

# Alberta Water Research Institute

A Whirlwind Tour, 29-March-2010

ALBERTA WATER  
RESEARCH INSTITUTE

water

# Background ...

- AWRI was created by the Government of Alberta in 2007 as a direct outcome of Alberta's *Water for Life* Strategy.
  - Established under contract with Alberta Ingenuity, now part of Alberta Innovates, Energy & Environment Solutions.
  - Formed with its own Management Advisory Board (chaired by Dr. Lorne Taylor) and an International Research Advisory Committee (chaired by Dr. David Schindler).
  - First staff in place, October 2007

# Background ...

- AWRI's activities are fully aligned with Alberta's *Water for Life* Strategy. AWRI is pursuing applied research and knowledge outcomes supporting the *Water for Life* goals & objectives of:
  - Safe, secure drinking water supply,
  - Healthy aquatic ecosystems, and
  - Reliable, quality water supplies for a sustainable economy.

# Background ...

- *Water for Life* identified key actions to meet the goals and objectives;
  - Knowledge and research (this is the key role of AWRI),
  - Partnerships (working with stakeholders is critical to capitalize on existing knowledge and ensure adoption of new policies and practices), and
  - Water conservation (full range of conservation activities, improvements in water use efficiency and productivity).

# Background ...

- Additional areas of focus for AWRI:
  - Institutional arrangements (public policy options and analysis), and
  - Education and outreach (bringing people together, focus on opinion leaders, decision-makers, water practitioners, other key stakeholders – role of a knowledge broker).

# Programming ...

- Strategic Research Programs (SRP),
- Strategic Opportunity Studies (SOS),
- Joint Research Collaborations (JRC),
- Technology Development, and
- Education and Outreach.
  - All initiatives must connect to *Water for Life*, be multi-disciplinary, and have public policy or practice outcomes.

# Strategic Research Programs ...

- SRPs are generated through a targeted call for research proposals by AWRI. The scope and criteria for the call for proposals is tied directly to the outcomes of *Water for Life*. AWRI seeks out research programs that are innovative and world-class, which may draw on multi-disciplinary experts from around the world, from the academic research community and/or from industry. A key element of any research project supported through the SRP program is that any outcomes, and/or “lessons learned”, must be made publicly available and communicated in a clear and relevant manner.

# SRP Initiatives ...

- Wetland Health: Challenges and Opportunities in Implementing Alberta's Wetland Policy
  - Total AWRI investment is \$1,284,900 over 3 years, external cash and in-kind \$158,000..
  - Added \$165,000 for acquisition of LiDAR data in 2009 -- \$30,000 from local community organization.
  - University of Alberta: Dr. Suzanne Bayley (lead), Dr. Lee Foote, Dr. Naomi Krogman; University of Western Ontario: Dr. Irena F. Creed
  - Outcomes target: safe, secure drinking water supply; healthy aquatic ecosystems; institutional arrangements; education and outreach.

# SRP Initiatives ...

- Water, Making Do With What We Have
  - Total AWRI investment is \$1,713,000 over 3 years, external cash and in-kind \$540,000.
  - University of Lethbridge: Dr. Henning Bjornlund (lead), Dr. Kurt Klein, Dr. Danny Le Roy, Sameer Deshpande, Surya Acharya, Ruth Grant-Kalischuk
  - Collaborators: Alberta Agriculture and Rural Development, Agriculture and Agri-Food Canada, Western Irrigation District, BRBC, OWC.
  - Outcomes target: healthy aquatic ecosystems; reliable, quality water supplies for a sustainable economy; institutional arrangements; education and outreach.

# SRP Initiatives ...

- Accelerated De-watering of Oil Sands Fine Tailing through Biological Densification
  - Total AWRI investment is \$1,212,100 over 3 years, external cash and in-kind \$435,000.
  - University of Alberta: Dr. Julia Foght (lead) Dr. Phillip Fedorak, Dr. Tariq Siddique, Dr. David Bressler, Dr. Rajender Gupta; Industry Partners: Syncrude Canada Ltd. [Edmonton, AB]; Shell Canada Ltd. [Calgary, AB]; Sanimax [Guelph, ON]
  - Outcomes target: reliable, quality water supplies for a sustainable economy; institutional arrangements; education and outreach.

# SRP Initiatives ...

- Safe, Secure, Water Supplies for Alberta
  - Total AWTI investment is \$4,011,300 over 3 years, external cash and in-kind \$900,000.
  - University of Alberta: Dr. X Chris Le (lead), Dr. Miodrag (Mike) Belosevic, Dr. Mohamed Gamal El-Din, Dr. Thian Gan, Dr. Gary Kachanoski, Dr. Xing-Fang Li, Dr. Jonathan Martin, Dr. Norman Neumann; University of Saskatchewan: Dr. John Giesy
  - Outcomes target: safe, secure drinking water supply; reliable, quality water supplies for a sustainable economy, institutional arrangements; education and outreach.

# SRP Initiatives ...

- Rivers for Life: Advancing Instream Flow Assessment Tools and Policy
  - Total AWRI investment is \$1,623,000 over 3 years, external cash and in-kind is \$1,830,000.
  - University of Calgary: Dr. John Post (lead), Dr. Ed McCauley, Dr. Bernhard Mayer, Dr. Leland Jackson, Dr. Derald Smith, Prof. Nigel Bankes, Prof. Arlene Kwasniak; University of Lethbridge: Dr. Stewart Rood, Dr. Joe Rasmussen, Dr. Alice Hontela; University of Alberta: Dr. Mark Lewis, Dr. Peter Steffler.
  - Outcomes target: healthy aquatic ecosystems, institutional arrangements, education and outreach.

# SRP Initiatives ...

- Iron Treatment: A Potential Remediation Strategy for Alberta's Eutrophic Freshwaters
  - Total AWRI investment is \$170,492 over 2 years, external cash and in-kind is \$20,400.
  - University of Alberta: Dr. Rolf Vinebrooke, Dr. Heather C Proctor; 4 other collaborators and 3 external partners;
  - Outcomes targets: safe, secure water supplies; healthy aquatic ecosystems, education and outreach.

# SRP Initiatives ...

- **Economic Assessment of Ecosystem Services**
  - Total AWRI investment is \$473,000 over 3 years, cash and in-kind is \$90,000.
  - University of Lethbridge: Dr. Henning Bjornlund (lead), Dr. Kurt Klein;  
University of Alberta: Dr. Vic Adamowicz, Dr. Peter Boxall
  - Outcomes target: healthy aquatic ecosystems; reliable, quality water supplies for a sustainable economy; institutional arrangements; education and outreach.

# SRP Initiatives ...

- Purification of Oil-Contaminated Water with Geomorphic Molecular Sieve Membranes,
  - Total AWRI investment is \$800,000; external cash and in-kind from industry is estimated at + \$415,000
  - University of Alberta: Dr. Steve M Kuznicki (lead), Dr. Subir Bhattacharjee,
  - Collaborators: GE Water & Process Technologies, Graver Technologies, Imperial Oil, Suncor Energy Inc.
  - Outcomes target: reliable, quality water supplies for a sustainable economy, institutional arrangements

# SRP Initiatives ...

- **Aboriginal Relationships with Water: Purpose, Practice and Stewardship**
  - Total AWRI investment is \$1,086,000., external cash and in-kind TBD.
  - Native Counselling Services of Alberta: Dr. Patti Laboucane-Benson et al;  
University of British Columbia: Dr. Ginger Gibson et al
  - Outcomes target: safe, secure drinking water supplies; healthy aquatic ecosystems; reliable, quality water supplies for a sustainable economy; institutional arrangements; education and outreach.

# SRP Initiatives ...

- Enabling Integrated Source Water Supply and Protection in Alberta
  - Total AWRI investment is \$1,496,100 over 3 years, external cash and in-kind is \$1,691,000.
  - University of Alberta: Dr. Uldis Silins (lead); University of Waterloo: Dr. Monica Emelko, Dr. Michael Stone; University of Lethbridge: Dr. Sarah Boon; FORREX UBC Okanagan: Dr. Kevin Bladon; 10 other partners;
  - Outcomes target: safe, secure water supplies; healthy aquatic ecosystems, reliable, quality water supplies for a sustainable economy, institutional arrangements, education and outreach.

# SRP Initiatives ...

- NSERC Industrial Research Chair in Water Quality Management for Oil Sands Extraction
  - The total investment in this research project is \$600,000 over 5 years.
  - Industry investment is \$750,000 over 5 years.
  - NSERC investment is \$750,000 over 5 years.
  - University of Alberta: Dr. Subir Bhattacharjee et al
  - Outcomes target: reliable, quality water supplies for a sustainable economy; institutional arrangements.

# SRP Initiatives ...

- NSERC Industrial Chair in Advanced Oxidation of Oil Sands Process-Affected Water – Process Fundamentals
  - Dependant upon NSERC approval, AWRI reserved investment is \$600,000 over 5 years.
  - University of Alberta: Dr. Gamal El-Din et al
  - Outcomes target: reliable, quality water supplies for a sustainable economy; institutional arrangements.

# Strategic Opportunity Studies ...

- SOS projects are internally (AWRI) directed and employ international experts, as well as Alberta leaders in various subject areas. The initiatives focus on a particular water issues from a policy or new direction/innovation point-of-view. They are designed to provide timely advice or background to initiatives that may also require further research or provide evidence based information and analysis for the development and analysis of public policy relevant to Alberta's *Water for Life* Strategy.

# SOS Initiatives ...

- **Water Data Accessibility Project**

- AWRI invested a total of \$325,000 in this initiative.
- Alberta WaterSMART, Calgary: Mike Scarth (lead)
- Outcomes target: institutional arrangements; education and outreach (this initiative directly targets medium term actions in Water for Life; providing water managers and Albertans with easy access to water data and information in support of improved management and decision-making)
- [http://albertawater.com/index.php?option=com\\_awp](http://albertawater.com/index.php?option=com_awp)
- Phase II is just underway with an additional AWRI investment of \$325,000
- Integration with other initiatives, long-term sustainability focus.



Search For Data

1. What would you like to find?

- Water Information
- Realtime Data
- A Location
- A Basin

2. How would you like to search for it?

- By Spatial Location
- By Keyword

3. Specify your Search Method.

- By Address
- By ATS Location
- By Lat Long
- By Click
- By Placename

4. Specify an address and proximity

10km  Search Radius



POWERED BY Google  
Map data ©2009 Tele Atlas, Google - [Terms of Use](#)

Distance: 0 m

Scale: 500 km  
500 mi

[Info](#)

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AN INGENUITY INSTITUTE  
Spatia Data Catalog

1. Specify any data layers you would like to overlay on the map:

- PFRA Watershed Boundaries
- Toporama WMS

2. Use the options below to select a background map service:

- [Background Services](#)

# SOS Initiatives ...

- Financial Market Based Instruments for Sustainable Water Management
  - This multi-disciplinary initiative (project management by CWF) brings together national and international experts in water management and market design and operation. The initiative is to develop a wide range of public policy options and approaches that explore the merits & operations of capital markets in addressing aspects of water scarcity.
  - AWRI is investing a total of \$425,000 in this initiative.
  - Outcomes target: safe, secure drinking water supply, healthy aquatic ecosystems, reliable, quality water supplies for a sustainable economy; institutional arrangements; education and outreach.

# SOS Initiatives ...

- **Dynamics of Alberta's Water Supply**

- This initiative involves Alberta and international experts and synthesizes a wide array of water data & information to develop a complete water budget for Alberta (taking into account surface water & ground water resources, current & future water use, and the integration of green and blue water resources). The project will identify research & information gaps & develop an overall approach to the mapping of water risk and vulnerability. The initiative also captures the 'virtual water' content of economic activities in Alberta (as an example, the water embodied in agricultural goods for export internationally and domestically will be defined).
- AWRI investment is \$360,000.
- Outcomes target: institutional arrangements; education and outreach.

# SOS Initiatives ...

- Sustainable Water Infrastructure for Future Cities
  - The biggest investments in the next 20 years needed in OECD countries are in the renewal and building of new water infrastructure. The cost breaks down to about \$20,000 per capita, a sum similar for all industrialized countries. With these costs in mind, it is fair to ask the question whether just fixing the old water works is satisfactory or should a new, more adaptable design be envisaged (project lead Emerald City Water Corporation, Calgary, AB).
  - AWRI is investing a total of \$282,5000 in this initiative.
  - Outcomes target: safe, secure drinking water supply; reliable, quality water supplies for a sustainable economy; institutional arrangements; education and outreach.

# SOS Initiatives ...

- **Water Allocation**
- Phase I, completion of an inter-jurisdictional review of water allocation & transfer policies, practices & outcomes, looking at primarily western US and Australia, and a comparative analysis of full range of options that Alberta can consider to meet *Water for Life* objectives with allocation policies and practices.
- Phase II, stakeholder engagement to develop & test a range of water allocation & management scenarios supporting watershed management.
- AWRI is investing a total of \$185,000 in this initiative.
- Outcomes target: safe, secure drinking water supply; healthy aquatic ecosystems; reliable, quality water supplies for sustainable economy; institutional arrangements; education and outreach.

# Supporting SOS Initiatives ...

- Works in support:

- Tara Hadler, Masters Candidate RE: Alberta's Irrigation Production & Virtual Water Trade(\$30,000),
- Conjunctive Surface and Groundwater Management in an Urban Setting with Town of Okotoks (\$30,000 AWRI, \$30,000 Okotoks),
- Brenda Chomin, AMEC RE: Water Quality in the NSRB (\$45,000),
- Dr. Patricia Holm, University of Basel RE: Deterioration of habitats for fish (Salmonidae) in running water courses of Alberta due to fine sediment input from forestry (\$43,000),
- Dr. Nesa Ilich, Optimal Solutions RE: Modelling Reservoir Operations (\$40,000),
- Water Management in Southern Alberta: Key Opportunities for Storage, Allocation, Flood & Drought Management, Mike Kelly (\$50,000).

# Joint Research Collaborations ...

- AWRI develops collaborative relationships and participates in diverse research networks with a focus on research in areas of Alberta's interest. These initiatives provide additional focus on key issues from an Alberta context or allow Alberta to demonstrate leadership in those same areas.
- Water Policy Working Paper Series
  - AWRI is participating with CD Howe on a 9 paper water policy series with a number of other organizations across Canada (AWRI investment is \$25,000).

# JRC Initiatives ...

- **Municipal Water Management Research Consortium**
- AWRI and the Canadian Water Network (CWN) entered into a collaboration research agreement focused on municipal water & wastewater management. Projects focus on key water issues facing municipal water & wastewater treatment operators & decision-makers. AWRI and CWN initiated the consortium, each providing \$300,000 a year for three years. Projects will be selected jointly and all administration is provided by CWN. The Ontario Centres of Excellence (OCE) joined in the 2009-2010 fiscal period at the same level of funding as the founding organizations.
- AWRI is investing a total of \$900,000 in this initiative over 3 years.
- Outcomes target: safe, secure water supplies; reliable, quality supplies for a sustainable economy, institutional arrangements; education and outreach.

# Technology Development ...

- This program area recognizes that there is existing science, processes and/or knowledge that could be piloted, tested, developed and commercialized in Alberta that will address specific Alberta water issues as well as driving economic development and opportunity. To that end, AWRI is open to a wide range of strategic partnerships with industry and other like-minded organizations that will lead to the piloting and testing of novel and/or advanced processes and technologies that address key Alberta water issues.
- Outcome targets: safe, secure water supplies, healthy aquatic ecosystems, reliable, quality supplies for a sustainable economy, institutional arrangements; education and outreach.

# AWRI & GE Water (SAGD) ...

- Total AWRI Funding Commitment, \$7,500,000
- Total GE Funding Commitment, \$7,500,000
- This project will accomplish the following:
  1. An optimized de-oiling and pre-concentration process will result in energy savings of at least 30% and capital savings of at least 10% versus current thermal applications.
  2. The volume of water used for both evaporation and boiler feedwater operation will be reduced. Savings of up to 30% are anticipated versus current conventional warm lime softening flowsheets.
  3. The development of a reliable and robust de-oiling process will improve the efficiency for the SAGD produced water process, enabling industry to operate more efficiently and improved environmental performance due to a reduction in the discharge of oil-contaminated waste.

# AWRI & GE Water (SAGD) ...

4. The aforementioned solution will reduce the carbon emissions by 3.5 million tons of CO<sub>2</sub> in the Alberta oilsands region, given the proposed project investment list over the next decade. It will also reduce energy consumption by at least 30% for the evaporative processes, saving ~72 GJ/hr for a 70,000 barrel per day plant.
  5. Proactive development of environmentally sustainable solutions for produced water and increased awareness within the global community.
- Other key features:
    - GE to secure on-the-ground industry cooperators,
    - All output data from the pilot will be made available publically,
    - AWRI receives 2% annuity from sales of new technology for fixed period of time.

# AWRI & Veolia (SAGD) ...

- Total AWRI Funding Commitment, \$249,000
- Total Veolia/Industry Commitment, \$3,751,000
- This project will accomplish the following:
  - Independent parameter evaluation of the CeraMem™ ceramic membrane. Based on the outcome of the evaluation, the surface-modified membrane may be able to be used as part of the system-wide technology design that AWRI is completing as part of its project with GE.
  - Matches agreement template with GE, open data sharing is a requirement of the funding envelope.

# Education and Outreach ...

- AWRI's creation was somewhat unique in that it is required to invest at least 5% of its resources into this program area.
- AWRI leads and partners with water community stakeholders to ensure that relevant science, technology and practice are shared with decision-makers, water practitioners, and the public.
- Activities are also conducted to broaden the discussion of water issues provincially, nationally and internationally through an Expert Speaker Series and senior executives and decision-makers can participate in AWRI's annual "ideaSummit" executive training program.

# Education & Outreach ...

- Expert Speaker Series:

- AWRI brings in experts with international, national and provincial expertise or knowledge to present information that could inform future research, policy or practice directions. These speaking events/workshops may be targeted to policy/decision-makers, researchers and/or the public.
- This initiative contemplates 4 events per year, with a focus on individuals that can bring a new scientific, policy and/or business approach to key water issues in Alberta,
- Next events; April 28<sup>th</sup>, Ryan's Well; June 28<sup>th</sup>, Peter Brabeck, Chairman, Nestlé
- Outcomes target: education and outreach.

# Education & Outreach ...

- Executive Training Program:
  - This Harvard/Stanford Business School designed curriculum focuses on senior corporate executive and/or senior government officials and uses a case-study based program that focuses on the importance and critical nature of water in long-term business practices. It involves a wide range of advice, strategic investments, developing improved social license to operate through targeted environmental improvements, and a range of legal and economic approaches to factoring in water as a strategic element in business planning and adaptation.
  - AWRI & GE co-invest and manage the program.
  - Outcomes target: reliable, quality water supplies for a sustainable economy; institutional arrangements; education and outreach.

# Education & Outreach ...



# Education & Outreach ...

- Inside Education Partnership

- Just underway, partnership program 55% AWRI/45% Inside Education and Partners
- Develop new in-classroom materials based on emerging science from AWRI funded projects (with an additional focus on interactive applications and SmartBoard specific applications),
- Teacher Professional Development with focus on innovations in water management and technology (2010 Field Tour),
- Provide new connections between scientists and classrooms.

# Who's Who ...

- **Management Advisory Board**

- Lorne Taylor
- Allen Benson
- Bill Berzins
- Dennis Fitzpatrick
- Lorne Olsvik
- David Pryce
- Stephen Stanley
- Linda Van Gastel\*
- Henry Vaux Jr.
- Barry Worbets\*
- Bob Barraclough (AENV)
- 2 Vacancies

- **International Research Advisory Committee**

- David Schindler, Chair
- Paul Bishop
- Peter Fritz
- Ginger Gibson
- Jan Hopmans
- Helen Ingram
- Mary E Power
- Joe Rasmussen
- Frank W Schaeffer III
- Fred J Wrona
- Mike Young
- 1 Vacancy

# Who's Who ...

- Full Time Staff
  - David Hill, Program Director
  - Dianne White, Program Officer
- Primary Contractors
  - Alexander (Sascha) Zehnder, Scientific Director (6 months/year)
  - Val Mellesmoen, Communications Director
- Subject Matter Contractors
  - Bob Sandford (environmental issues, publications, policy synthesis)
  - John Thompson (economics, water policy issues)
  - Petra Rowell (policy issues)



# Achievement Targets ... by 2011 ...

- **Safe, secure drinking water supply**
  - **Establish and partner in the Municipal Water Management Research Consortium,**
  - **Gap analysis completed, funding and strategy in place, research initiated,**
  - **Evaluation of sustainable rural water management,**
  - **Determination of 'next generation' design of urban water management processes and infrastructure, and**
  - **Identify policy opportunities for water efficiency gains in urban areas.**

# Achievement Targets ... by 2011 ...

- **Healthy aquatic ecosystems**

- **Practical ecosystem health parameters defined,**
- **Selection of two study basin (one open to additional allocations and one closed) in which to assess ecosystem health and model integrated watershed management opportunities.**

# Achievement Targets ... by 2011 ...

- **Reliable, quality water supplies for a sustainable economy**
  - **Scenarios and initial evaluation of future expanded agricultural production potential based on environmentally responsible water efficient agronomic practices,**
  - **Pilot projects in place demonstrating increased water use efficiency and reduced energy consumption in in-situ oil sands (SAGD) operations,**
  - **Define discharge limits for contaminations in process water (tailings ponds) into the environment (surface and groundwater),**
  - **Guidelines and mechanisms for implementation of improved water use efficiency and productivity in industrial water use processes.**

# Achievement Targets ... by 2011 ...

- **Institutional arrangements (public policy options)**
  - **Assessment of successful water transfer systems and/or marketplace taking into account experience in other jurisdictions,**
  - **Evaluation of capital market and/or policy instruments in support of a water market place.**

# Achievement Targets ... by 2011 ...

- **Education and outreach**

- **World-class executive education training program in water and resource management in place and running,**
- **Well established expert speaker series,**
- **Targeted symposia and interpreted proceedings,**
- **Selected magazines and newspaper articles and media representation,**
- **Open access to data, information and knowledge through a Water Portal,**
- **Survey of provincial water issues and actions completed.**