquely experienced geoscience workforce, (4) pre-existing evidence of a functioning helium “system” in the area, and (5) a resource-development-friendly regulatory framework and operating environment.

Regarding the transferability of oil and gas exploitation practices to helium E&D, although many similarities exist between the associated E&D methodologies, the differences between these two

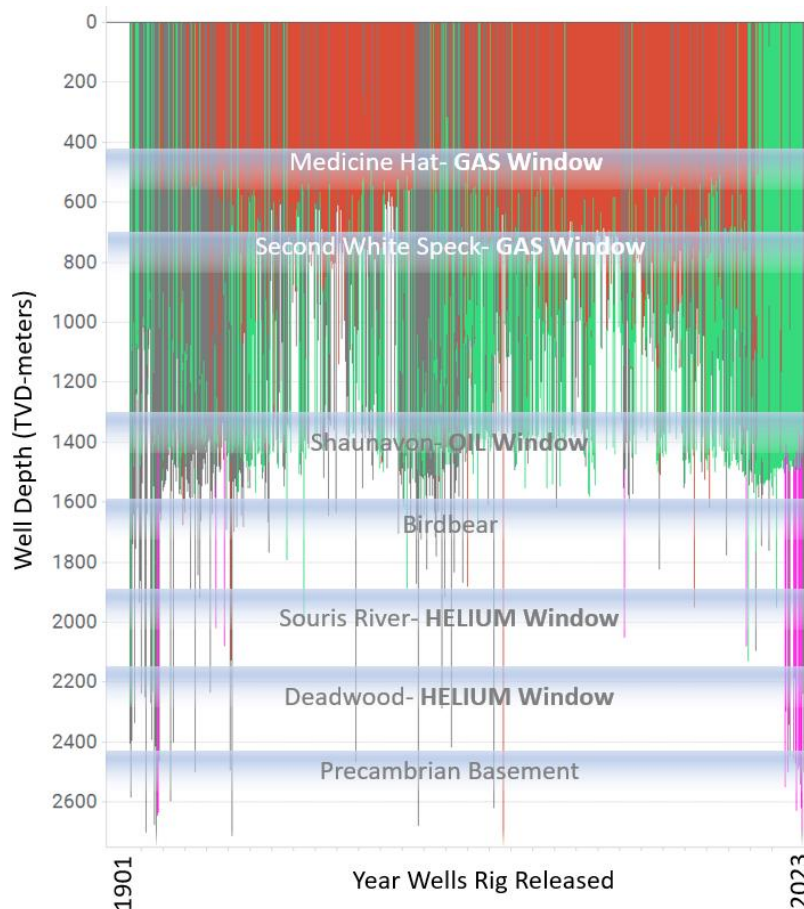


Figure 2- Depiction of drilling activity in map area by well depth and rig release date. Wells are identified as natural gas in red, oil in green, helium in pink, abandoned in grey

activities are numerous and consequential. Foremost, unlike the majority of current oil and gas upstream activities in North America, which are largely characterized as *unconventional* development in nature, currently proven commercial helium discoveries have been derived exclusively from grass-roots *conventional exploration* and development activities. Here, the former is characterized as staged fracture-stimulated horizontal development of regionally pervasive, low permeability, high storage capacity reservoirs, whereas the latter is characterized as vertical, unstimulated development of discrete, high permeability, high porosity *old-school* reservoirs (Fig. 3).

and gas unconventional resource development models. Foremost for NAH, achieving corporate success in helium development has required managing the multiple operational, planning, and reporting complexities that are largely unique to a conventional exploration business model. Examples of the relevant complexities that have required managing include ensuring an ability to: (1) access massive amounts of seismic data, cost effectively, to adequately map prospects and delineate the targeted play fairways, (2) execute an exploration campaign that is large enough to allow the probabilities of the prospects within the program to play out, (3) set meaningful, and achievable, guidance to re-assure stakeholders and manage expectations, (4) fund large capital programs and maintain key stakeholder commitments during the occasional, but inevitable, runs of disappointing exploration well results, (5) follow-up on material discoveries through having

Strategic considerations associated with helium exploration models differ in multiple ways with those of oil

amassed an expansive, contiguous, low cost, land position, (6) pivot quickly within an exploration program when deemed necessary, made possible by having established a deep, diverse, and credible prospect inventory, and (7) optimize ESG conformance.

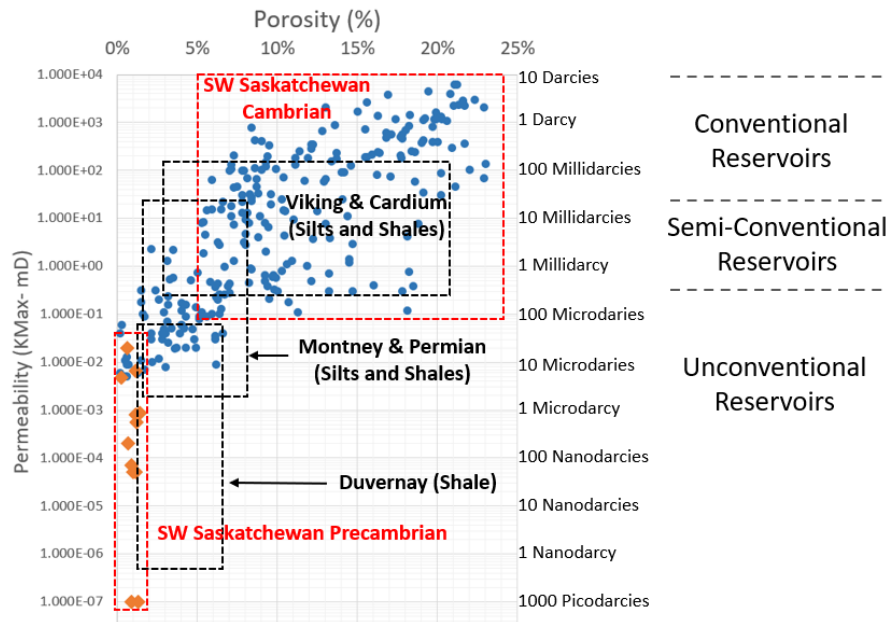


Figure 3- Plot depicts the relative porosity & permeability fields of conventional, semi-conventional, and unconventional reservoirs. Blue dots and orange diamonds depict core data points from conventional Cambrian and unconventional Precambrian reservoirs (Climax Nazare), respectively, on the map sheet. Black boxed areas indicate the approximate porosity-permeability fields of selective oil and gas-condensate plays within North America for reference. Red boxed areas indicate the approximate porosity-permeability fields of the SW Saskatchewan Cambrian and Precambrian core data.

NAH's decision strategies in helium E&D are driven by a combination of observations and learnings from the oil and gas industry's distant past, and a multitude of present-day resource development realities. The learnings from the past consider the factors that differentiated the winners from the losers in conventional exploration (i.e., establishing a first mover advantage, building a company of patient and highly skilled stakeholders, being well-financed and staying private for as

long as possible). The present-day realities that drive decision strategies for NAH in helium E&D are tied to, (1) considerations around ESG operational conformance, (2) stressed service-provider availability and supply chains, (3) a diminishing pool of relevantly experienced geoscience explorationists, and (4) a steady stream of continuous learnings derived from a rapidly growing dataset of geoscience findings in an as-yet under-explored basin.