

GTX - Datathon

Team ALM

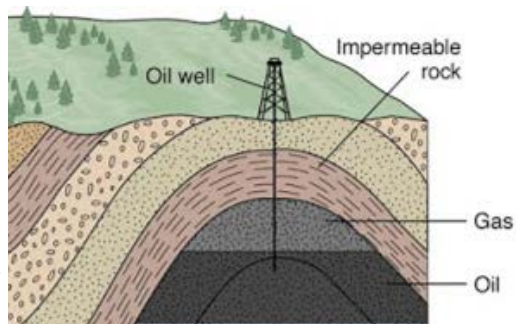
Aaron Ji, Luis Acosta, Margot Dupont, Marie MacLean



Organized by



The Opportunity: Generate value from abandoned wells

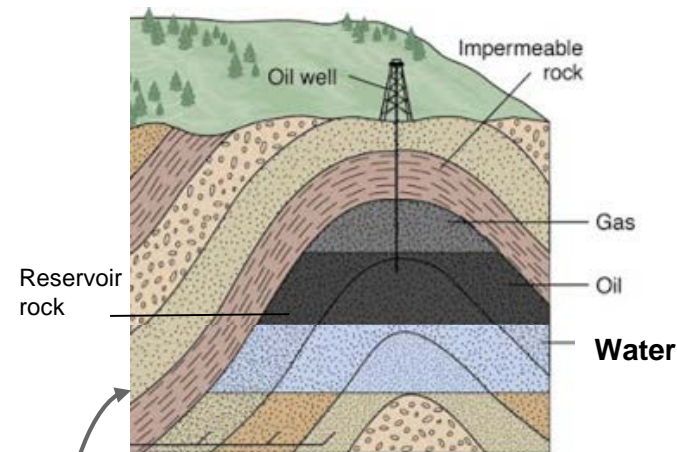


71,000

Abandoned oil & gas wells in Alberta,

of which **2,100** are **orphaned**

The Opportunity: Generate value from abandoned wells



Heat

GEOTHERMAL

Repurpose abandoned
wells -> similar geological
context!

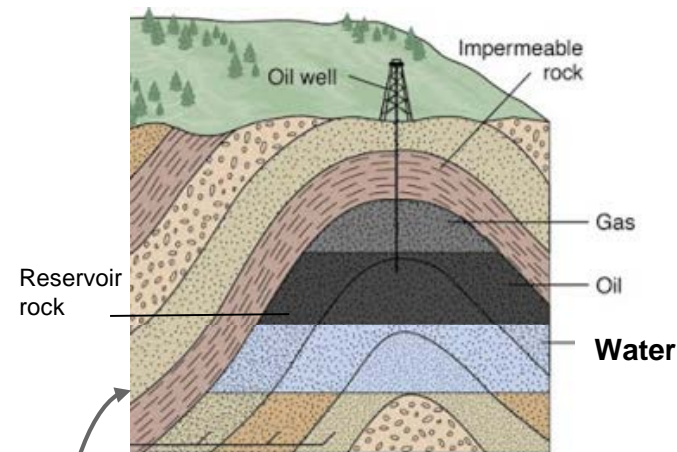
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Abandoned oil & gas wells in Alberta,
of which 2,100 are orphaned

50%

of the total cost of a geothermal project is
spent on drilling

The Opportunity: Generate value from abandoned wells



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Repurpose abandoned wells -> similar geological context!

71,000

Abandoned oil & gas wells in Alberta, of which **2,100** are orphaned

50%

of **the total cost** of a geothermal project is spent on **drilling**

\$1.7B

to be spent by the Canadian Government on **orphaned** and **abandoned oil & gas wells** in **Western Canada**

\$16B

Available in the **USA** to **plug old oil wells** and **clean up mines**

Presentation Outline



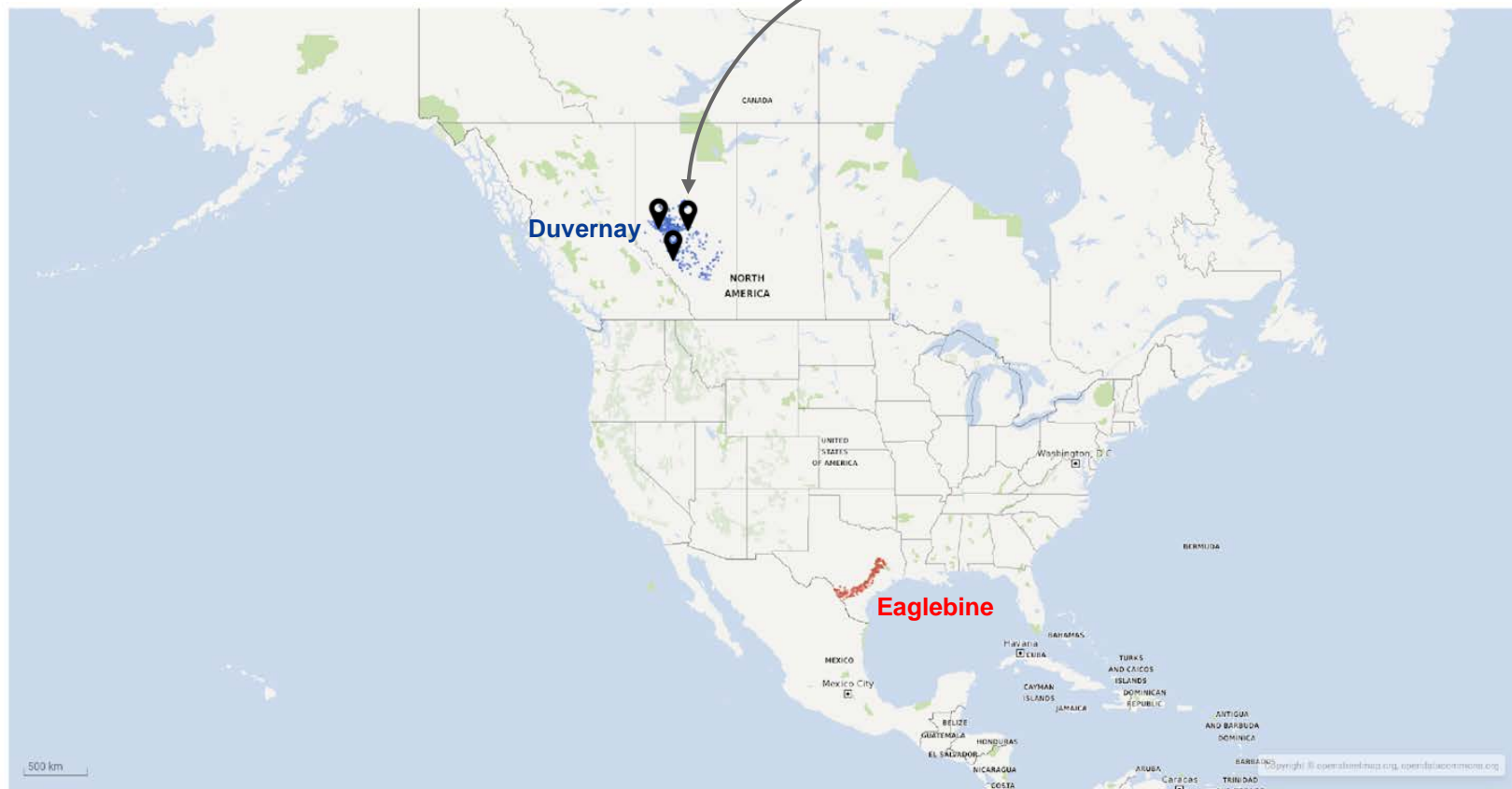


Background



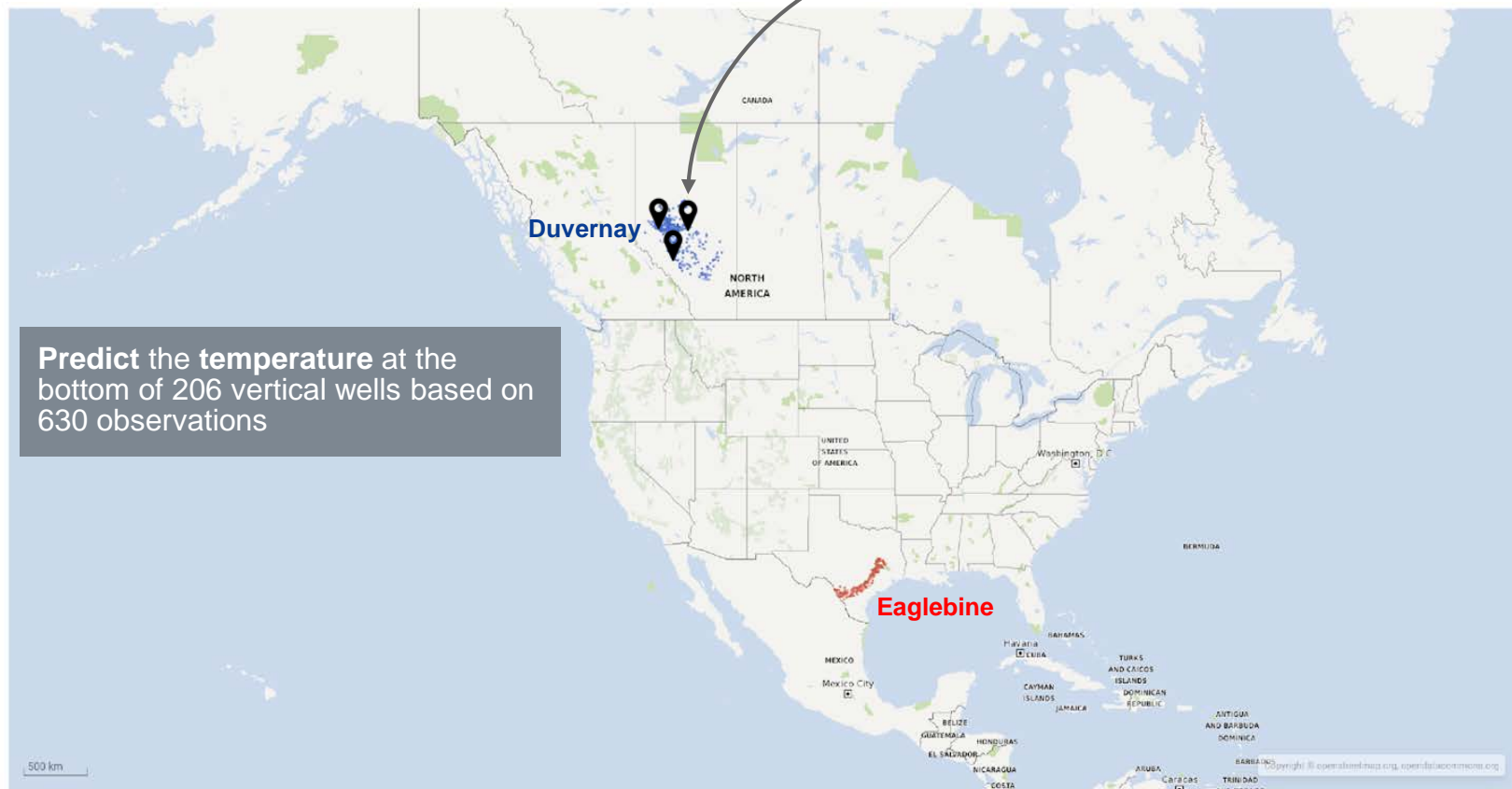
The Challenge

Current projects in Alberta



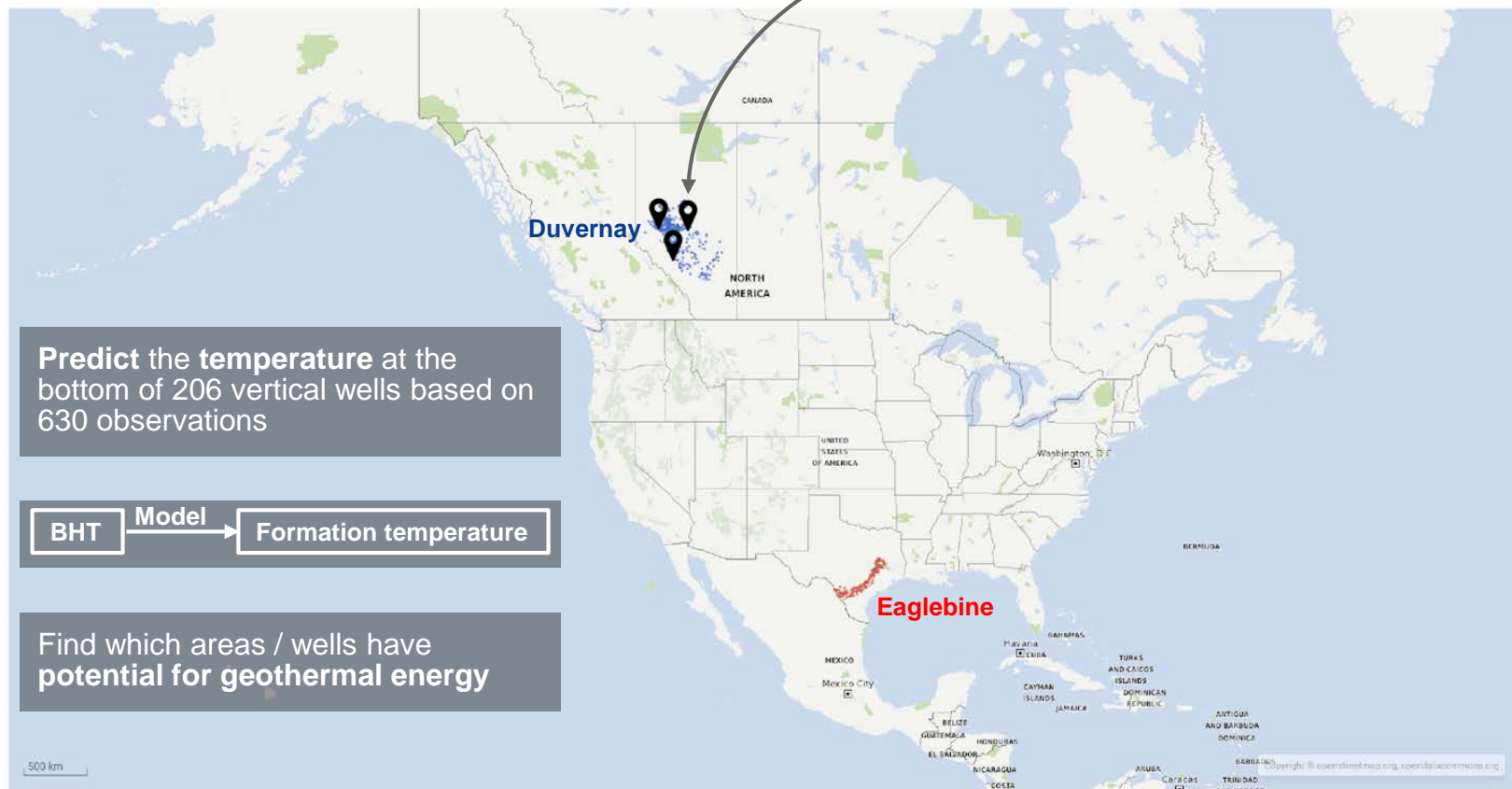
The Challenge

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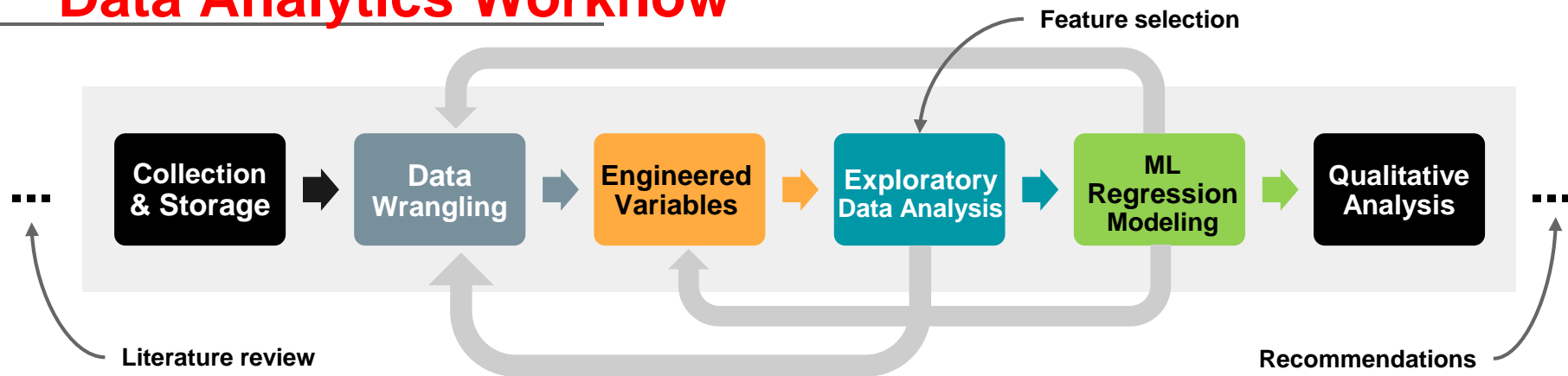


The Challenge

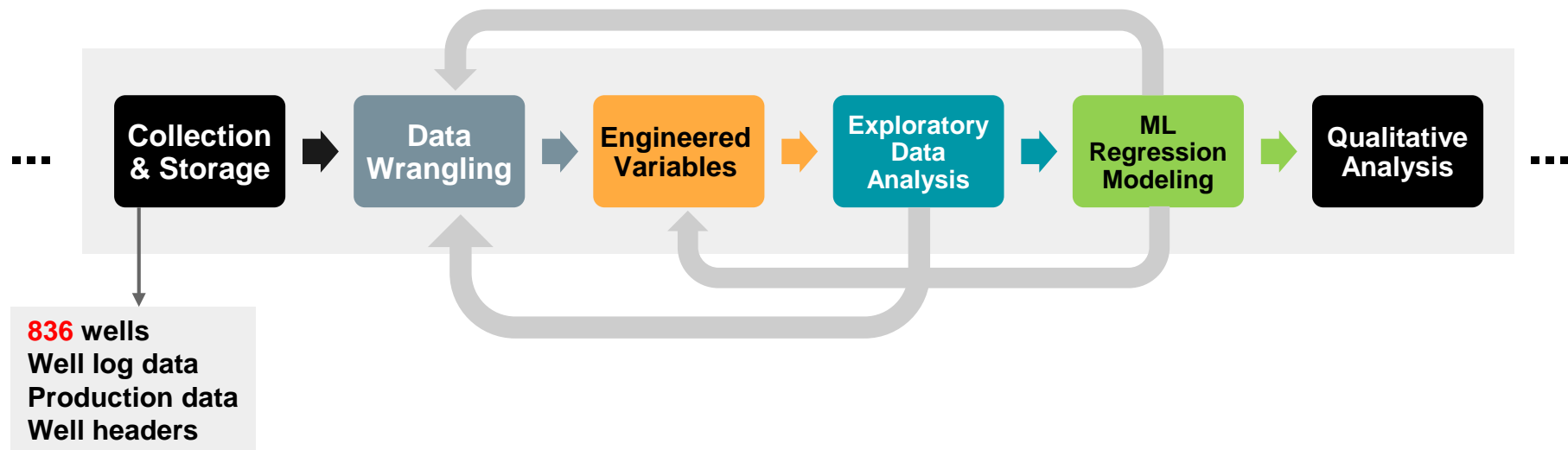
Current projects in Alberta



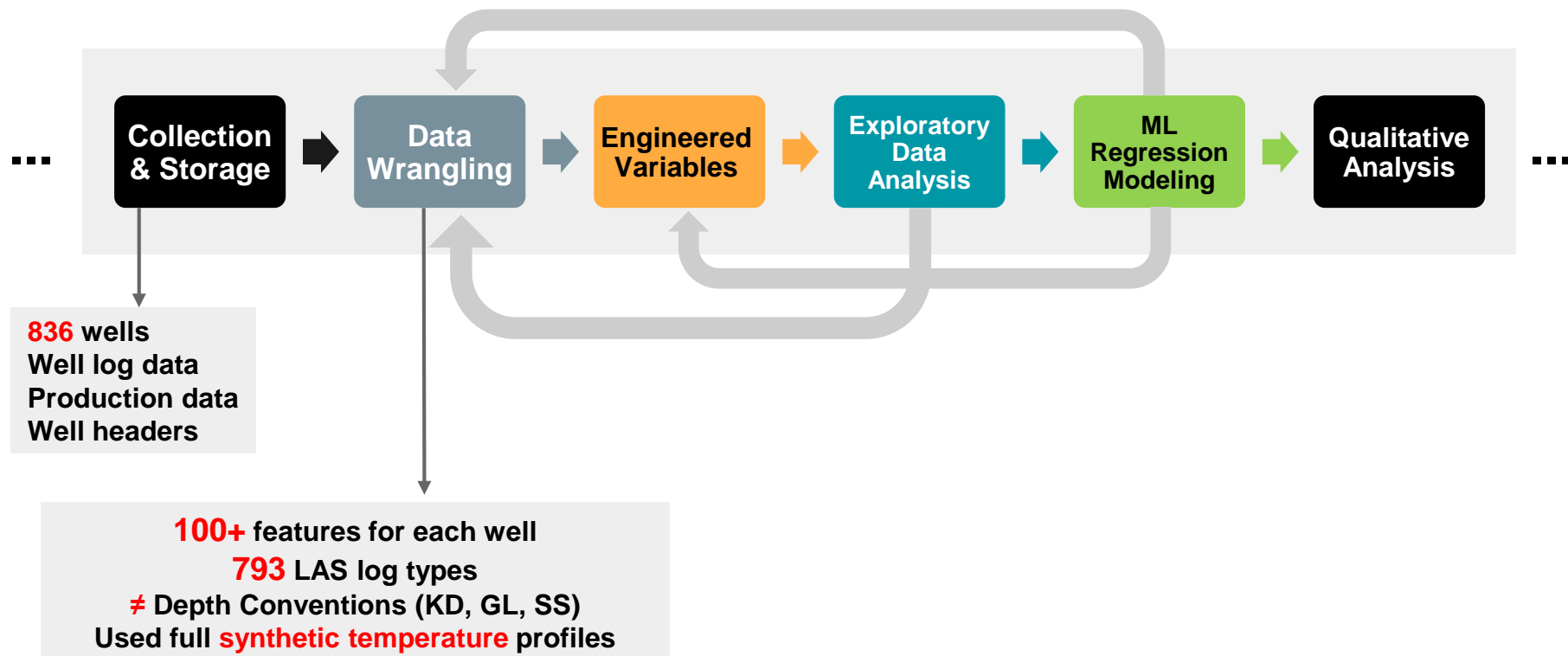
Data Analytics Workflow



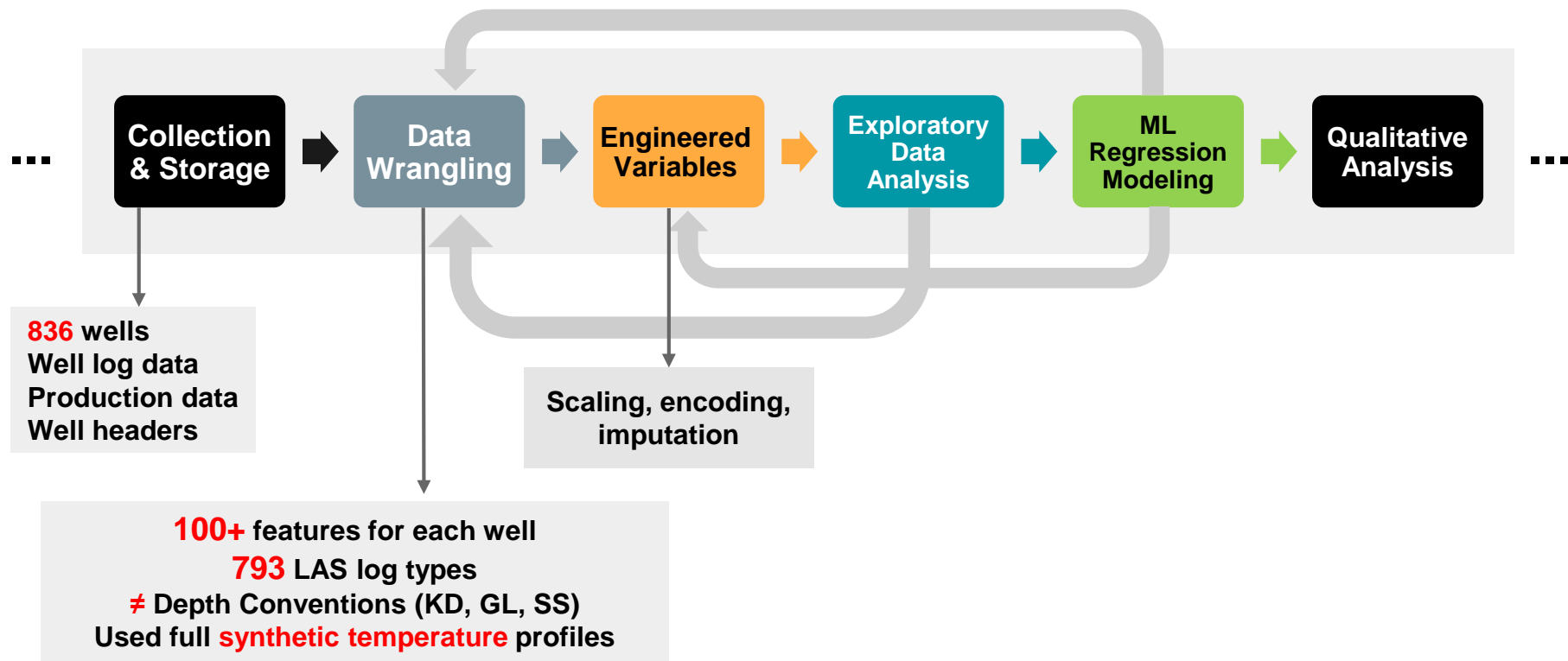
Data Analytics Workflow



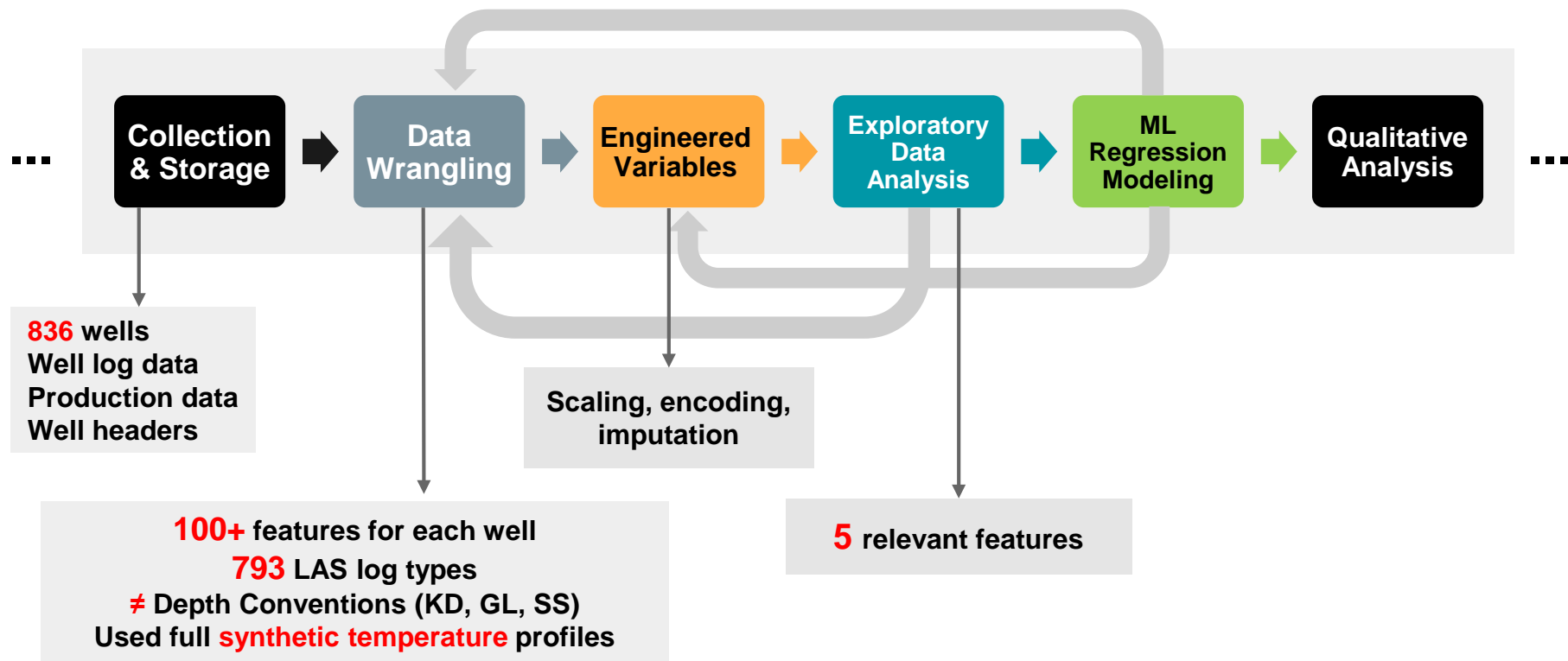
Data Analytics Workflow



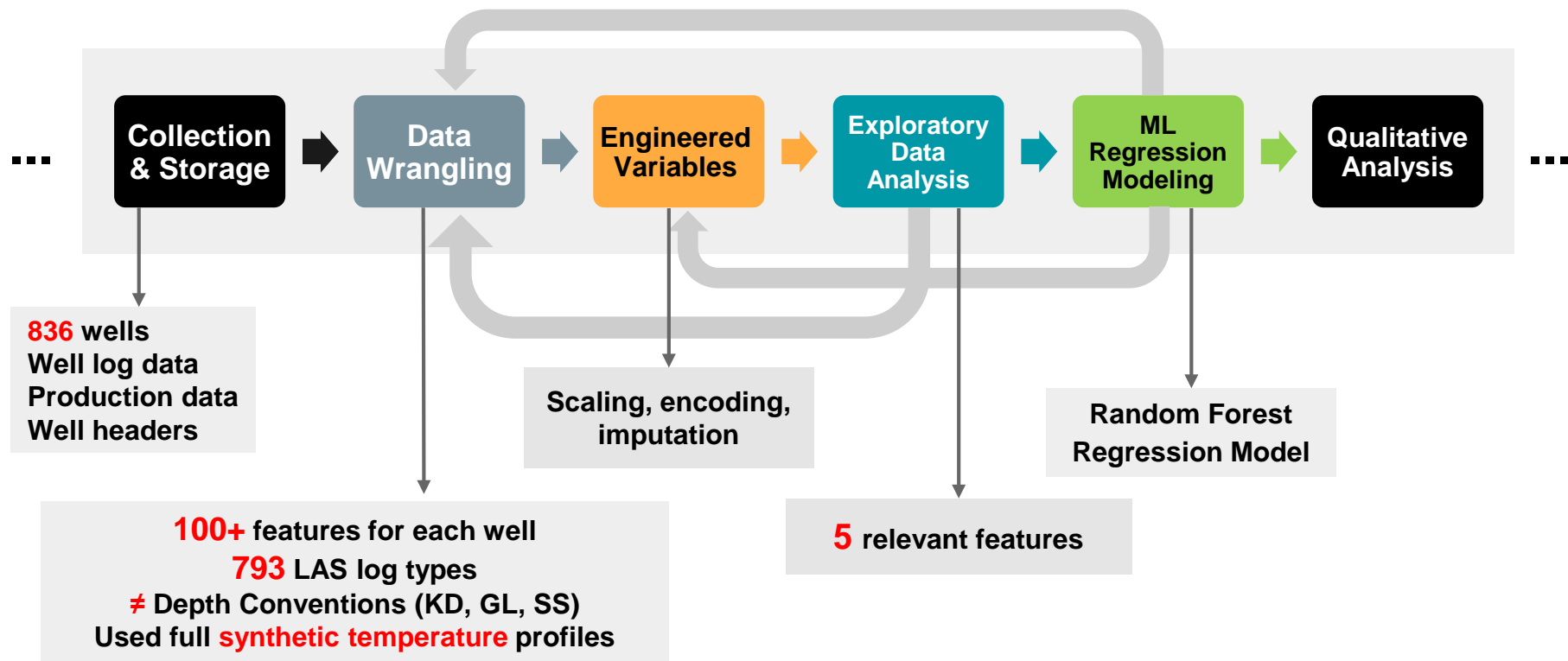
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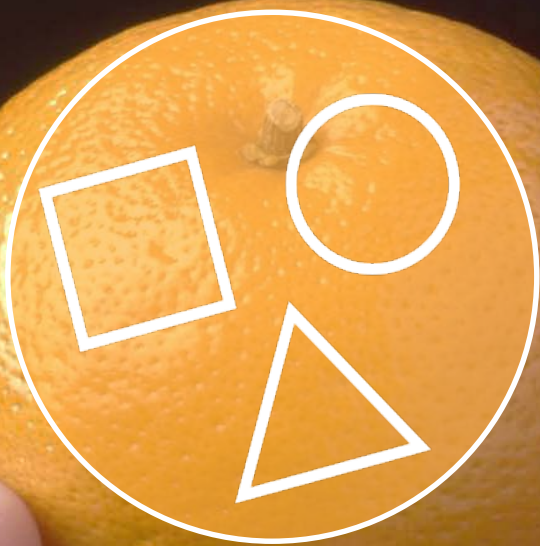


Data Analytics Workflow



Data Analytics Workflow



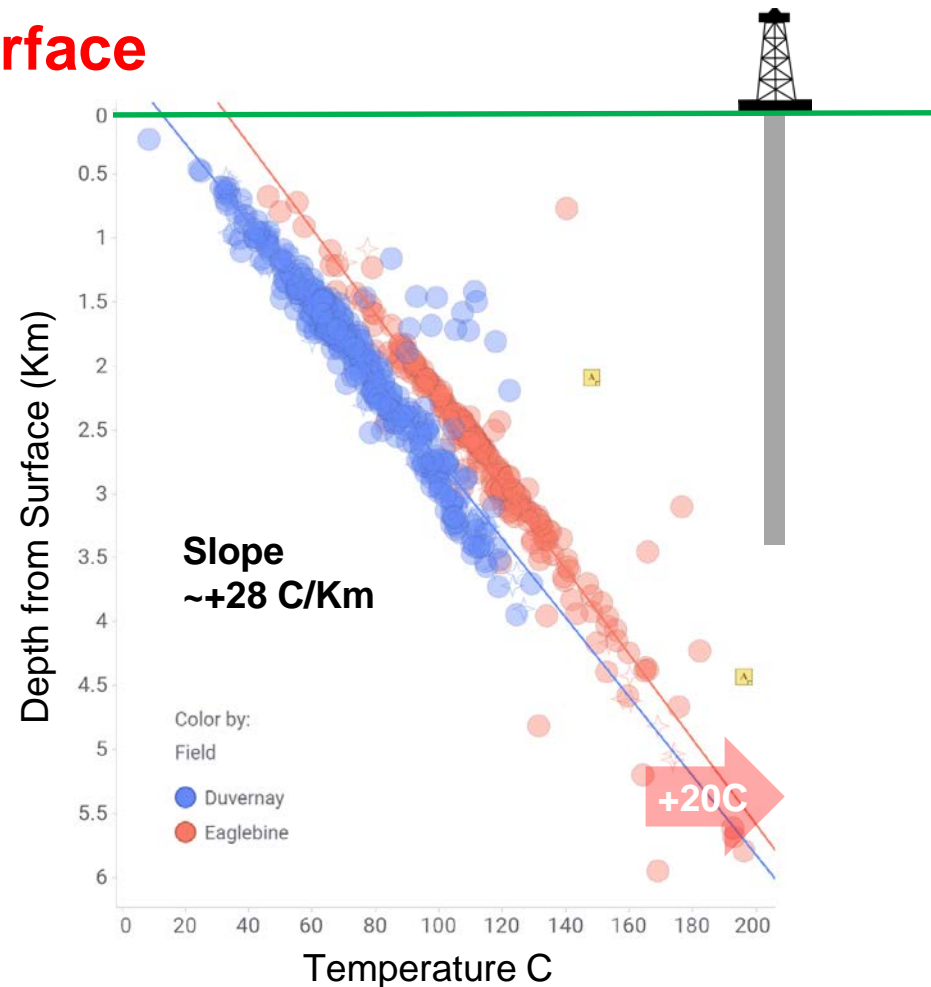


Basins Comparison

Temperature vs Depth from Surface

Similar gradients (slopes)

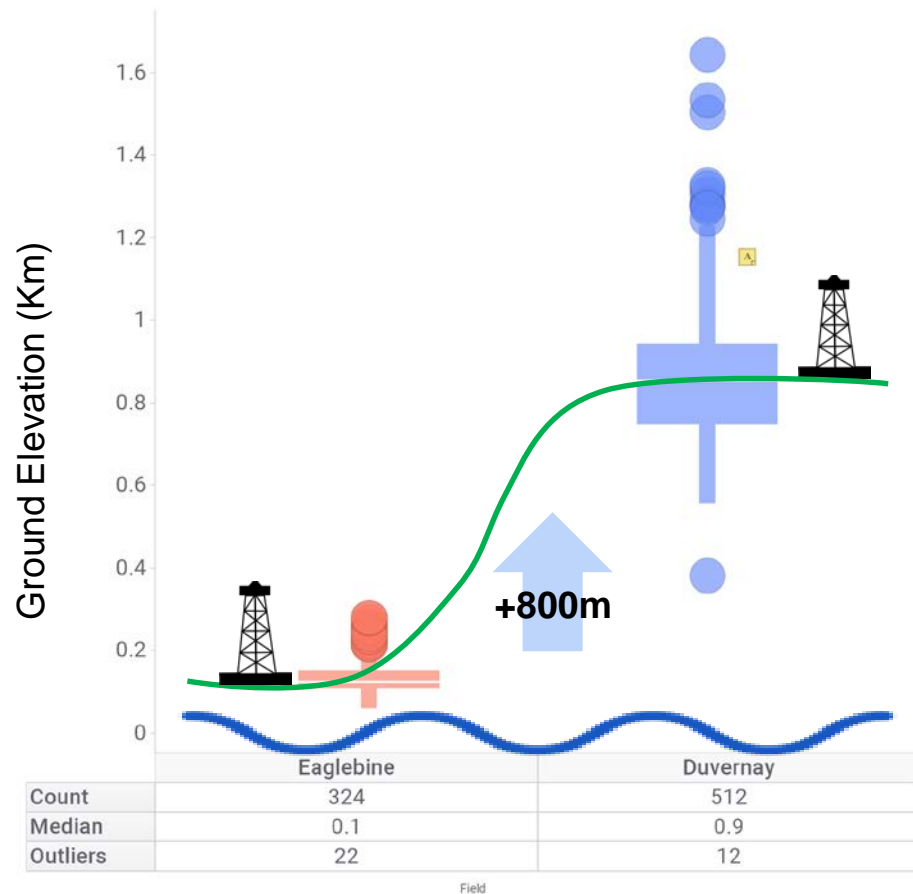
20°C shift



Ground Elevation Comparison

Eaglebine wells are almost at sea level.

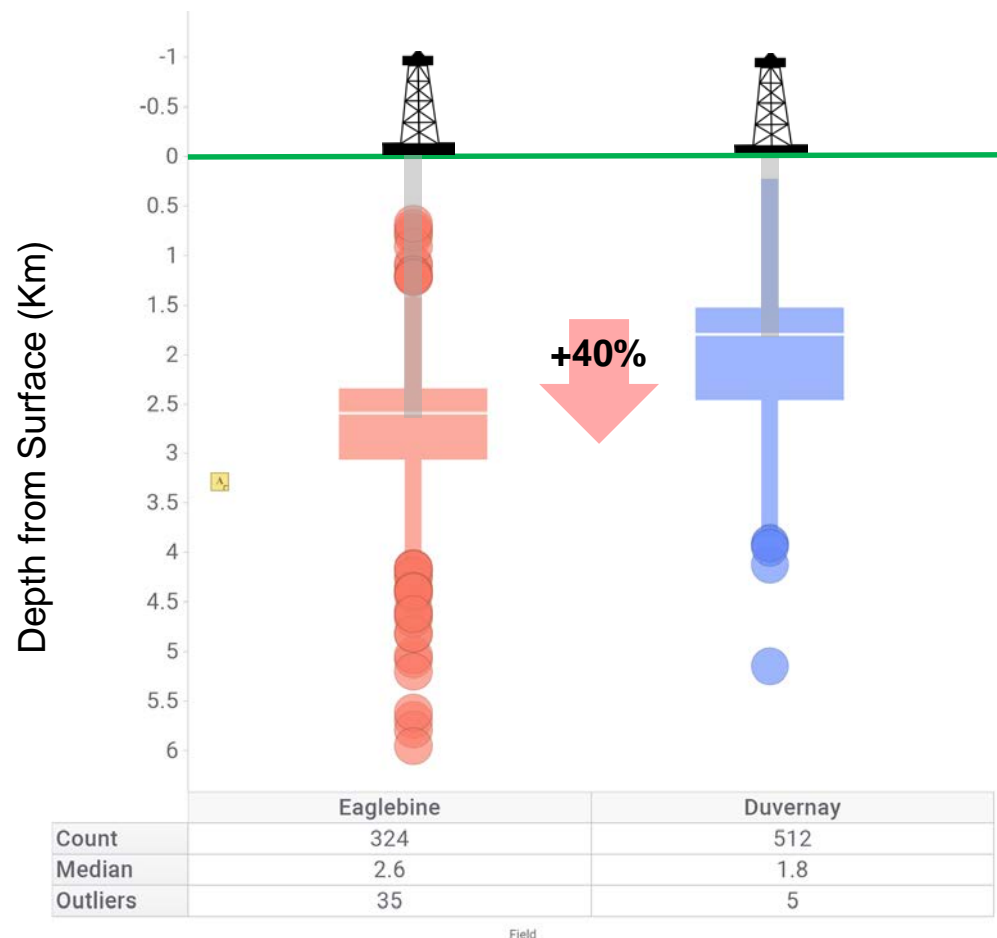
Duvernay is further away, at 900 m above sea level.



Well Length

On average:

- Duvernay $\simeq 1.8$ km long
- Eaglebine $\simeq 2.6$ km long
(40% longer)

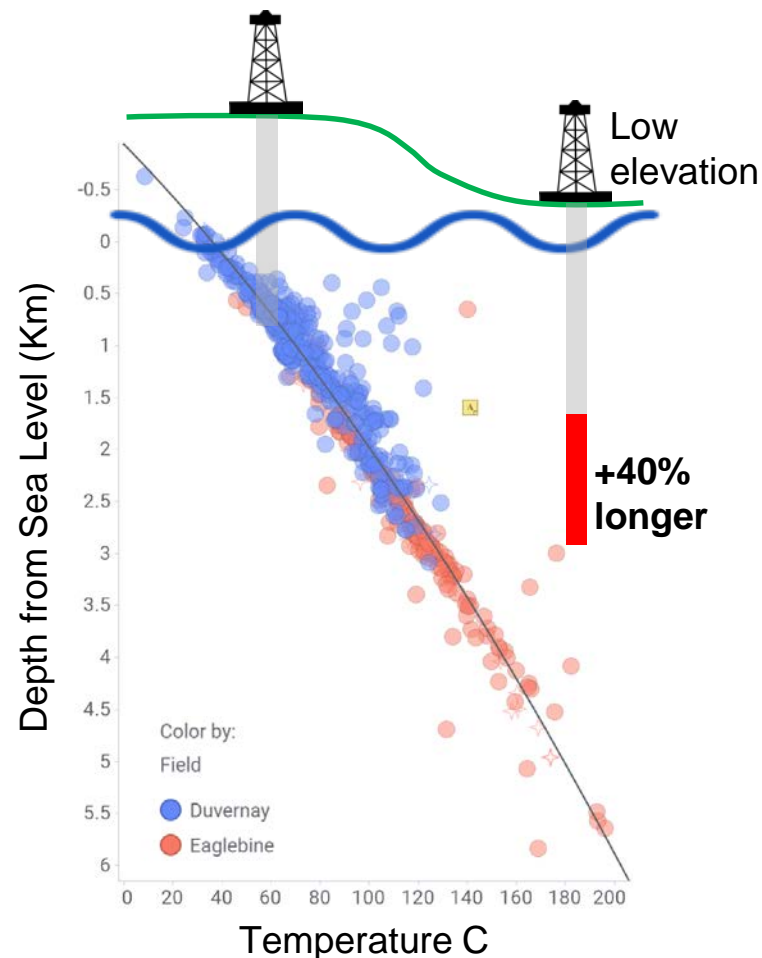


Why Eaglebine is hotter

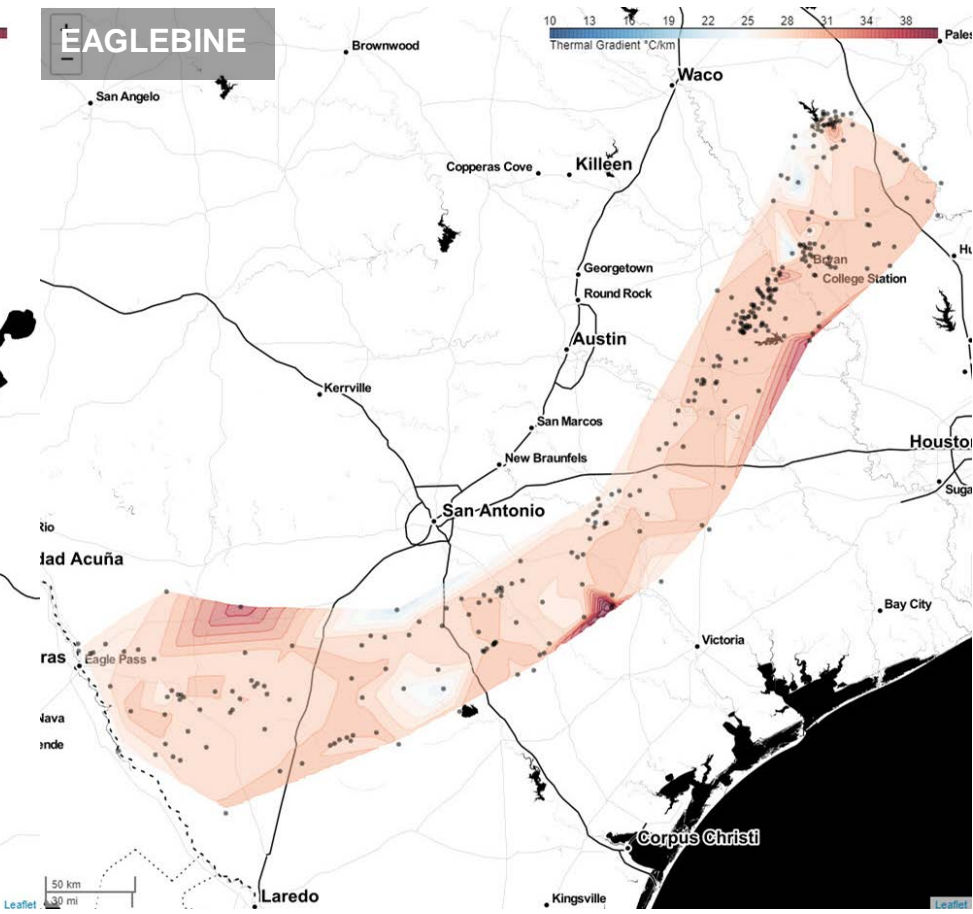
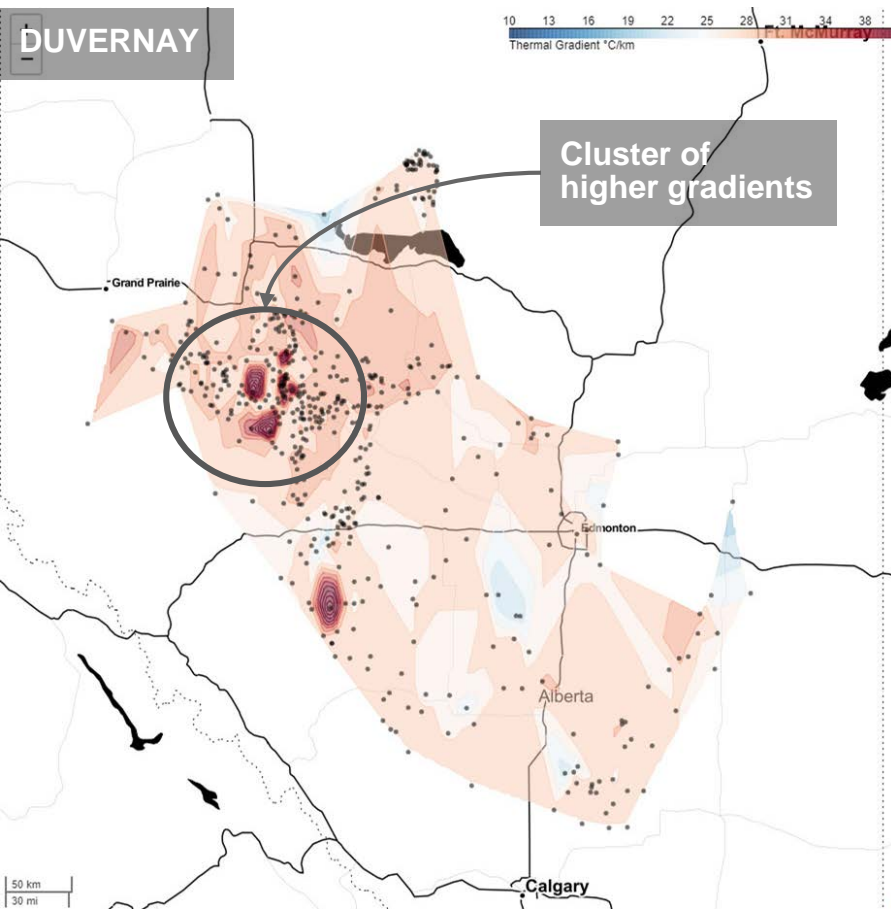
Eaglebine wells might be hotter because:

- they reach deeper into the earth
- 40% longer
- 800m lower elevation

When temperatures normalized to sub-sea level they align on the same gradient trend.



Thermal Gradient Mapping

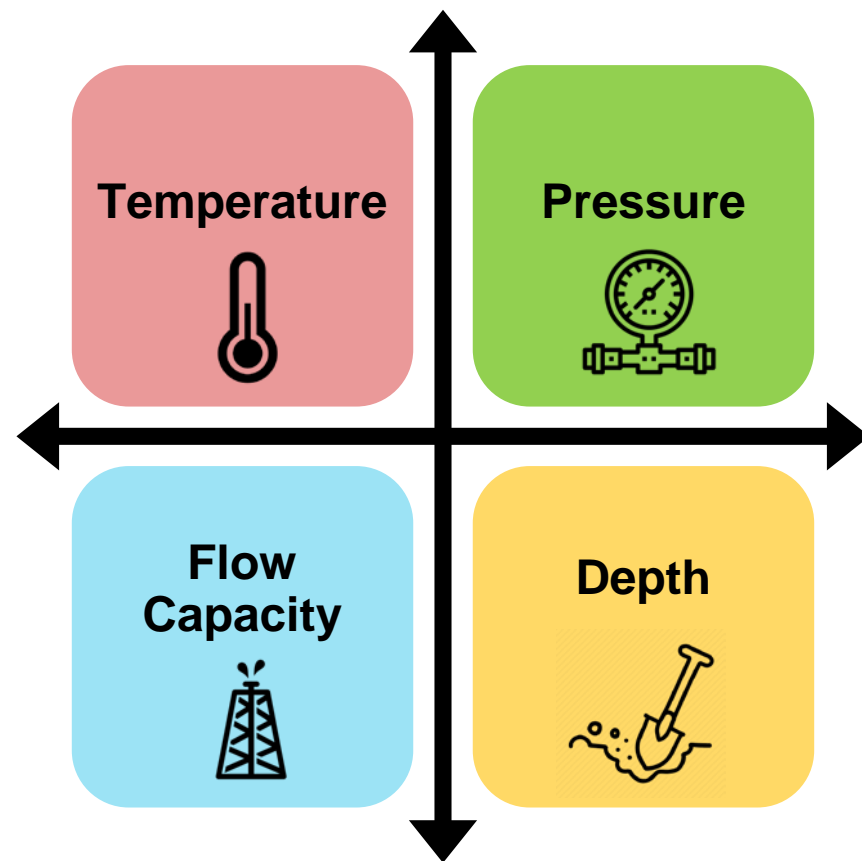




Duvernay Opportunities



Geothermal Opportunity Ranking Criteria



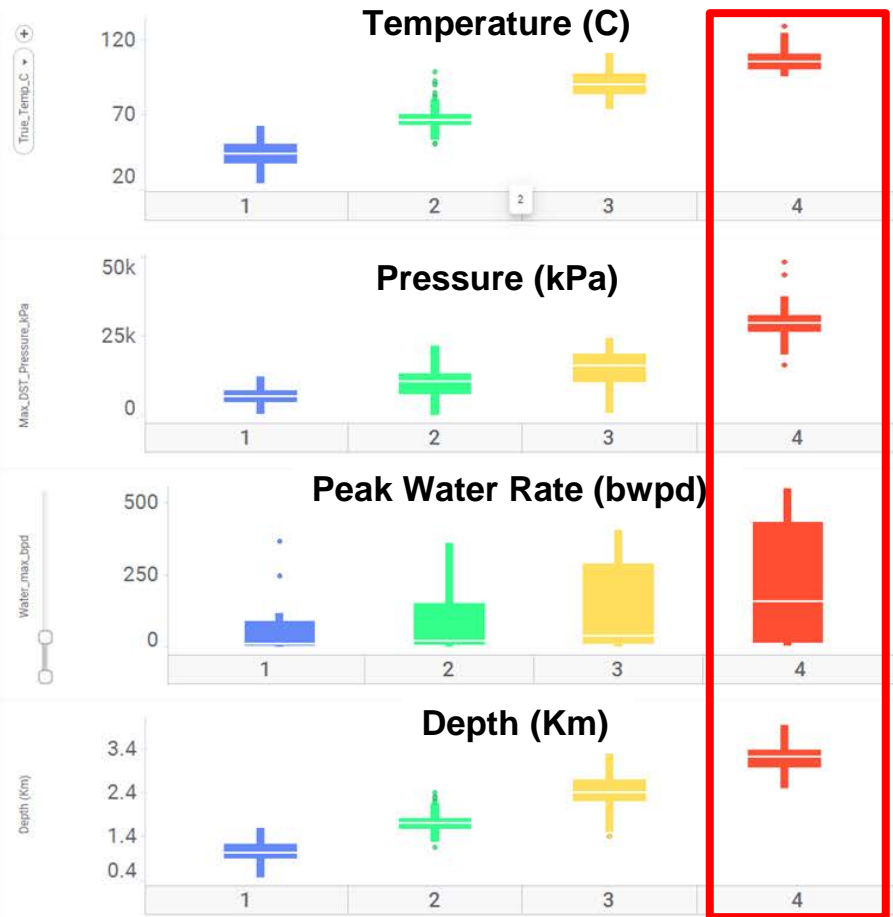
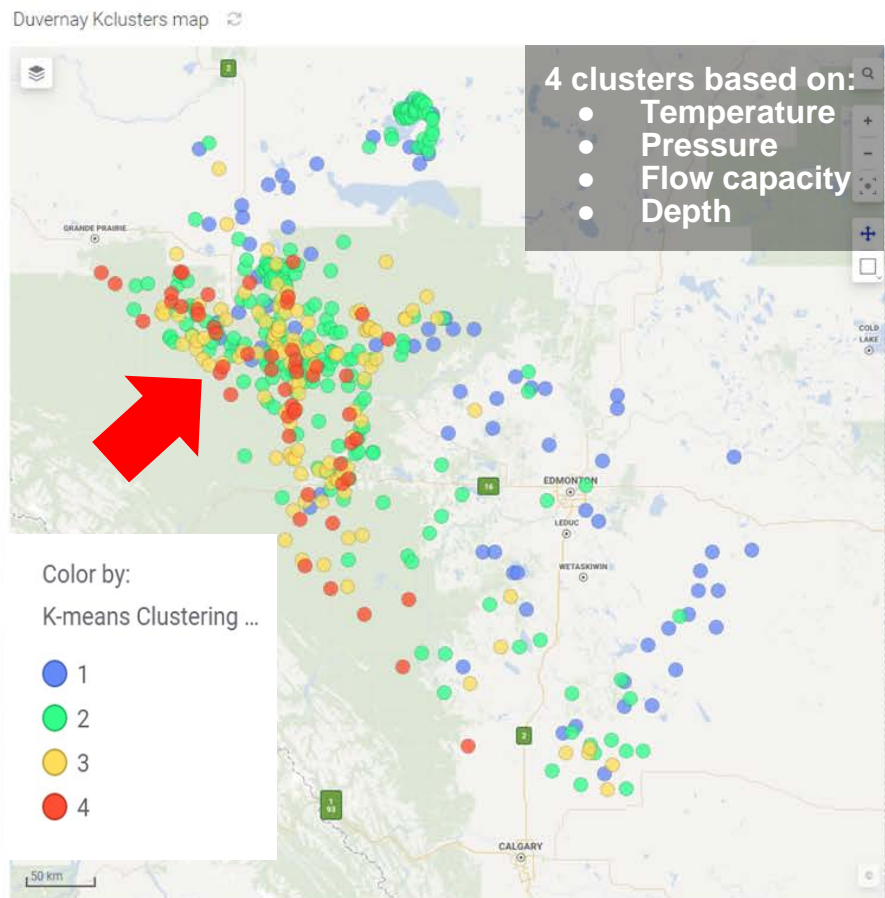
Other potential criteria
not covered here

Well status

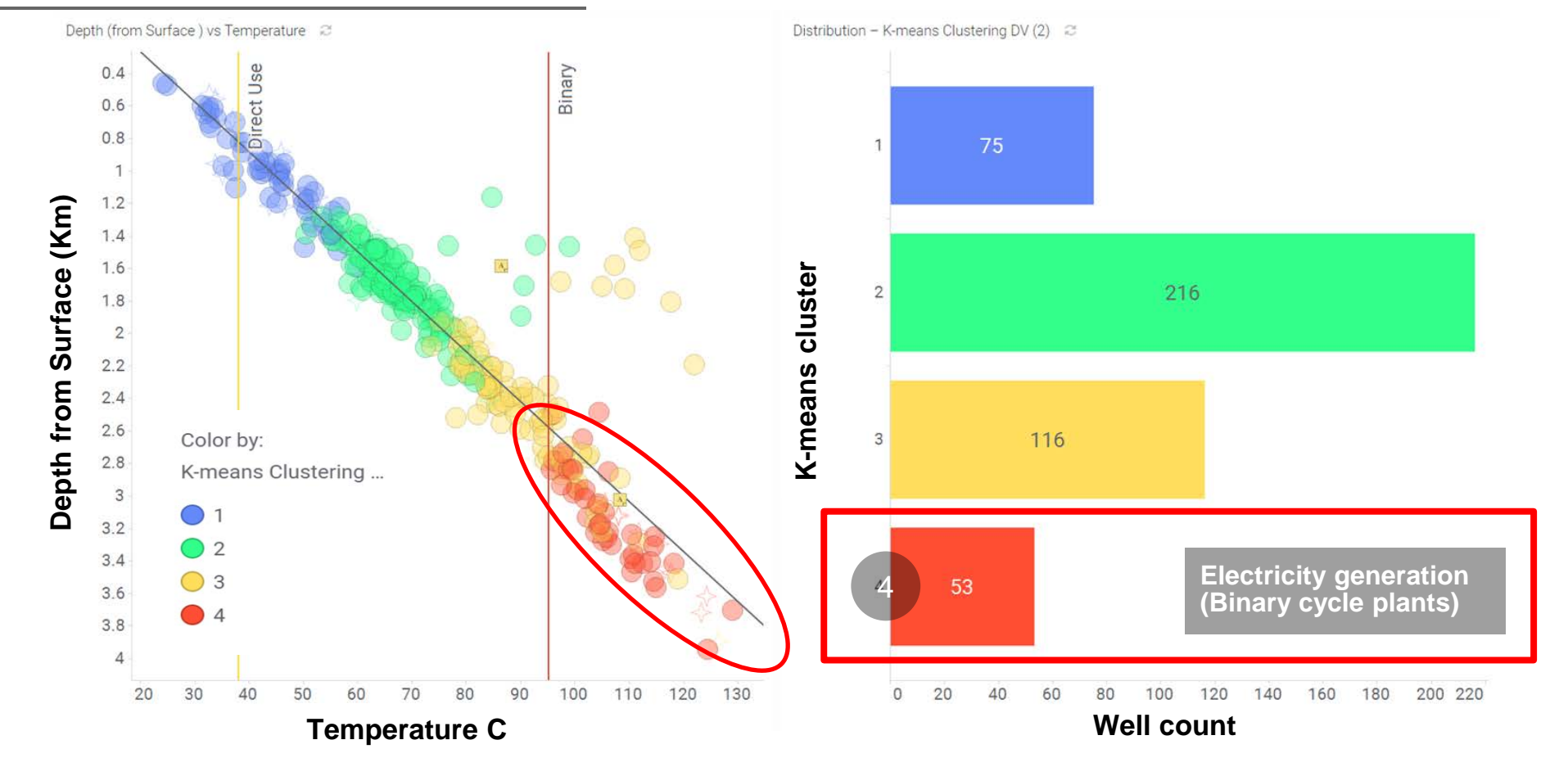
Integrity

Casing diameter

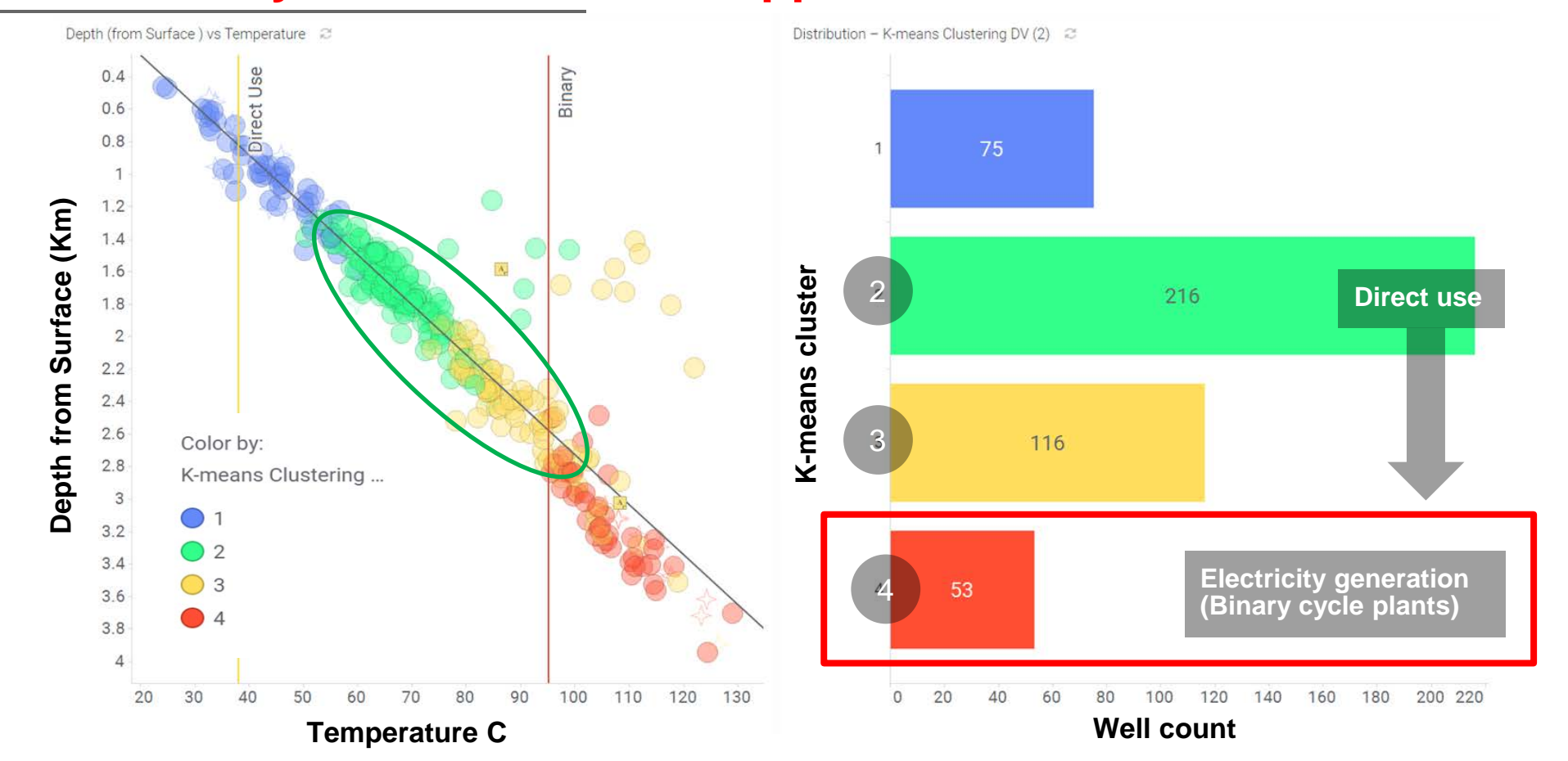
Duvernay Well Grouping Using K-means Clustering



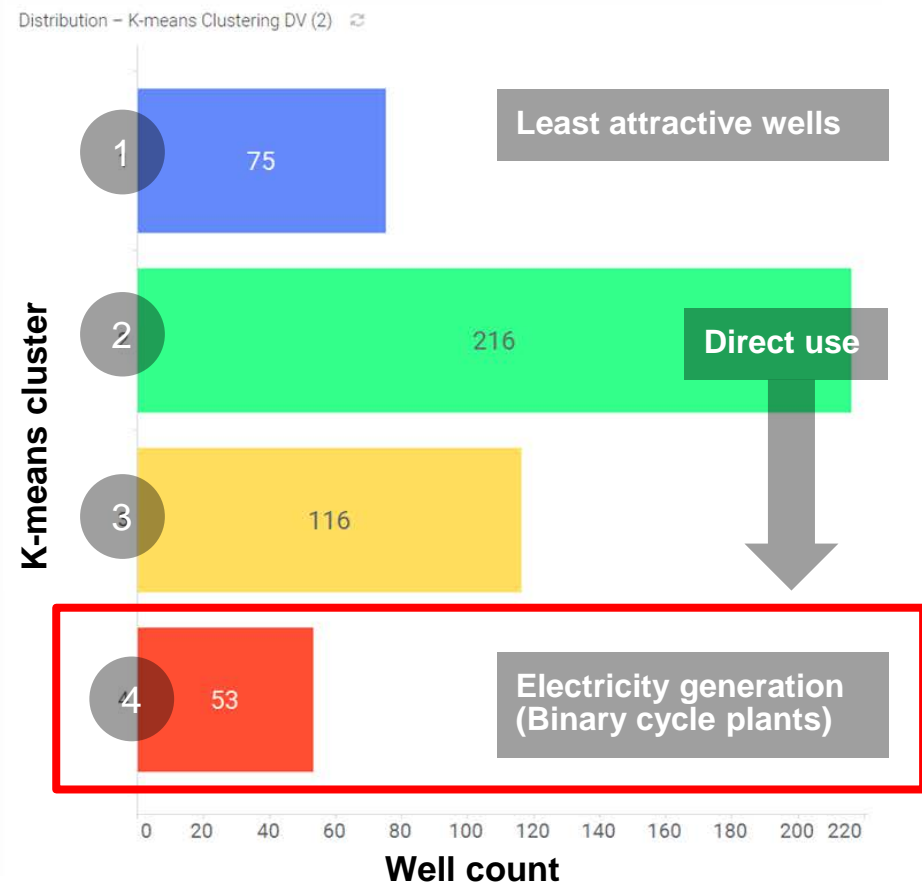
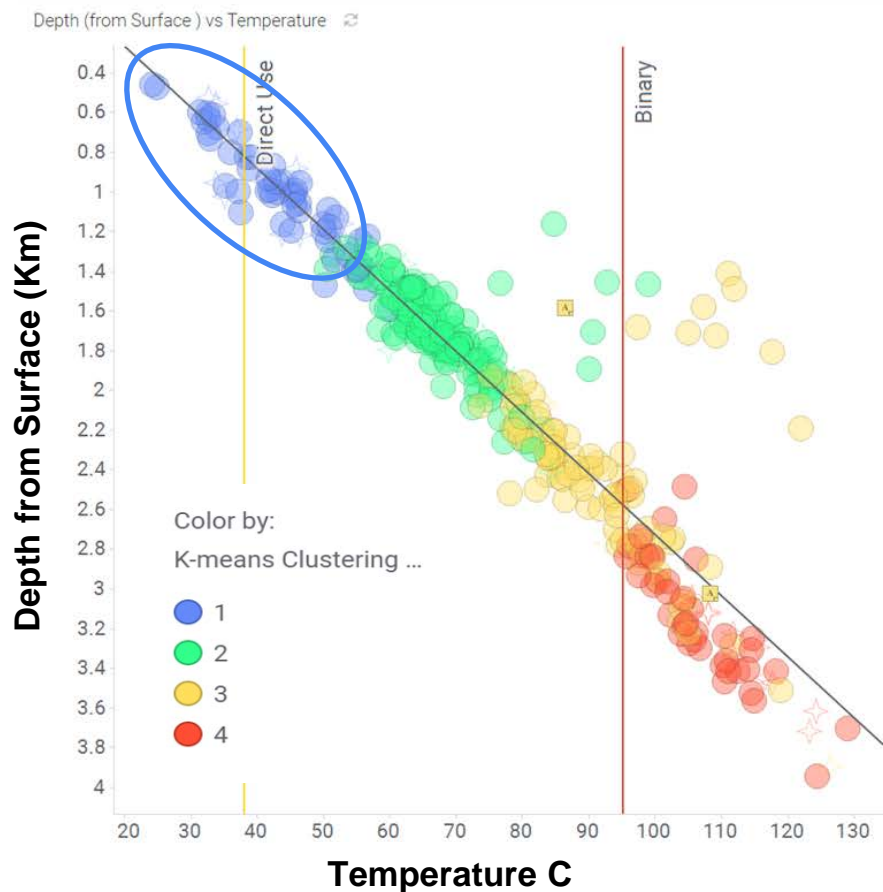
Duvernay Geothermal Well Opportunities



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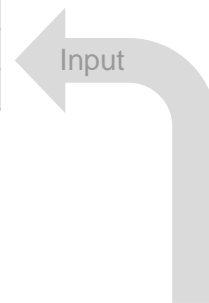
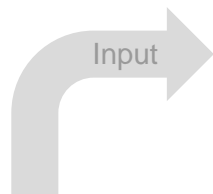
Duvernay Geothermal Well Opportunities



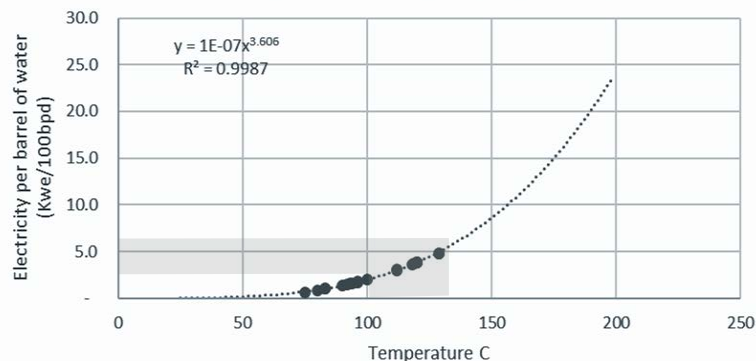
Business Case: How much electricity can a well generate?

Based on **Duvernay Well K-Cluster #4**

Temp (°C)	Rate bwpd	Kwe	30 y Gross Revenue CA\$
100	500	10	\$ 207 k
	1,000	20	\$ 413 k
	2,500	50	\$ 1,034 k
130	500	26	\$ 543 k
	1,000	53	\$ 1,085 k
	2,500	131	\$ 2,713 k



Correlation Specific Energy Capacity vs Temp

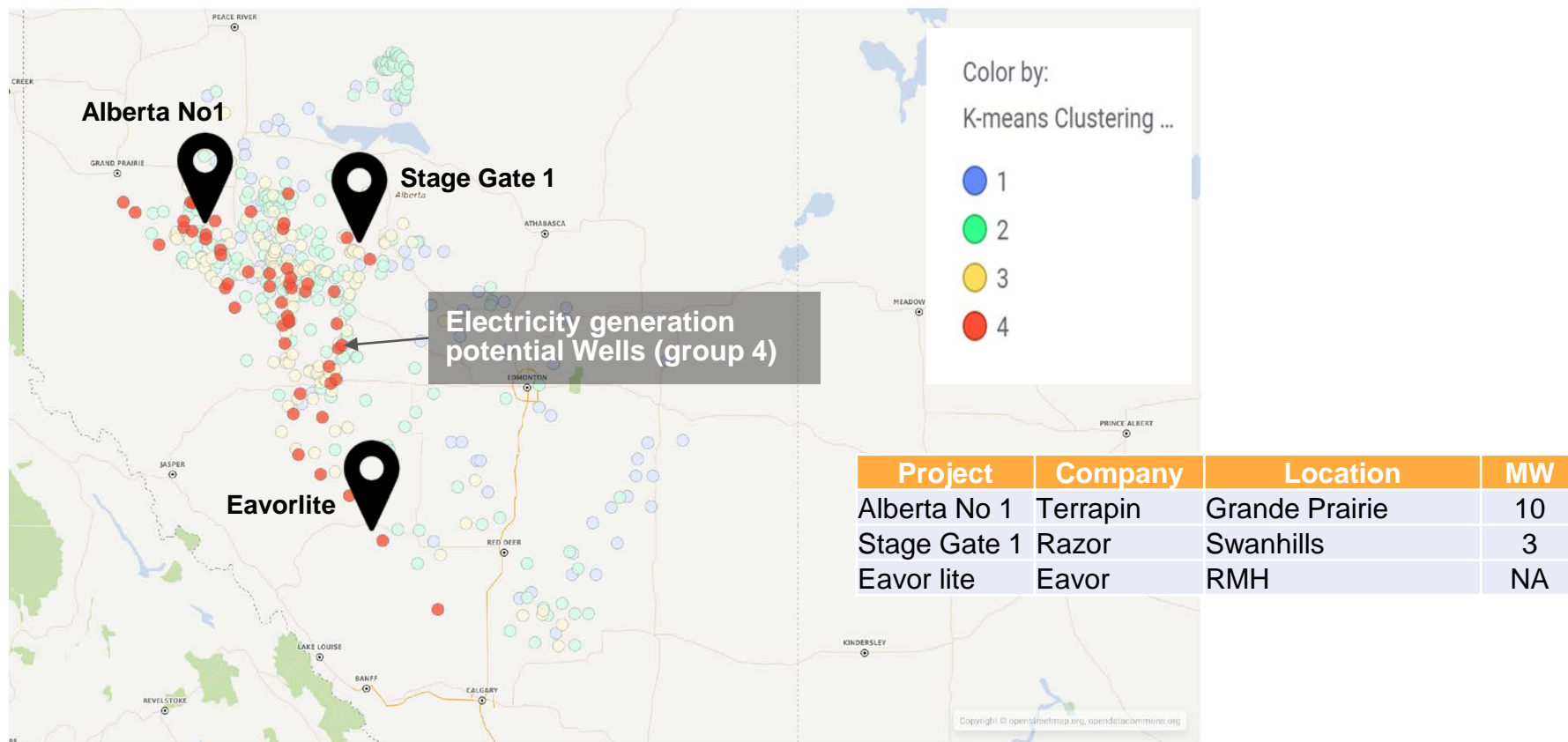


2021 Regulated Electricity average Rates:

\$7.86¢/kwh

<https://energyrates.ca/why-alberta-electricity-bills-are-getting-higher-and-what-you-can-do-about-it/>

Ongoing Geothermal Pilot Projects in Alberta

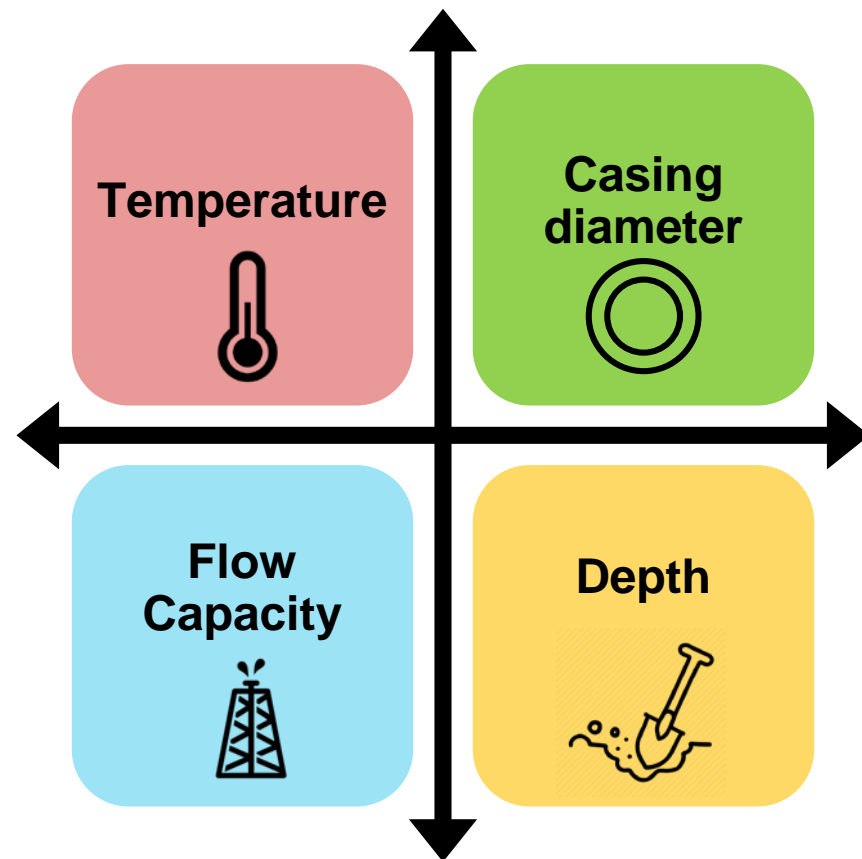




Eaglebine Opportunities



Geothermal Opportunity Ranking Criteria



Other potential criteria
not covered here

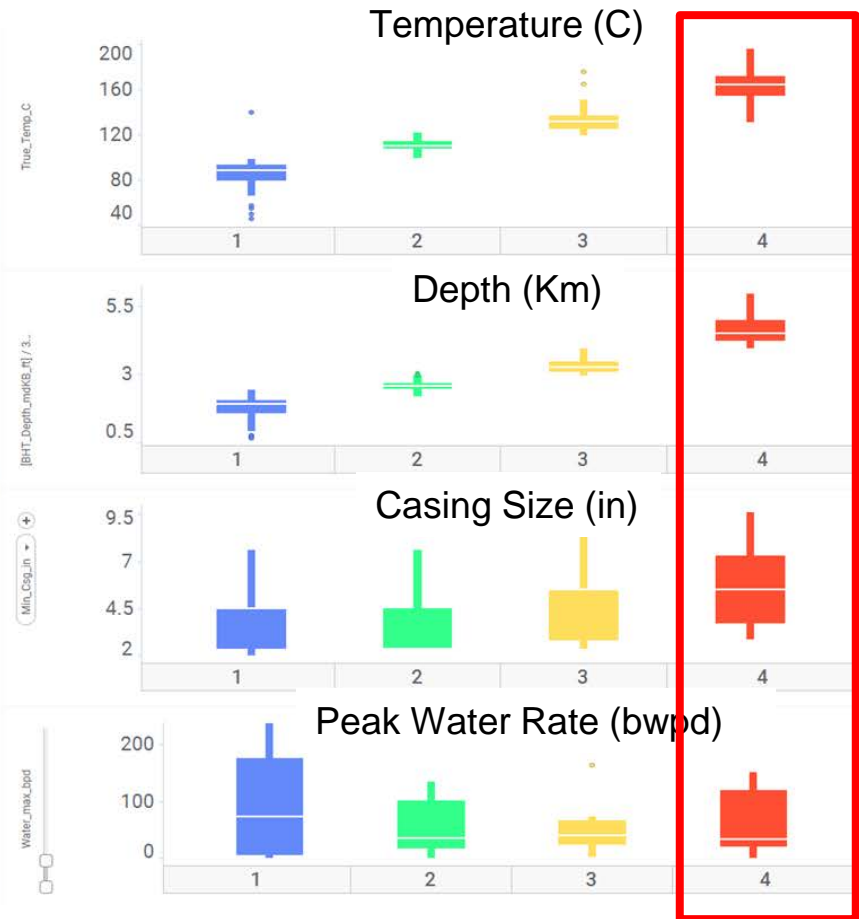
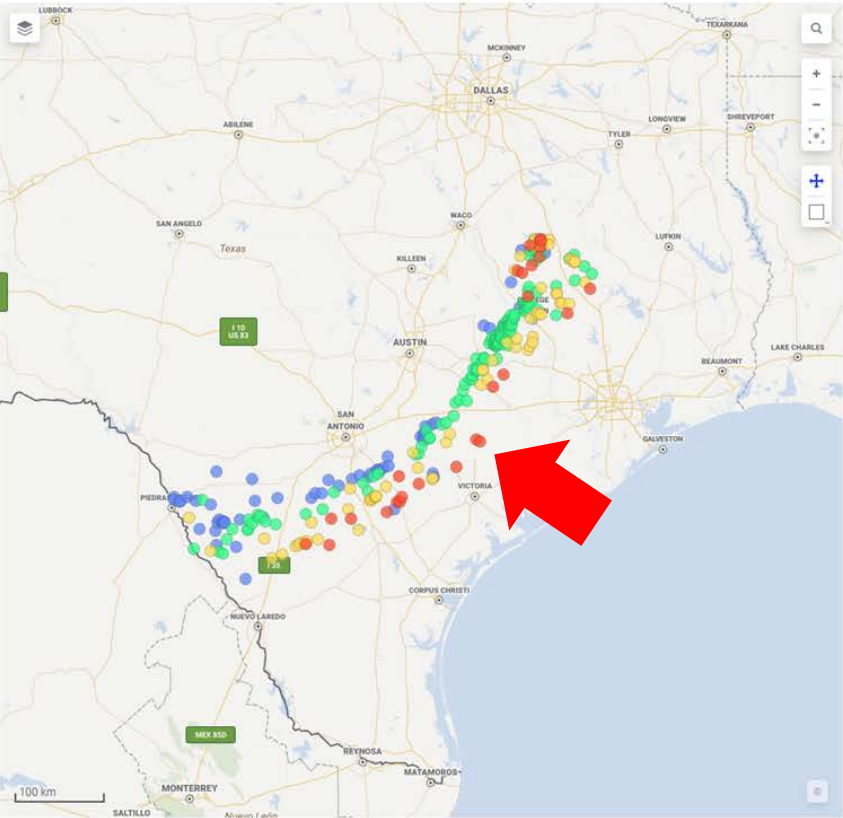
Well status

Integrity

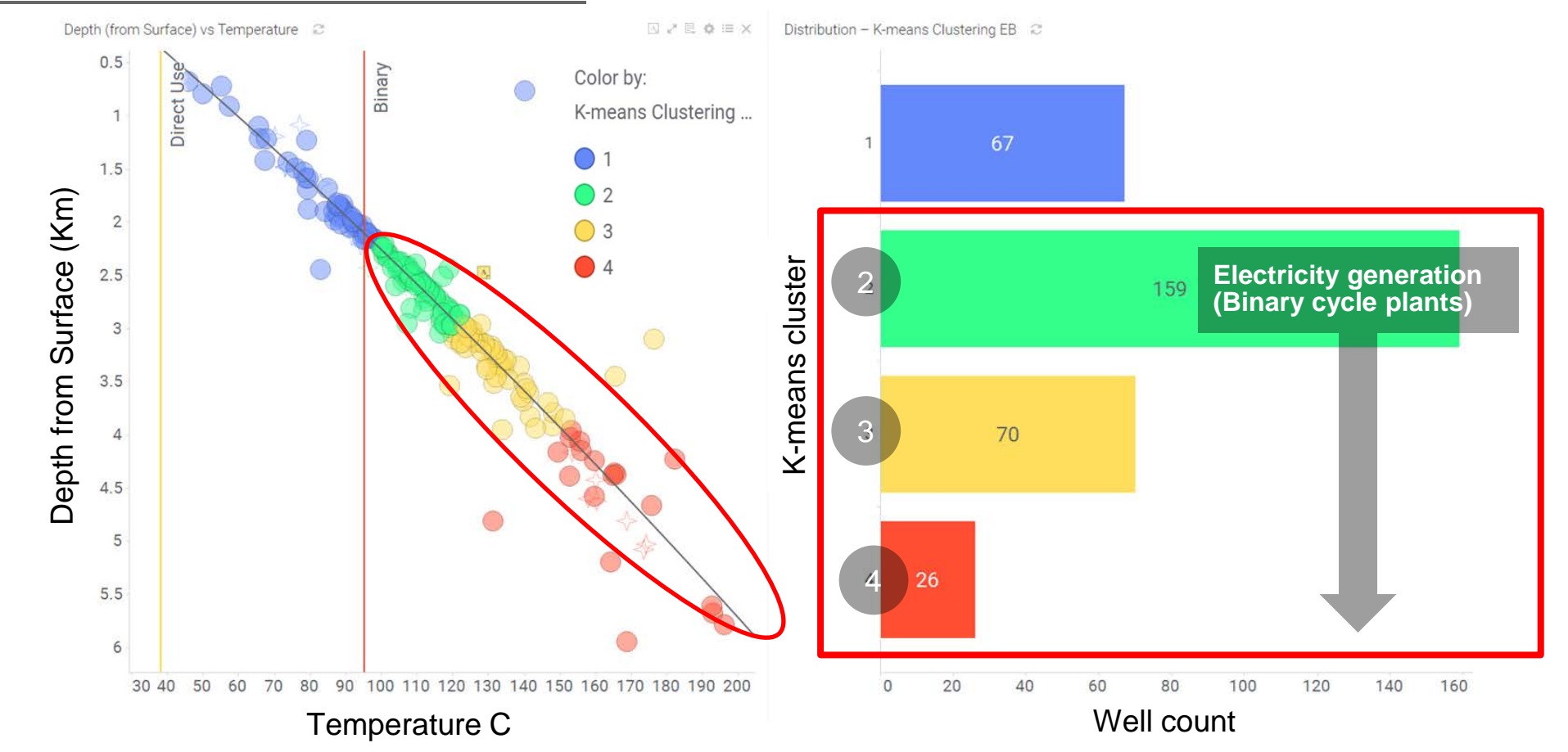
Casing diameter

Eaglebine K-means Clusters

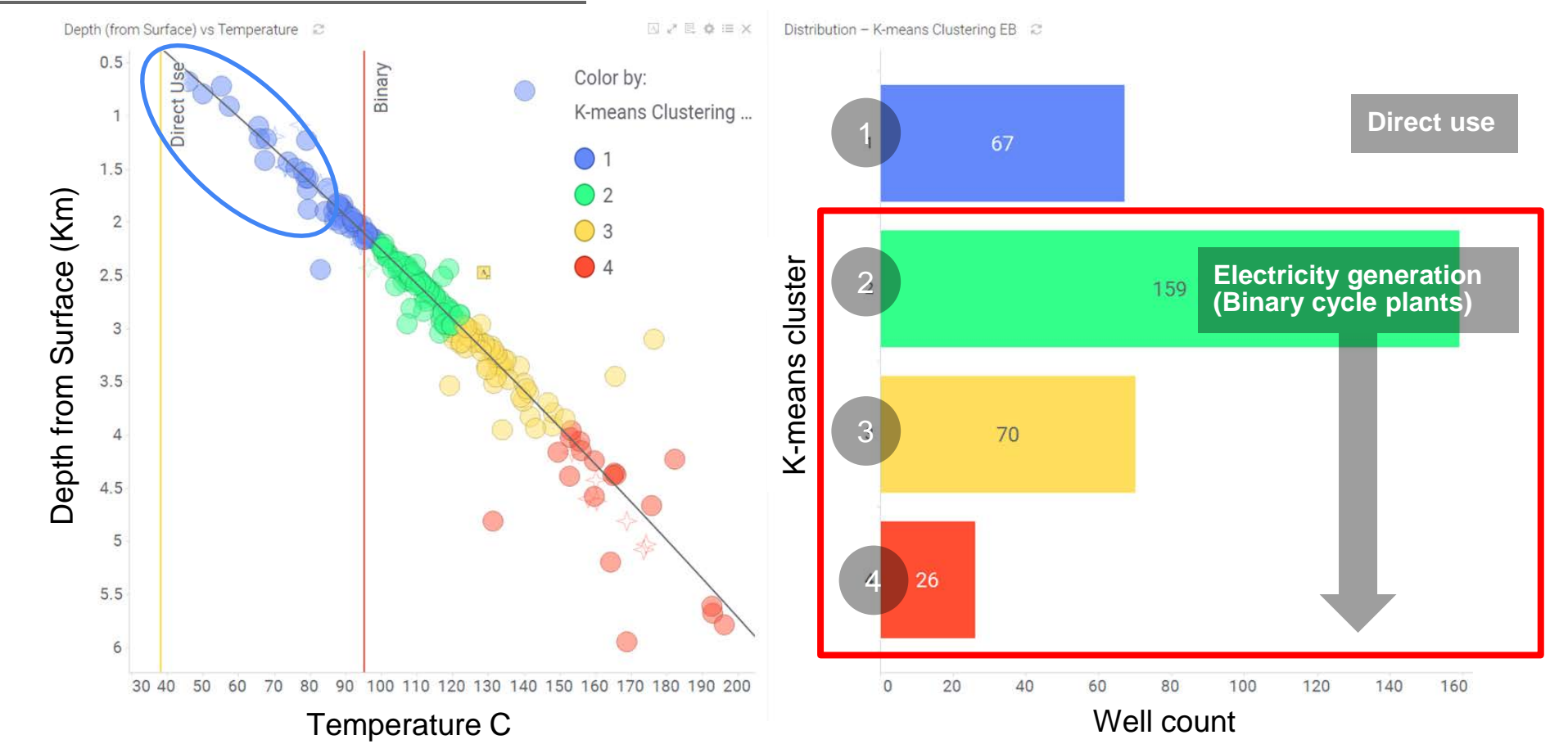
Eaglebine Wells Kmeans Clusters



Eaglebine Geothermal Well Opportunities



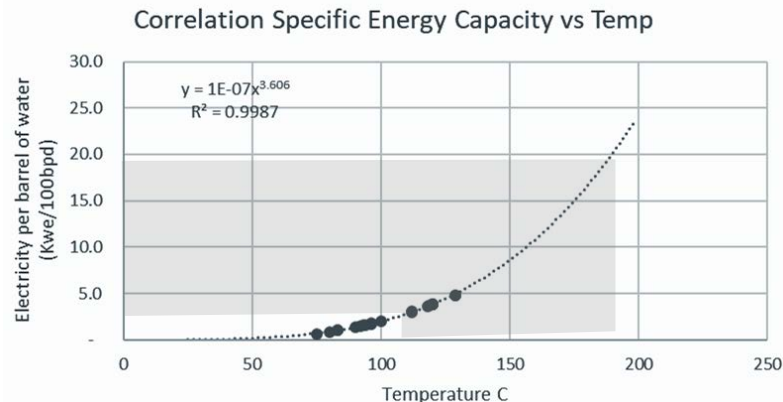
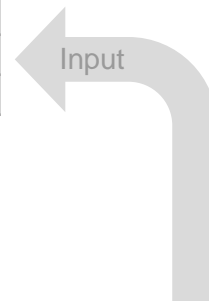
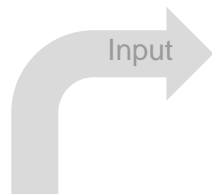
Eaglebine Geothermal Well Opportunities



Business Case: How much electricity a well can generate?

Based on **Eaglebine** Well K-Cluster #4

Temp (°C)	Rate bwpd	Kwe	30 y Gross Revenue US\$
110	500	15	\$ 265 k
	1000	30	\$ 530 k
	2500	75	\$ 1,325 k
190	500	110	\$ 1,943 k
	1000	220	\$ 3,888 k
	2500	550	\$ 9,720 k



Texas Electricity rates today:
Average rate **\$6.72¢/kwh**
For a 6 month term

www.energybot.com/electricity-rates/texas



Conclusion



Potential Geothermal Well Use Cases

AB, CANADA



- Potential in **Duvernay** for **direct use**
 - local commercial heating needs
 - Over 300 candidate wells
- Electricity production potential limited
 - 56 wells

TX, USA



- Potential in **Eaglebine** for **electricity** production
 - clean, 24/7 supply to the grid, from binary geothermal power plants
 - Over 250 candidate wells
- **Texas** increasingly exposed to **extreme-weather events**
- Pressure to adapt energy infrastructure

Geothermal path to profitability

- **Technology priorities:**
 - Maximize well rates
 - Lower costs
 - Minimize thermal losses
- **Economic incentives for:**
 - Carbon offsets
 - Clean energy initiatives
 - Deferred abandonment liabilities



The ALM Team

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