Water Quality Model Development and Application
Modelling Plan and Priorities
Southern Region – South Saskatchewan and Milk River Basins

South Saskatchewan River Basin

- Bow River sub-basin including Highwood River
- Oldman River sub-basin
- South Saskatchewan River sub-basin
- Red Deer River sub-basin (TBD)

Milk River Basin
Modelling Focus

Model Development

Phase 1 - Data Scoping Study

Phase 2 – Data Collection
(Climate, Water Quality, Hydrometric, Bathymetric/Hydraulic, Sediment and Vegetation)

Phase 3 - Water Quality Models
• Non-point Source Watershed Model: characterize non-point sources
• In-stream Flow and Water Quality Model: characterize the fates of point and non-point sources in main water body

Model Applications
Data Scoping Study

Identify, collect, and assemble existing data and knowledge

Assess current water resources and water quality

SSRP Water Quality Data Scoping

Identify data/knowledge gaps for model development

Provide guidance for determining the approach and selecting appropriate models

Oldman/S. Sask., Milk, Highwood/L. Bow, Red Deer (Central Region)

SSRP Land Use Land Cover (LULC) Data and Model Scoping

Potential Impact of Climate Change on Water Availability and LULC (Novus Environmental)

LULC Mapping for SSRP (U. of Calgary)
Address Data & Knowledge Gaps

**Bathymetry**

- Lack of data at rural reaches for the 600 Km long of River

**Ice**

- Ice development and its impact on water quality, sediment transport...

**Sediment**

- Nutrients and organic matters; DO demands; Erosion/deposition

**Macrophyte**

- Lack scientific knowledge: kinetic rates, stoichiometry, community composition...
Address Data & Knowledge Gaps (cont’d)

Bow River Biosonic Vegetation/Sediment Study (4 phases)

– Joint Project (ESRD, City of Calgary and Golder Associates)

– Selected river reaches within the City of Calgary
Bow River Water Quality Model (BRWQM)

In-stream Flow and Water Quality Model (WASP/HECRAS)

Phase 1: Bearspaw Dam (U/S Calgary) to U/S Highwood Confluence - owned by the City and enhanced by ESRD

Phase 2: Highwood Confluence to Bassano Dam

Phase 3: Bassano Dam – Mouth (Bow/Oldman Confluence) – under development

Phase 4: Upper Bow River Water Quality Model (U/S Calgary) - Develop prototype - incorporate Ice Dynamic Mechanism of RIVER1D into CE-QUAL W2

Stormwater Model (EPA SWMM under development)

Phase 1: City of Calgary stormwater runoff (QHM) - owned by the City

Non-point Source Watershed Model (SWAT)

Phase 2: Crowfoot Creek (WID Major Return Flow)

Phase 3: SWAT
Highwood/Little Bow System
Water Quality Models (cont’d)
Highwood/Little Bow System (2013 and beyond)

- Major Tributary and Non-point Source contribution to the Bow River

**In-stream Flow and Water Quality Model**

- Highwood River
- Sheep River
- Frank Lake
- Little Bow River
- Mosquito Creek
- Twin Valley Reservoir
- Other tributaries

**Non-point Source Watershed Model**

- Agricultural areas

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Phase 1

Phase 2
Model Applications

BRWQM Application (Bears Paw Dam to Bassano)

LUF/Region Planning: SSRP – coupled WRMM with BRWQM

Regional Approval (Carseland effluent to the Bow River) - Wheatland County application (in progress)

Water Management Operations - Bow-Carseland Headworks (Travers Reservoir Enlargement EIA; and Bow-Carseland Canal Enlargement DFO approval)

Bow River Phosphorous Management Plan (P Plan) – model data update/extension to 2011, and model re-calibration (in progress)
Other Initiatives and Information

WRMM-CA Model Interface (Geomatic Journal) – in conjunction with U. of Calgary

SSRP Scenario Modelling Report – Modelling Team

Climate Change Impact Analysis (Research) – U. of Alberta; U. of Saskatchewan;

Bow River Biosonic Study on Sediment and Vegetation (CWRA National Conference) – in conjunction with Golder Associates and City of Calgary

Other Jurisdictions – Saskatchewan Water Security Agency etc