## ECACEP Scenario - Full Speed Ahead

### Planning Factor: Water Quality and Quantity

- **What if we can’t mitigate the fast pace of change?**

### Theme: Community and our Environment – Uncontrolled Growth

<table>
<thead>
<tr>
<th>Force/Driver</th>
<th>Scenario Assumptions (developed by workshop participants)</th>
<th>Forces/drivers /outcomes from Consolidated Report that could support this scenario (developed by workshop participants)</th>
<th>Supportive Information from Topic and Focus papers</th>
</tr>
</thead>
</table>
| Climate change | • Political will and resources are provided for adaptation | • Increased weather variability  
• Shifting weather patterns create uncertain supplies of water and more rain/drought cycles  
• Drier climate and atmospheric air; decreased availability of drinking water, ground water and soil quality; dryer wetlands, well water and recharge areas  
• Amount of arable land decreases  
• Wildlife declines  
• Communications/education helps people adjust to climate change/drought conditions | • A warming world  
• By 2050 Calgary, Edmonton, Grande Prairie and Fort McMurray are projected to experience degree-day totals similar to Lethbridge and Medicine Hat today  
• Longer growing season/shorter milder winters  
• Reduced snow accumulation – declines in annual streamflow- shift in streamflow to earlier in the year = lower summer water supplies  
• Drier soils – decrease in subsurface recharge leading to decline in the water table  
• Increased soil erosion leading to increase in stream sediment and nutrient load (increased eutrophication and pathogen loading in local water bodies and streams during summer  
• Increased frequency of extreme weather events  
• Could have enhanced productivity of forests, crops and grasslands – where there is adequate moisture  
• Summertime drying – greater water loss by evaporation and plan transpiration |
| Ecological Goods & Services (EG&S) | • Mitigation of all other sources of wealth (i.e. paying more for the replacement of Ecological Goods and Services, social, safety, etc. | • EG&S are not factored into economic calculation  
• Their loss is mitigated  
• Technological solutions are sought to replace EG&S | • Natural capital yields EG&S, which is almost always overlooked in calculating Canada’s assets.  
• Value of wetlands to Canadians is estimated at $20 billion  
• Forests provide air quality, carbon storage and sequestration, soil formation, water treatment, biological control, storm water control, recreation, culture, raw materials and genetic resources  
• Grasslands and rangeland provide water regulation, erosion control, soil formation, waste treatment, pollination, carbon storage and sequestration, biological control and food production  
• Wetlands provide water supply and treatment, disturbance regulation, food production, recreation, culture, habitat and refuge  
• Lakes, Rivers and riparian areas provide water supply and treatment, food production and recreation  
• Croplands provide food production, habitat/refuge, scenic (over 80% of the region)  
• Undeveloped lands provide scenic, carbon sequestration and storage, tourism |
| Wetlands | • Wetland mitigation underlying the whole thing | • EG&S are not factored into economic calculation  
• Their loss is mitigated  
• Technological solutions are sought to replace EG&S | • 71% of wetlands in the Prairie Region have been lost (2003)  
• Drainage has been encouraged through policies and incentives  
• Conflicts are common between communal and individual rights to resources  
• Crown owns the water in a wetland, but the surroundingland, bed and shores of non-natural or non-permanent wetlands can be privately owned |
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<th>Water supply</th>
<th>Wetlands help recharge underground aquifers that store 97% of the world’s unfrozen freshwater (groundwater recharge occurs where there are ponds – and mostly occurs in spring and early summer – before evaporation intercepts seepage outflow from ponds.</th>
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<tbody>
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<td>• Decreasing wetlands to make way for Big Agriculture</td>
<td>• Benefits include increase soil moisture for crop production and increased deep aquifer recharge for well water maintenance</td>
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<td>• Chemical toxins negatively impact the environment</td>
<td>• Wetlands store as much as 40% of global terrestrial carbon (carbon sinks)</td>
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<td>• Plants and soils in wetlands purify water, removing nitrogen and phosphorous, and in some cases toxic chemicals</td>
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<td>• Chemical toxins negatively impact the environment</td>
<td>• Freshwater wetlands hold more than 40% of the world’s species and 12% of all animal species</td>
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<td>• Wetlands help recharge underground aquifers that store 97% of the world’s unfrozen freshwater (groundwater recharge occurs where there are ponds – and mostly occurs in spring and early summer – before evaporation intercepts seepage outflow from ponds.</td>
<td>• Recreational activities associated with wetlands (and which generate income locally) are boating, hunting, bird watching, art and literature</td>
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### Water supply

- **Water shortages and droughts**
- **Contaminated water supply and unhealthy ecosystems due to unchanging agricultural practices require mitigation**
- **Damage to groundwater supply is mitigated, where possible**
- **Increasing demand for water by agriculture**
- **Inter-basin transfer is considered, but surpluses elsewhere are not available**
- **Increased conflicts as water allocations are fully realized**
- **Shortages impact types of farming, size of community, etc.**
- **Conflicts over water arise with USA, as well as locally**

#### Study area lies mostly in the Battle River Basin (BRB)
- **Primary surface water source**
- **Water is derived entirely from local surface run-off (rain and snow melt) and ground water flows. River flows dependent on precipitation, resulting in tremendous variability in annual flows**
- **Total current average surface water us is about 19% of average natural flow**

- **North Saskatchewan River Basin (NSRB) is also important (especially around Tofield)**
- **Trends in the NSRB:**
  - Increase in water use in the NSRB is the result of petroleum sector (bitumen upgraders and coal gasification plants)
  - Annual groundwater use is expected to increase around 13%
- **Groundwater- used mostly for agriculture (stockwatering). 12 municipalities in the area rely on groundwater for their municipal water supply**

### Water use/cost

- **Demand requires water to be piped into homes**
- **Well-water supply is safeguarded, where possible**
- **Pumped water is used to water livestock so they do not contaminate the source**
- **True cost of water usage is paid for by the consumer**
- **Wastewater is better managed and treated**

- **Battle river uses:**
  - **ATCO (cooling thermal electric power facility) is biggest user – but 98% is returned to river after use**
  - **Agriculture (irrigation, feedlots, stockwater) second largest user**
  - **Wildlife conservation – uses about 30%**
  - **By 2030 water use for agriculture is projected to increase by 18%, in part due to expanding livestock operation**
  - **Carrying capacity of pastureland could decrease with increased water restraints**

- **Water licenses:** Upper basin uses 70-79% of its allocated water; middle basin use 60-76% of its allocation through water licenses

#### Trends: Battle River

- **Key sectors driving future use: population growth (especially in upper basin); expansion of livestock populations; industrial growth; oilfield injection**
- **Increased groundwater uses: stockwatering; industrial; recreation**
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<th>Carbon energy use and water</th>
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<td>• To gain access to mineral deposits, mines are dewatered.</td>
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<tr>
<td>• Water is required to process non-metallic mineral deposits (coal; sand and gravel) and may draw down the water table locally</td>
</tr>
<tr>
<td>• New technology is required to mitigate metal and metalloid leaching and acidic drainage resulting from coal wastes and workings</td>
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<tr>
<td>• Large volumes of water are required for oil and gas extraction (Flagstaff County) – much of which is consumed and not reused. Freshwater used for these activities becomes highly contaminated and cannot be reused.</td>
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<tr>
<td>• Low Quality water (substandard/grey to brackish water) can be used for coalbed methane production – but dewatering leads to decline in surface water levels in adjoining water bodies.</td>
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<tr>
<td>• Effects carbon-based fuel production is local</td>
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<tr>
<td>• Changes in water quality are a concern</td>
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<td>• More groundwater is allocated for use in recovering oil from wells (Flagstaff County)</td>
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<tr>
<td>• Degradation of groundwater in shallow aquifers from leaks around well casings and pipelines and shallow disposal of saline formation waters – must be mitigated</td>
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</tbody>
</table>

**Impacts:** from the Sherritt public disclosure document ([http://environment.alberta.ca/documents/Sherritt_Dodds-Roundhill_PDD.pdf](http://environment.alberta.ca/documents/Sherritt_Dodds-Roundhill_PDD.pdf))

**Water:** The Sherritt project will require 2.4 to 9.5 million cubic metres of water a year depending on the type of cooling process used. It is currently expected that the bulk of the water will come from the North Saskatchewan River. The development of the mine (dewatering, surface drainage etc.) will affect groundwater aquifers and surface water hydrology in the region and extensive studies will be conducted as part of the Environmental Impact Assessment (EIA) process to ensure that water impacts of the Project are understood and proactively managed.

| Water Quality | • Well-water supply is safeguarded, where possible                                          |
| | • Pollution clean-up industry is developed                                                 |
| | • Surface water is generally poor. Battle River frequently has high concentrations of fecal bacteria and numerous pesticides and personal care products have been detected. |
| | • Poor water quality is a result of low flows (increased contact time with surrounding soils) and point (industrial and municipal) and non-point (primarily agriculture) discharge into the Battle River. |
| | • As a result of high nutrient concentrations, frequent excessive growth of algae and aquatic plants occurs in most bodies of water in the project area. |
| | • Water quality in the lakes sampled is generally poor with high nutrient concentrations. |

| Water management | • Water conflicts arise as water allocations are fully utilized                             |
| | • Water shortages impact sizes of communities and types of farming and industry           |
| | • Water management becomes an important governance issue                                  |
| | • Pace of reclamation increases to restore                                               |
| **Reclamation** | **Land for agricultural purposes**  
- Policies are developed to support water recycling  
- Assurance role of government is strengthened to manage conflicting demands on the landscape  

**Mitigation of all other sources of wealth (i.e. paying more for the replacement of Ecological Goods and Services, social, safety, etc.)** | **Major factor is still to achieve agricultural supportive lands, however wetlands are now being taken into account.**  
- Current policy is of 3:1 compensation ratio for wetlands. Aim is to quickly re-establish riparian corridors (wetland areas)  
- Balanced approach to reclamation now in use – intent is to provide more than one ag land use (e.g. rotational ag production and cattle pasturing) using progressive reclamation approach (forage/hay crop first to build up nitrogen and reduce compaction, then cereal crops.  
- Plus the creation of wetlands, e.g. lakes for wildlife, fisheries, recreation, etc. and forested land |