Water Sourcing in Southern Saskatchewan

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We strive to be the premier engineering solutions partner, committed to delivering complex projects from vision to reality for a sustainable lifespan.

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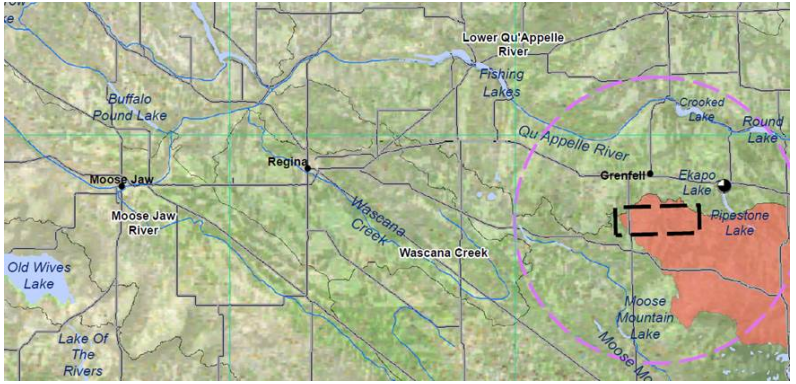
Water Sourcing in Southern Saskatchewan: The Issue

- Large scale operations often plan developments in Saskatchewan with the assumption that water will be available
- However, many proposed large scale operations end up sourcing surface and or groundwater many kilometers away from the operation
- This makes water sourcing an expensive afterthought
- Elevating water sourcing considerations to one of the primary considerations could save proponents millions to hundreds of millions of dollars



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Discussion Outline

- Site Selection
  - Factors that dictate facility location
- Water Sourcing Options and Challenges
  - Surface Water
    - Lake Diefenbaker
    - Saskatoon South East Water Supply System
    - Qu'Appelle System
    - Other smaller rivers, creeks and reservoirs
  - Groundwater
    - Hatfield Valley Aquifer
    - Bedrock Aquifers
    - Glacial Aquifers
- Adaptable Water Sourcing Solutions

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Starting a Project: Site Selection

- Site selection is complex and requires a multidisciplinary approach
- Factors include the following considerations:
  - Proximity to resource
  - Land access
  - Social
  - Geotechnical
  - Environmental
  - Constructability
  - Cost

- Provincially Saskatchewan has lots of water available, it is just located in the wrong place for many large scale operations

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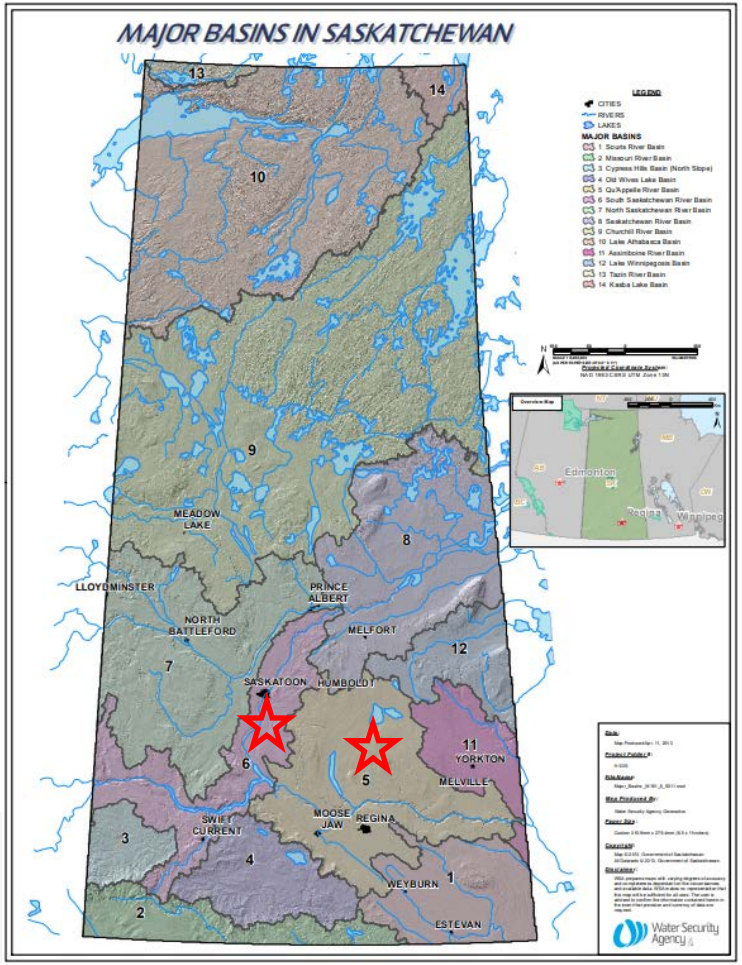
Surface Water: Resource Distribution

- Most of the industrial surface water supply is from South Saskatchewan River and Qu'Appelle River basins in Southern Saskatchewan
- North Saskatchewan and Saskatchewan River basins are used in Central Saskatchewan
- Northern Saskatchewan has lots of water but little infrastructure
- Water supply challenges include interprovincial water rights, conveyance, and management



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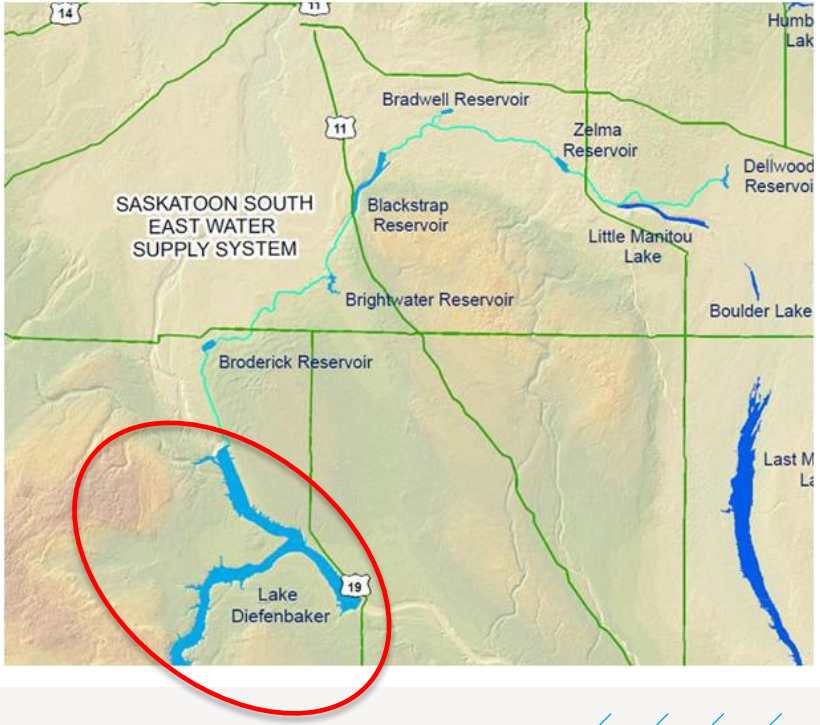
Surface Water Sources and Challenges

Lake Diefenbaker

- Able to supply multiple industrial, irrigation, recreational, and municipal demands
- Long environmental assessment and regulatory acceptance process for water sourcing
- May not be economically feasible for projects located far from lake and lengthy permitting process



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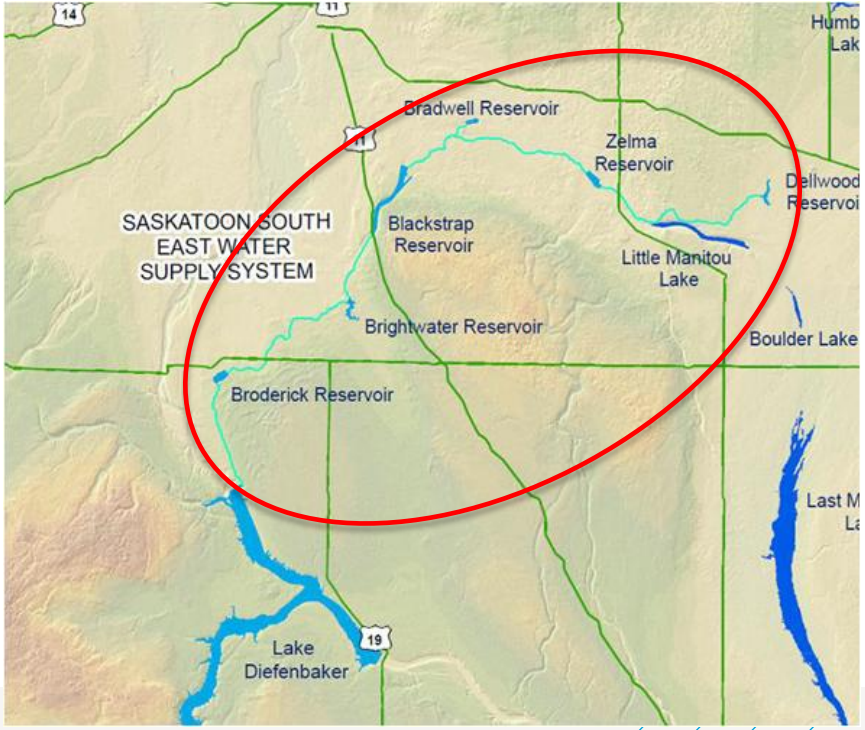
Surface Water Sources and Challenges

Saskatoon South East Water Supply System

- Industrial and irrigation water supply source
- Stretched water demand and limited water supply during winter
- Potential water supply issues during dry years
- Moderate environmental assessment and regulatory acceptance process



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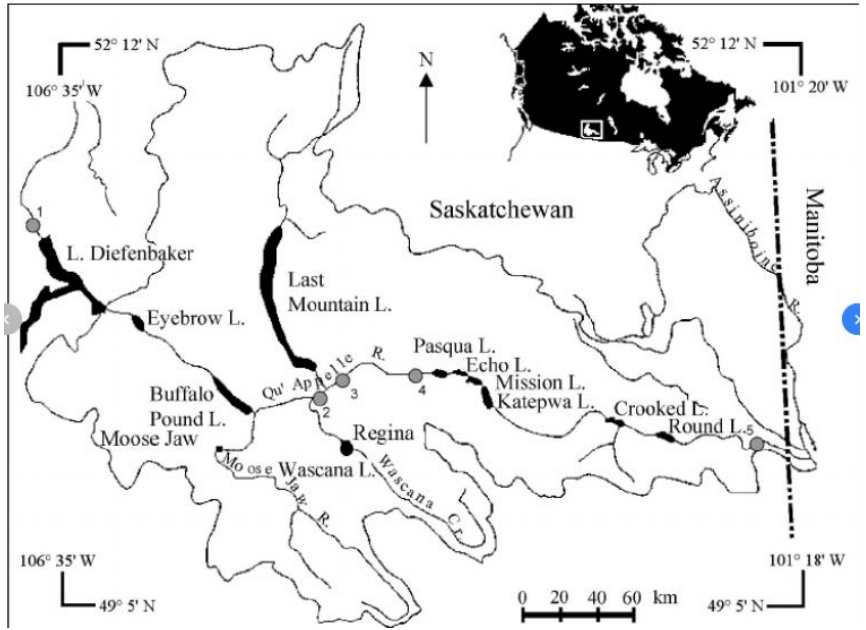
Surface Water Sources and Challenges

Qu’Appelle System

- Able to supply multiple projects and municipal demands
- Water quality varies going downstream
- Potential water supply issues during dry years and under climate change issues
- Long environmental assessment and regulatory acceptance process



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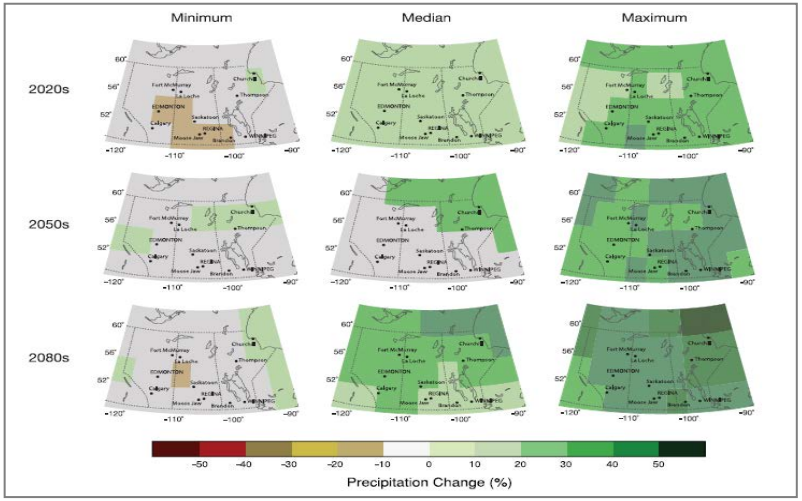
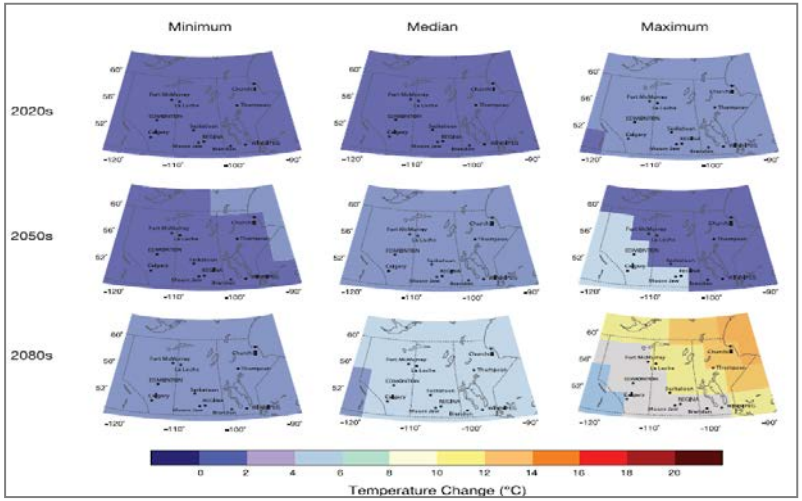
Surface Water Sources and Challenges





- Climate change poses significant risk to fresh water supply as changes in temperature and precipitation are becoming increasingly evident
- Water demand amplifies due to population growth, climate change factors, etc.

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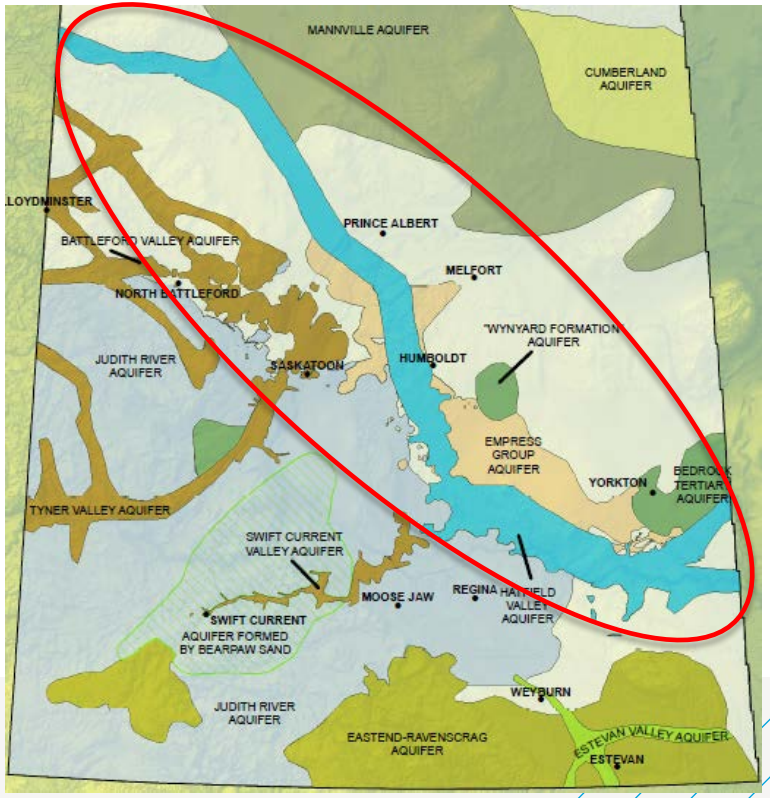
Groundwater Sources and Challenges

Hatfield Valley Aquifer

- Potential to supply large volumes
- Exploited for industrial, municipal, and domestic water use
- Limited extent
- Complex system that can be hydraulically connected with overlying aquifers



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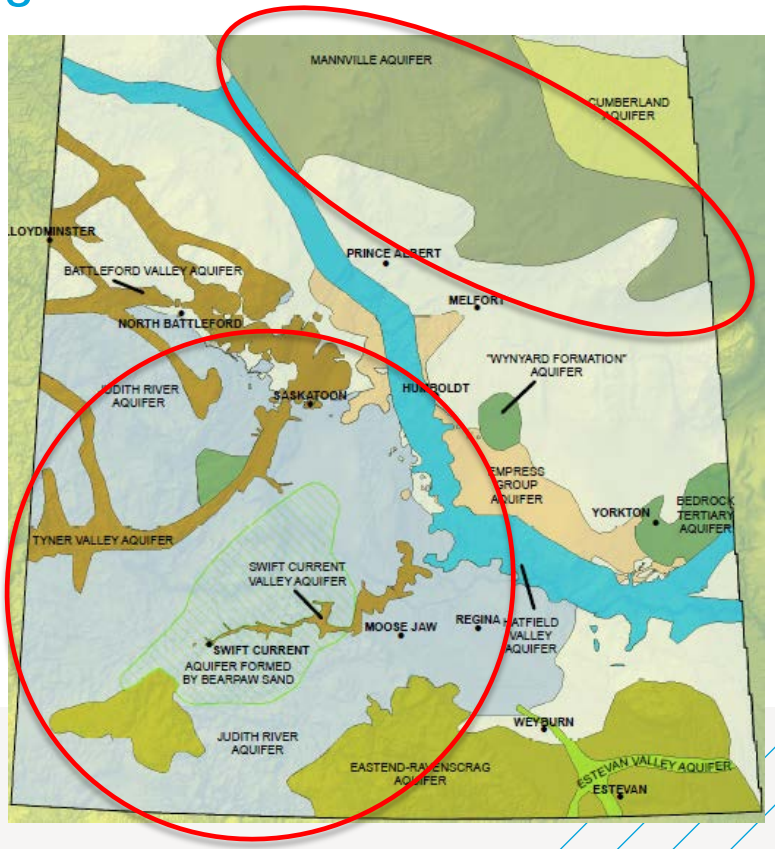
Groundwater Sources and Challenges

Bedrock Aquifers

- Highly variable production rates
- Reduced water quality



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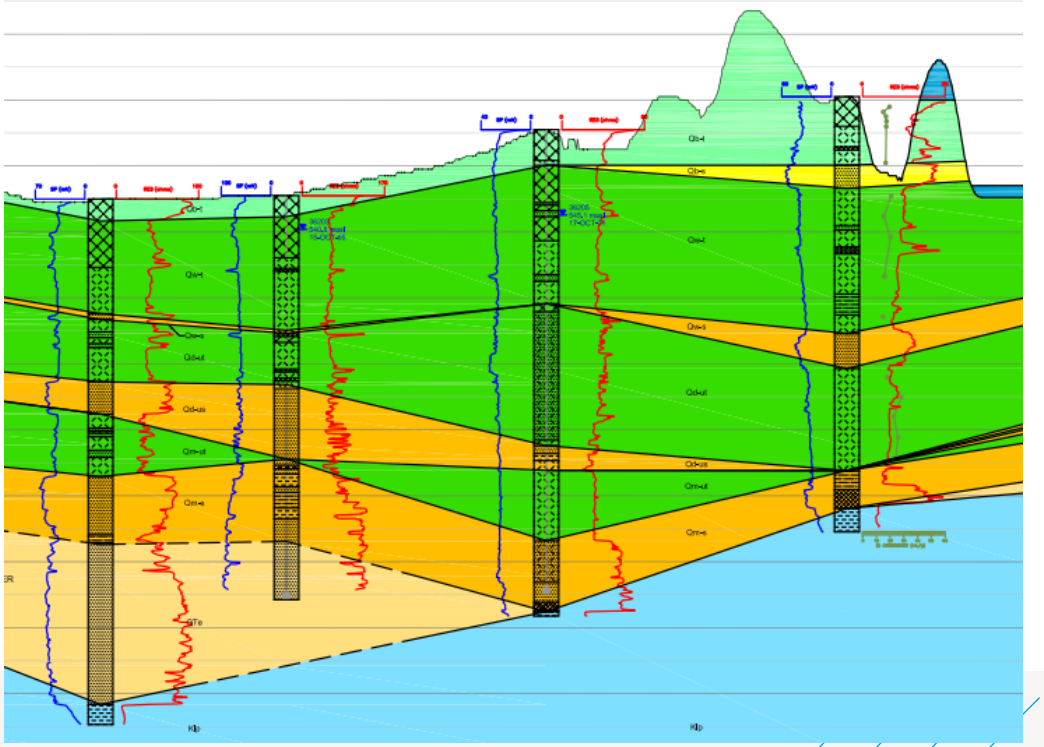
Groundwater Sources and Challenges

Glacial Aquifers

- Thickness and extent highly variable
- Smaller production rates



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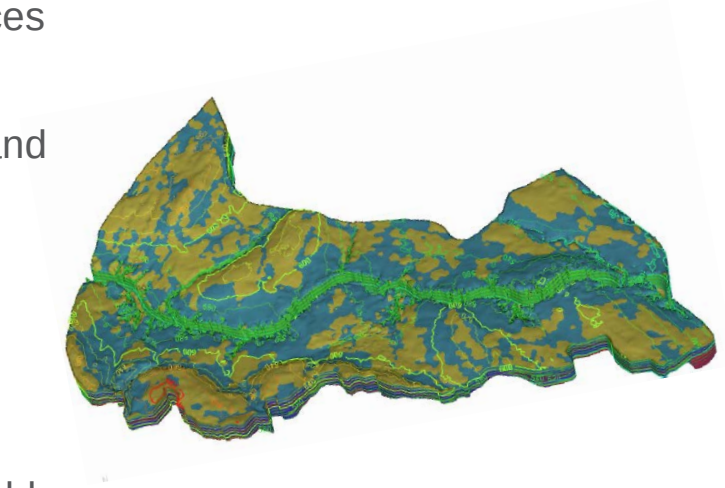
Adaptable Water Sourcing Solutions

- Strategic use of groundwater and surface water sources combined
- Best management practices of industrial processing and on-site water conservation practices to minimize fresh water demand
- Water resources assessment through research and monitoring for better planning and management
- Additional water supply infrastructure (e.g. increasing conveyance capacity) is warranted to ensure sustainable water supply



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Conclusions

- Locating a project as close to possible to a viable source during the siting stage is best practice and could result in significant savings
- Proponents are increasingly looking at ways to reduce and reuse water such that their overall demand is lower
- There also appears to be a move in the potash solution mining sector toward smaller scale projects (e.g. Western Potash, Gensource, etc.) that can potentially draw water from deeper more saline sources
- Consideration of water source during project planning can result is substantial cost reduction

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