ZARGON OIL & GAS LTD.

Carrot Creek Enhanced Recovery Scheme
Water Diversion:
Water Conservation / Educational Program

www.zargon.ca

Zargon Core Values: Translated to Water Use

- **Safety and Health**
  - Ensure the Health and Safety of Zargon Employees, the Public and Environment
- **Environmental Stewardship**
  - Conservative use of Resources will minimize impacts: Zargon will limit impacts due to groundwater withdrawal to below prescribed allocation limits
- **Highest Ethical Behavior**
  - Zargon understands that judicious use of groundwater resources is necessary to ensure their licence to operate
- **Respect for People**
  - Zargon will ensure that use of groundwater resources in the area is done in an effective sustainable manner to ensure water supplies are available in the future

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General Overview

Government Policy/Legislation: Water For Life Goals

- Reliable quality water supplies for a sustainable economy
- Reduction or elimination (on a case-by-case basis) of non-saline water use
- Improved productivity and efficiency of water use
- Conservation and protection of non-saline aquifers
- Improved partnership and research initiatives
- Compliance with “Water Conservation and Allocation Guideline for Oilfield Injection”

Provincial Water Use Synopsis: CAPP CEP Plan

Benefits

The CEP plan is expected to help provide several benefits:

- Potential industry water savings and corresponding net economic benefits for producers by avoiding water costs, depending on the required additional infrastructure capital and operating costs;
- Potential for improved water security based on reduced likelihood of exceeding water licence limits;
- Potential for economic expansion within existing water licences, due to improved water management practices;
- Opportunity to collaborate as a good environmental steward of provincial water resources;
- Opportunity to share factual information with the public; and
- Potential improved information base for regional watershed management and water allocation.

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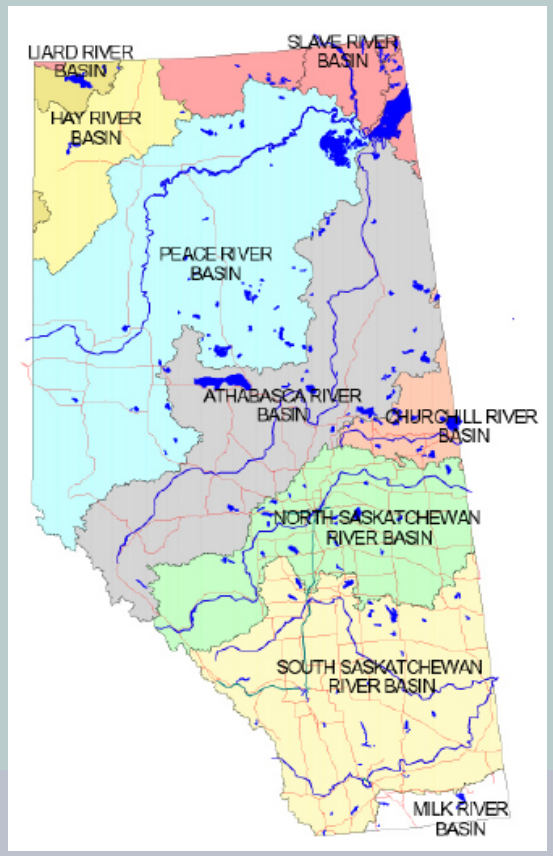
Provincial Water Use Synopsis: CAPP

- CAPP members produce water for operations province wide



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Provincial Water Use Synopsis:

- Water licences limit the maximum annual volume and the instantaneous peak rate, as well as having site-specific conditions
- In 2009, Alberta's total water allocation was 9.89 billion m3, 97% of which was allocated from surface water sources, and the remaining 3% from groundwater sources
- Water Allocations are limited (less than 2%) in Alberta to a fraction of measurable flow in river basins
- The oil and gas sector (includes oil & gas industry, injection & drilling) is the fourth largest water user in Alberta 8.5% of the provincial water allocation (See figure on next slide)
- However, direct contribution to the Alberta Economy are much greater than this, estimated to be in the range of 40%

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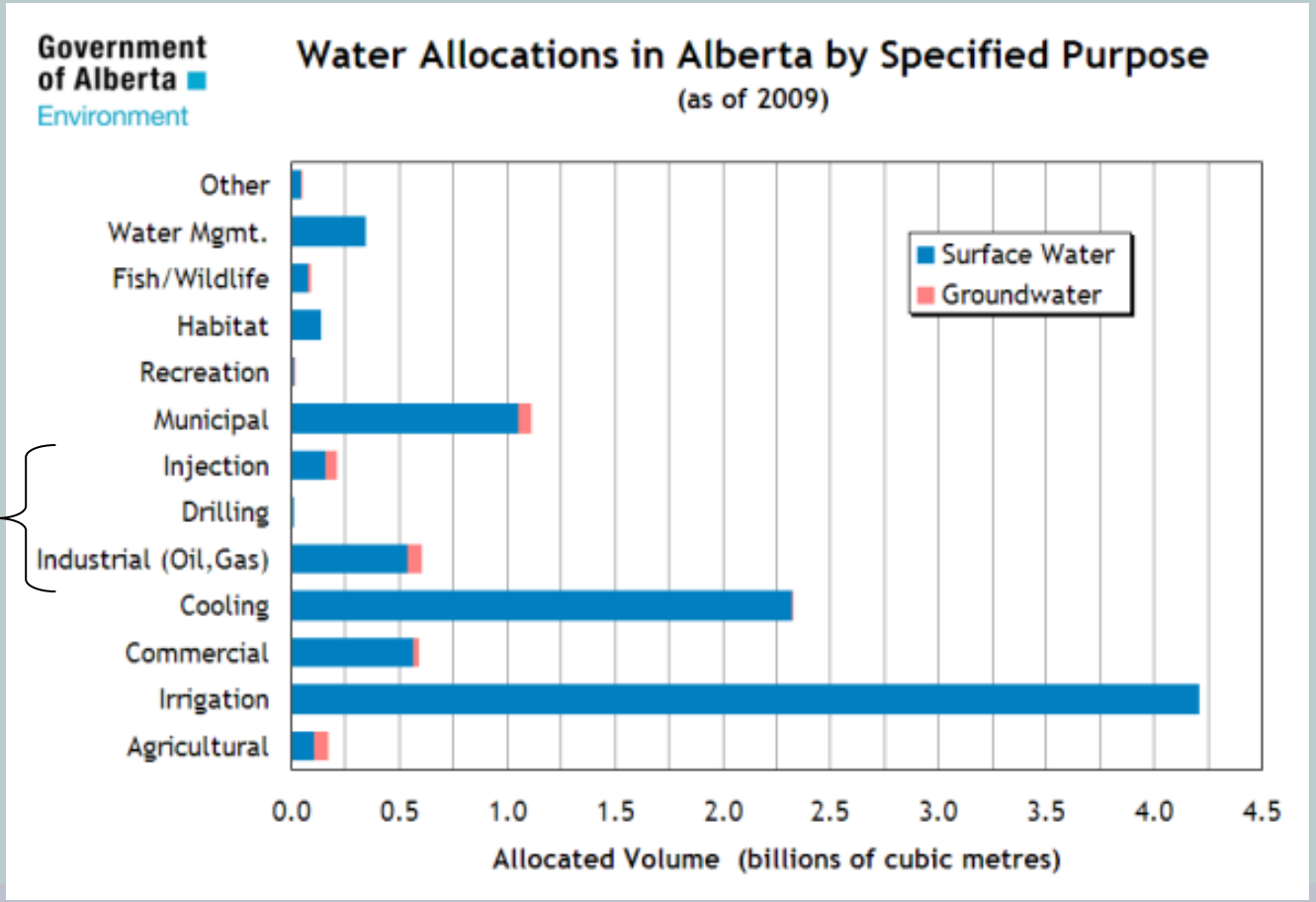
Provincial Water Use Synopsis:

Oil & Gas Use



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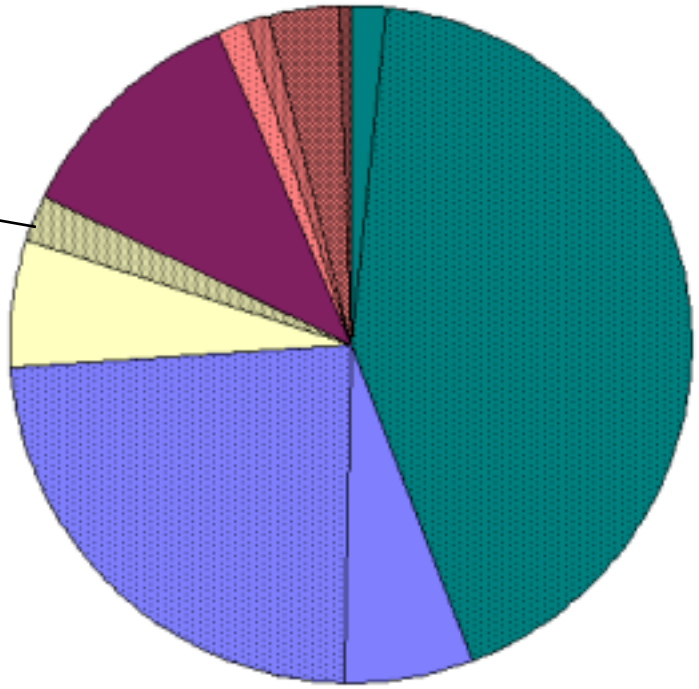
Provincial Water Use Synopsis (cont'd)

Industry Injection



- Ag - Agricultural 1.8%
- Ag - Irrigation 42.5%
- Com - Commercial 6.0%
- Com - Cooling 23.5%
- Ind - Industrial (Oil,Gas) 6.2%
- Ind - Drilling 0.07%
- Ind - Injection 2.2%
- Mun - Municipal 11.3%
- Othr - Recreation 0.22%
- Othr - Habitat 1.4%
- Othr - Fish/Wildlife 0.92%
- Othr - Water Mgmt. 3.5%
- Othr - Other 0.53%

Total Licensed Volumes as of 2009: 9,891,606,000 m^3
(9,591,071,000 m^3 Surface Water; 300,535,000 m^3 Groundwater)

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Provincial Water Use Synopsis

Provincial Water Use: Synopsis

- Oil Industry groundwater withdrawals are restricted to a maximum of one-half of the long-term yield of a given aquifer in the immediate vicinity of the water source well (drawdown at 150 m distance from source well limited to 35 % available in first year and 50% over long term. Zargon has monitored water use and is less than the performance criteria for the withdrawal allocation
- This project is a relatively small EOR project with limited infrastructure. Project size limits allocation water demand to **127 m3/day** at peak declining to **50m3/day** over a period of ~15 years
- Zargon understands that these rates are sustainable over long term and will continue to monitor to ensure this is this case going forward. Zargon will evaluate and monitor the non saline water use to ensure no long-term net loss or damage to the aquifer due to groundwater withdrawals
- Allocation requires review annually and reassessment of monitoring parameters and ongoing economic assessment

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Economic Assessment

Carrot Creek Oil Property: Small Oil Battery, 3 Oil Recovery Wells and Waterflood Facilities, Production time frame

- Pre project planning ensured Safety and Environmental Performance, Capital Effectiveness, Operational Excellence, Energy Efficiency
- Source water requirement initially were 127 m3/day (3 year time frame) declining to 50 m3/day by 2017 and declining amounts after this time
- Source makeup water required to meet AER voidage replacement requirements and reservoir pressure support (i.e. replace the volume of oil removed)
- Zargon completed a TIER 1 Economic Assessment for Water Supply from Groundwater: Small-scale project in an isolated area of the province. The area has minimal water shortage or development pressure issues
- The place-based categorization and assessment include technical, social, environmental and economic criteria
- Potential water supplies assessed sources of water supply including two non saline, three saline and one industrial wastewater source
- Assessed in terms of feasibility, probablity of success, capital cost, operating cost and environmental aspects (net environmental impacts vs. benefit)
- Result: Existing source well onsite was the most feasible, least impact and most economic water supply source.

Carrot Creek Water Use Performance

Project Water Use Performance

- No anticipated water demand from surface water thus no impact to the surface water bodies in the area;
- Located in an area not regionally water short
- No impact observed over time to freshwater aquifers, these will recharge over time eliminating impact as water required declines and recharge replenishes non saline aquifers
- An existing proven groundwater supply capable of producing the demand limits without stress to the aquifer
- The Paskapoo Formation Aquifer is estimated to have a long-term safe yield of 477 m3/day whereas allocation withdrawal limits are set at 127 m3/day. Drawdown in non pumping water levels beyond the required limit of 30% in the first year have not been observed to date (i.e. were less than 27% at the observation well)
- Water Use maintained below allocation limits: Allocation was obtained for 127 m3/d (actual average use over 18 months between May 2012 to Jan 2014 was ~95 m3/d), and 46,355 m3/yr (actual use was 32,920 m3/yr in 2013 and 22,839 m3/yr in 2012, ~71 % and ~50% of licence allocation respectively).
- Decline in nonsaline water demand over the life of the project is anticipated since produced makeup water from nonsaline sources is proportional to oil withdrawal volumes. The amount of oil recovered is expected to decline over time.

Conclusion: Carrot Creek Water Use

- Carrot Creek Non Saline Groundwater Use is conducted within the provincial approval system and has been assessed based on various environmental and economic factors;
- Non saline water use is deemed prudent and sustainable from an environmental point of view and the best choice from a net benefit point of view;
- Allocation is based on an site specific hydrogeological assessment;
- Negative impacts are being monitored and mitigated by pre planning. Water Use is limited to what is required and less than the allocation;
- Oil and Gas Industry Water Use is a small but important activity in terms of the provincial economy providing direct benefits to Albertans.