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MANITOBA'S PROGRESS TOWARDS "LIVING WITH THE RED"

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LINKING SCIENCE TO WATER POLICY

ICEWarm Conference

Adelaide, SA

November 20th, 2008

The Hudson Bay Drainage Basin

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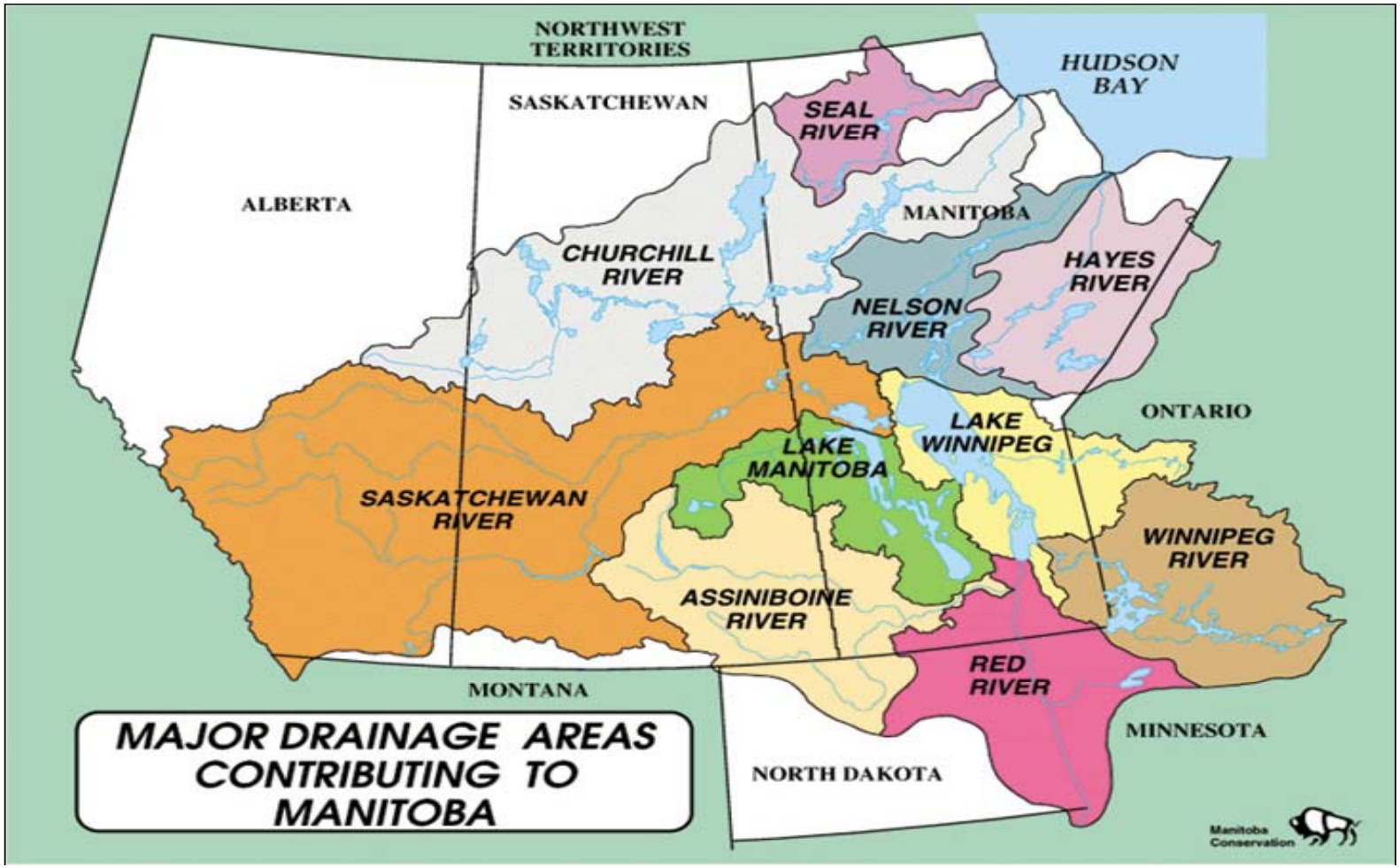
Watershed Sub-Basins

- 13% of Canada's



The Red River Basin

- Almost 2/3 of Manitoba's 0.9 million people are located in the Red River Valley
- Winnipeg Population = 850,000
- Rural Population = 50,000
- 10 % of Provincial GDP (excluding Winnipeg)
- Agriculture is predominant
- 1500 +/- farm operations
- 3000 +/- individual homes/businesses

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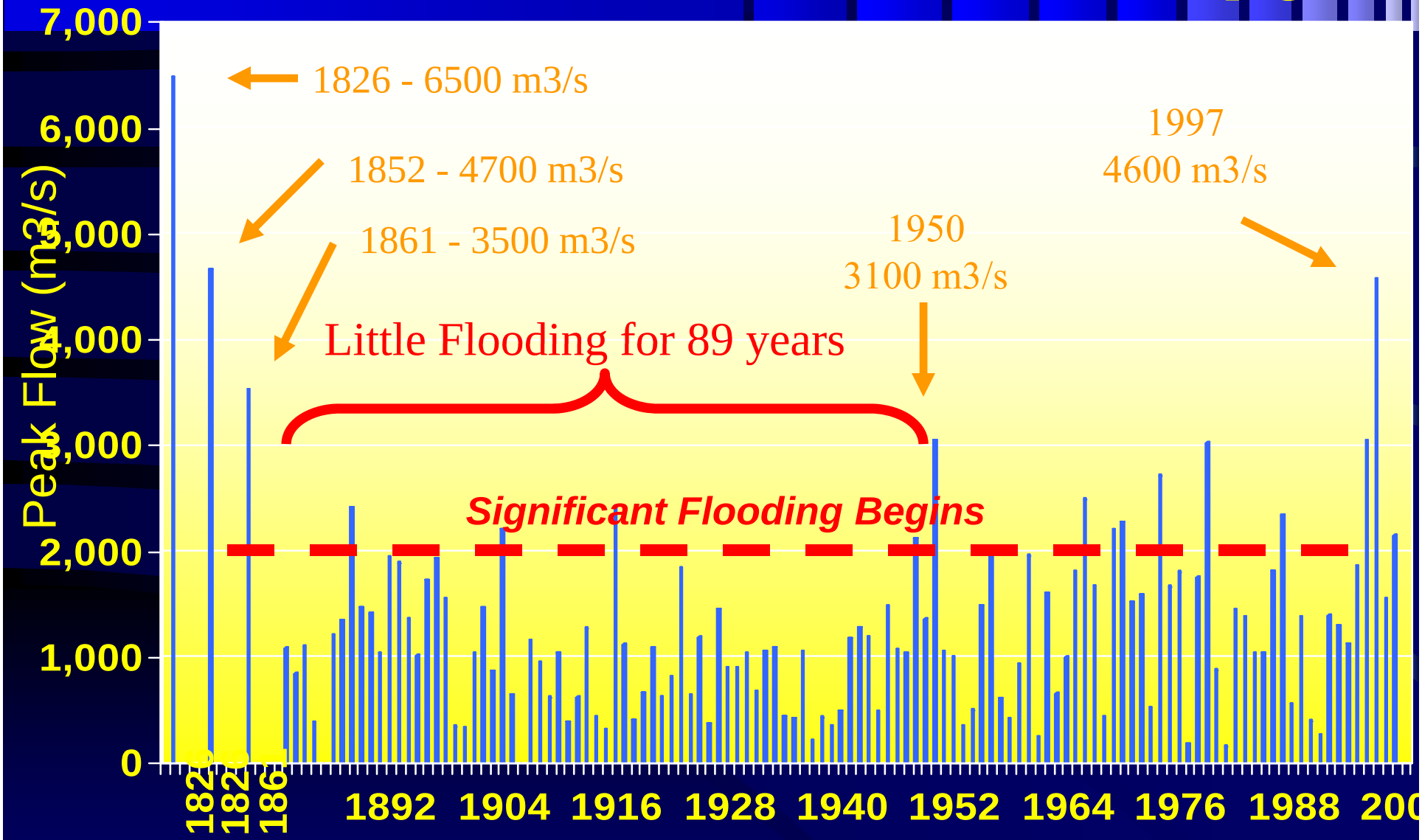
Red River Basin

Historic Peak Flows at Winnipeg



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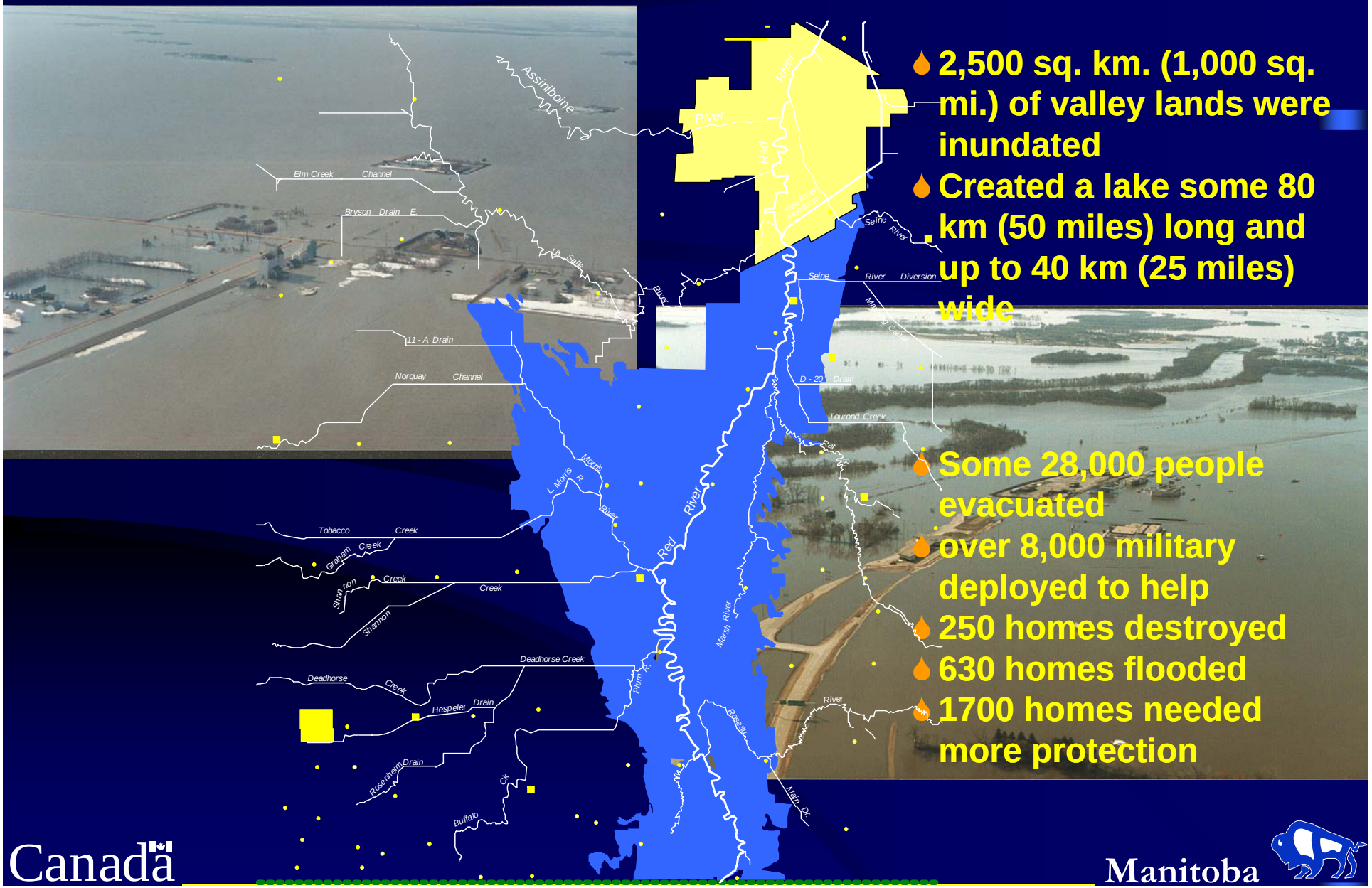
Flood of the Century



- 2,500 sq. km. (1,000 sq. mi.) of valley lands were inundated
- Created a lake some 80 km (50 miles) long and up to 40 km (25 miles) wide
- Some 28,000 people evacuated
- over 8,000 military deployed to help
- 250 homes destroyed
- 630 homes flooded
- 1700 homes needed more protection

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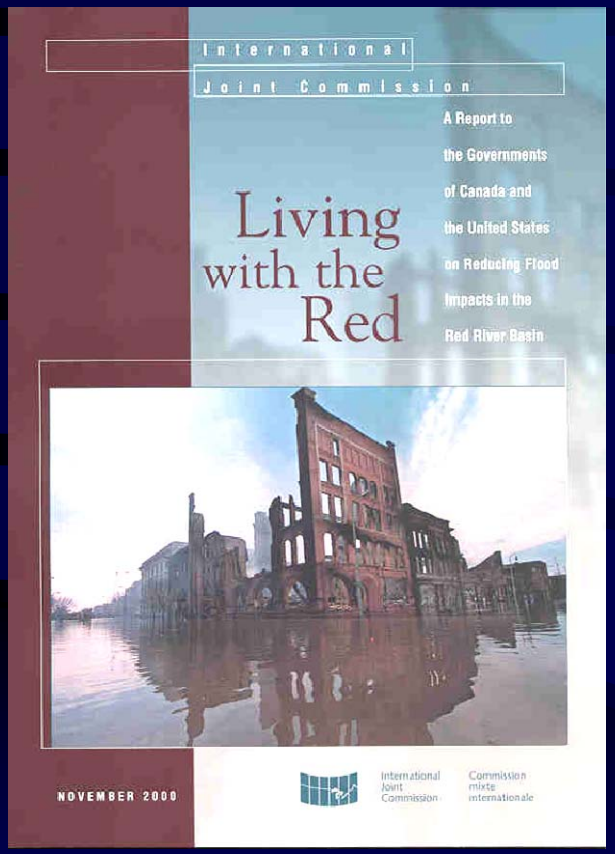
1997 RED RIVER FLOOD

International Joint Commission Study

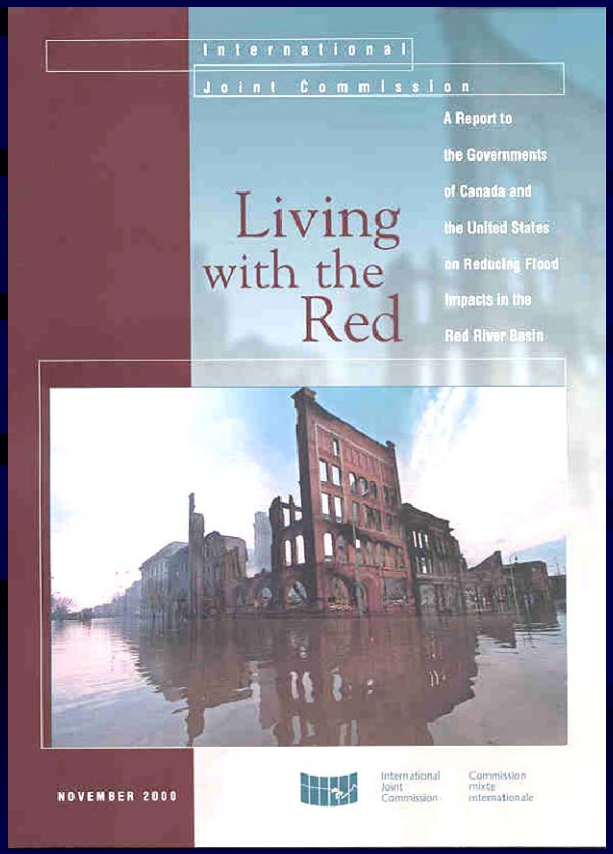
Main Conclusions:



- Flooding is natural. Expect floods even larger than 1997 in future.
- Risk of failure of Winnipeg's flood protection system is high.
- Need for comprehensive binational cooperation.

International Joint Commission Study

Main Recommendations:



- Promote a culture of flood preparedness in the valley.
- Improve flood protection for Winnipeg.
- Develop a comprehensive flood damage reduction plan for whole basin.
- Improve data networks.
- Develop digital elevation model for full basin.

Canada Manitoba Flood Protection Agreement

- $130 M ($65M Fed. + $65M Prov.)
- Consists of 5 program elements
  1. Individual Homes & Businesses
  2. Communities
  3. City of Winnipeg
  4. Environmental Impact Mitigation & Scientific Data
  5. Provincial Infrastructure works

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Program Element 1: Individual Homes & Businesses

- **Financial assistance for individual flood protection (1997 flood level + 2 ft.) for homes & businesses located outside ring-diked communities**
  - maximum reimbursement of $60,000 per project - costs in excess of $70,000 were ineligible
  - could qualify for more than one project (i.e.. Farm & Residence)

- **Acceptable flood proofing methods:**
  - Constructing a ring dike around building(s)
  - Raising home or building(s), i.e.. on a earth pad
  - Relocating inside a ring-diked community or outside the flood zone
  - Structural / Assembly dikes

Individual Flood Proofing Methods

Program Element 1: Individual Homes & Businesses

- **Physical anomaly:** limitations such as limited lot size or riverbank instability
- **Economic anomaly:** where flood proofing exceeds property value - under investigation

- 60 economic & physical properties

Anomalies

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Program Element 2: Communities

- **protecting & enhancing flood protection infrastructure for rural communities subject to flooding.**

90% level of financial assistance for projects

- **10% local municipal contribution**
- **10 new community projects constructed**
- **The 8 existing ring dikes also upgraded**

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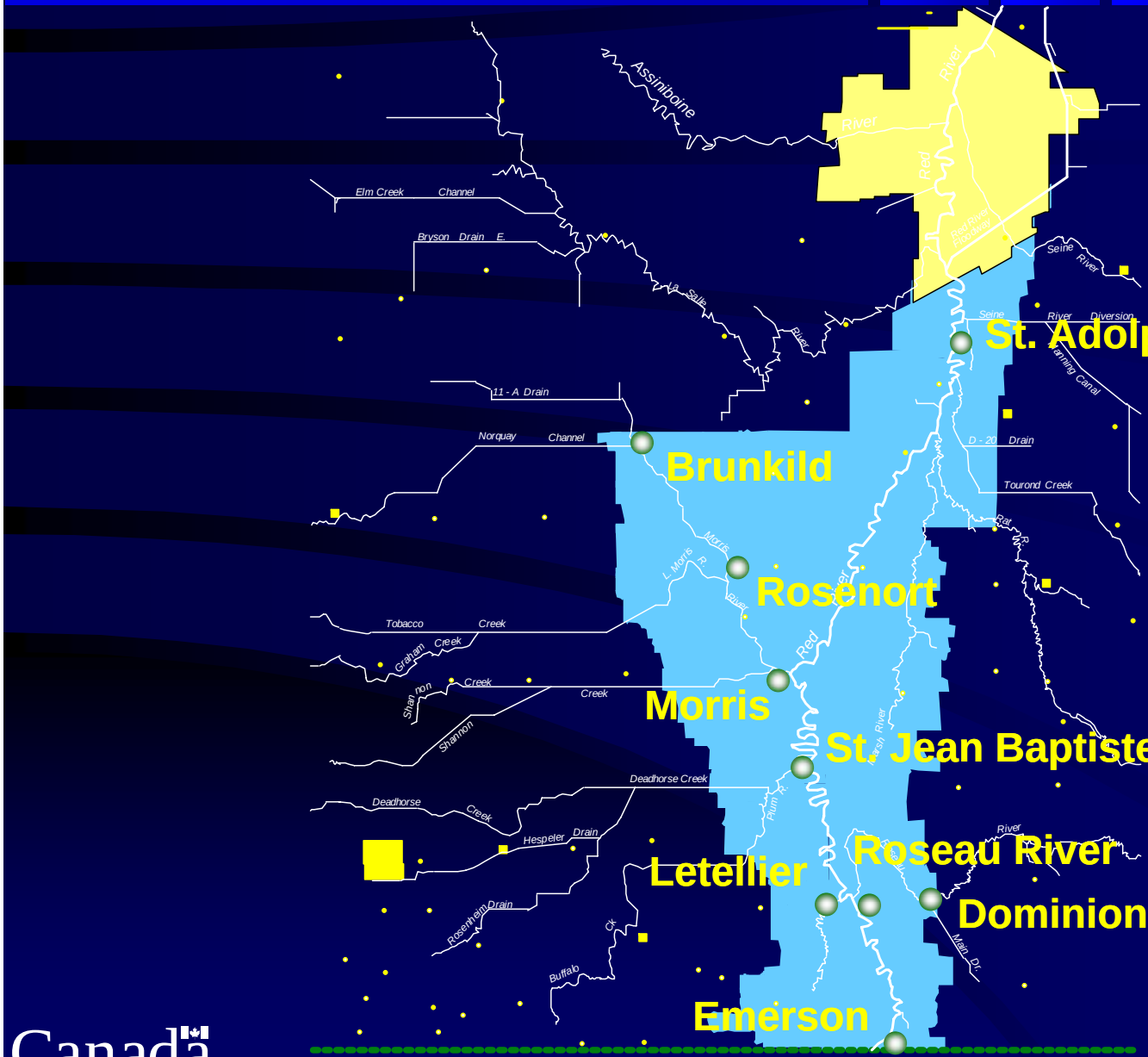
Program Element 2: Communities



Existing Community Dikes

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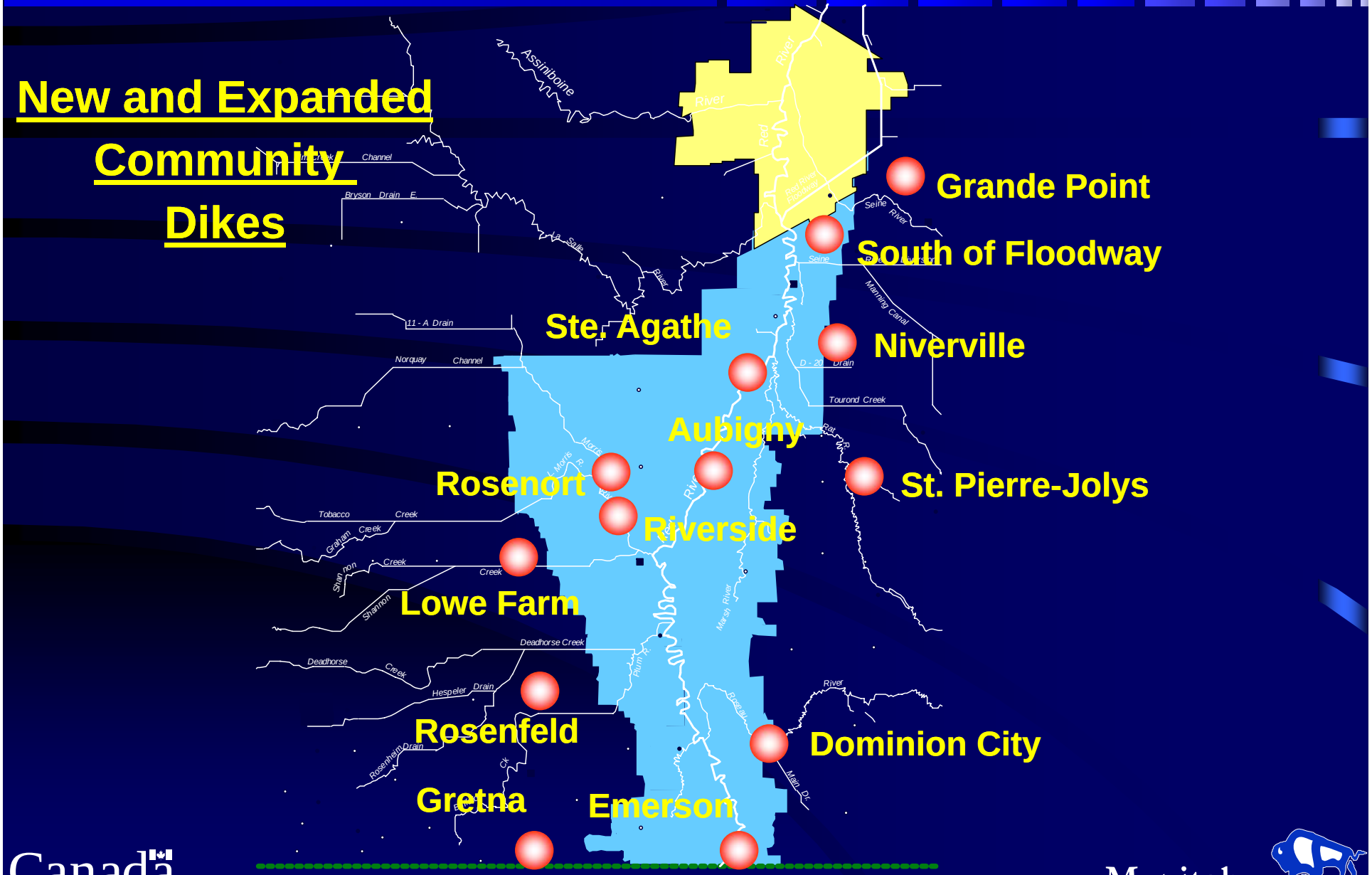
Program Element 2: Communities

New and Expanded Community Dikes



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Emerson Flood Protection Dike

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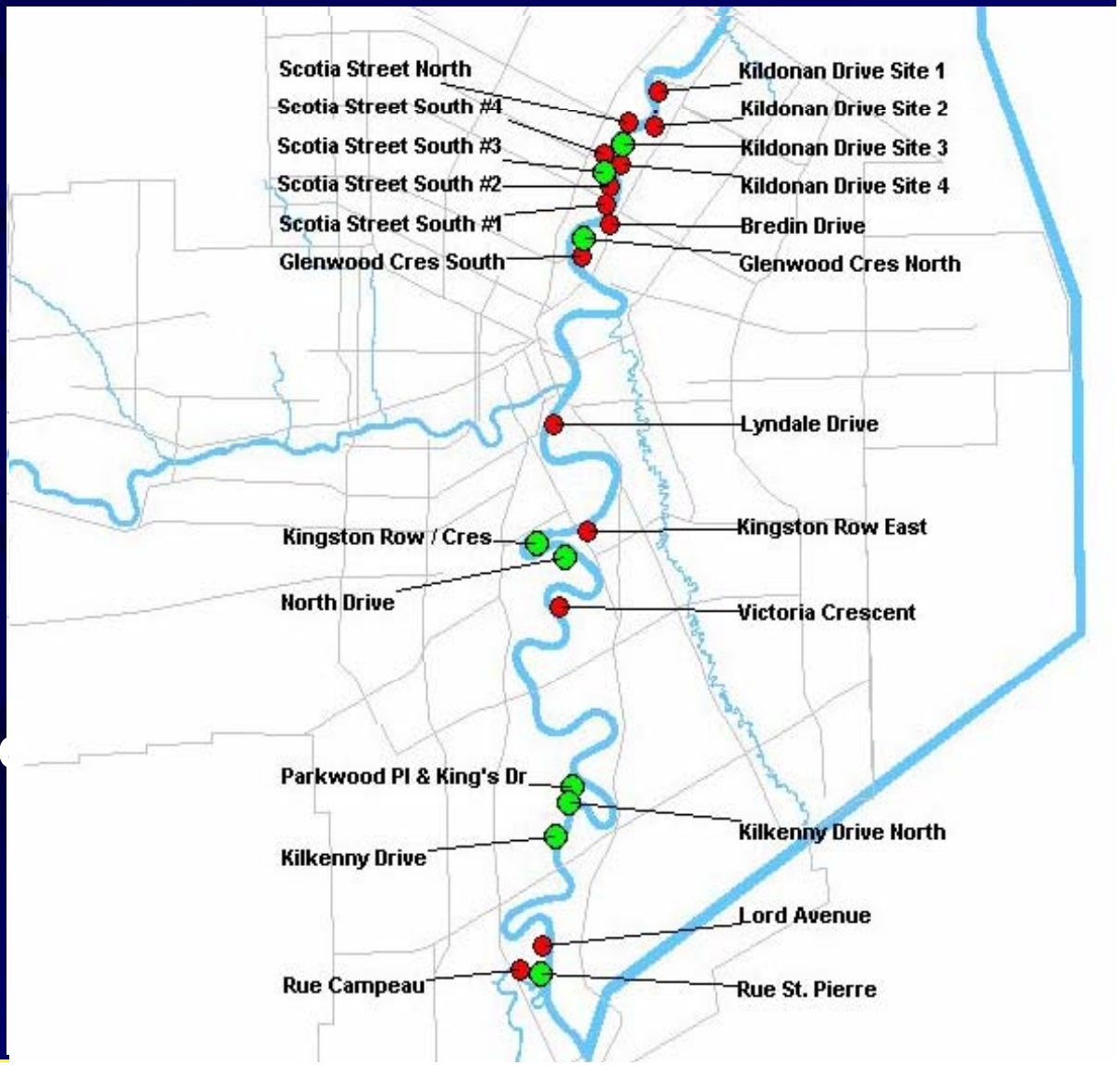
Program Element 3: City of Winnipeg

- **Community Projects to enhance the level of protection and/or integrity of the secondary diking systems within the City of Winnipeg**
  - **lOver 800 properties affected**
  - **Approximately 500 properties were addressed on a community or individual flood protection basis**

City of Winnipeg

Secondary Ring Dike Locations

- 23 sites considered
- 9 sites short-listed
- 450 properties outside primary dike



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Program Element 4: Environmental Impact Mitigation & Scientific Data

- **$5 M allocated to address other public interests in the Red River valley**

- Groundwater protection

- **inventory of existing wells in the flood-prone area**
- **seal abandoned wells**
- **upgrade/protect wells from surface water flooding**

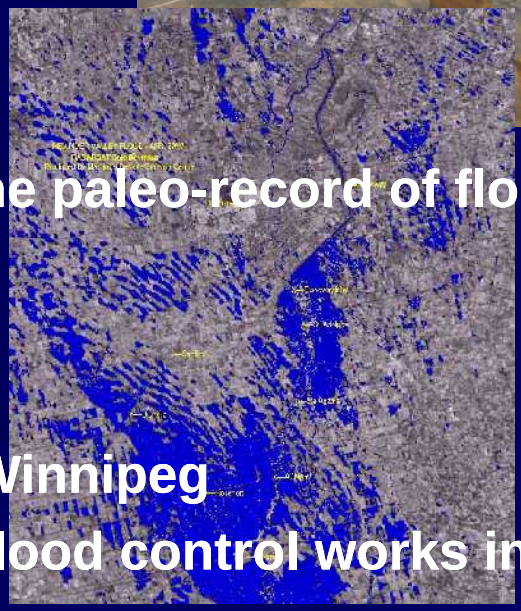
- GIS & Topography Data

- **enhance existing databases,topographical information & monitoring networks to enhance flood preparedness**
- **collect detailed topographical information to support IJC hydraulic model**
- **Web based tool for flood fighters**

cont'd...

Program Element 4: Environmental Impact Mitigation & Scientific Data

- Flood Forecasting Network
  - enhance 43 hydrometric stations within the RR Basin
  - reactivate/add an additional 34 hydrometric stations
  - enhance climatological network to provide additional information for use in flood forecasting



- Research on Red River Floods
  - 4 year research project to establish the paleo-record of flooding patterns in the Red River Valley

- Other studies
  - Flood Risk Workshop for the City of Winnipeg
  - Cumulative impact of the enhanced flood control works in the Red River valley

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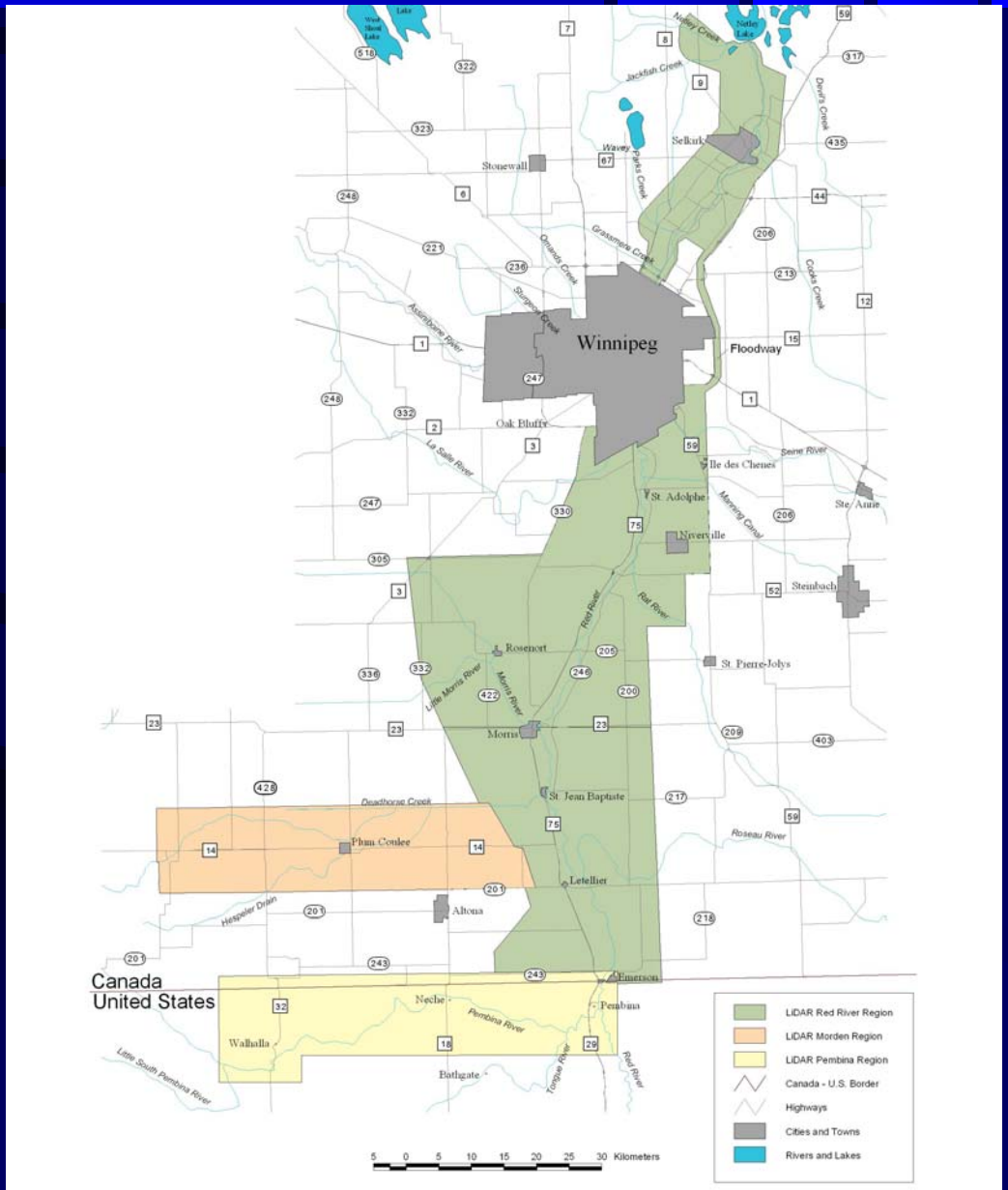
Lidar Coverage – Red and Pembina Rivers



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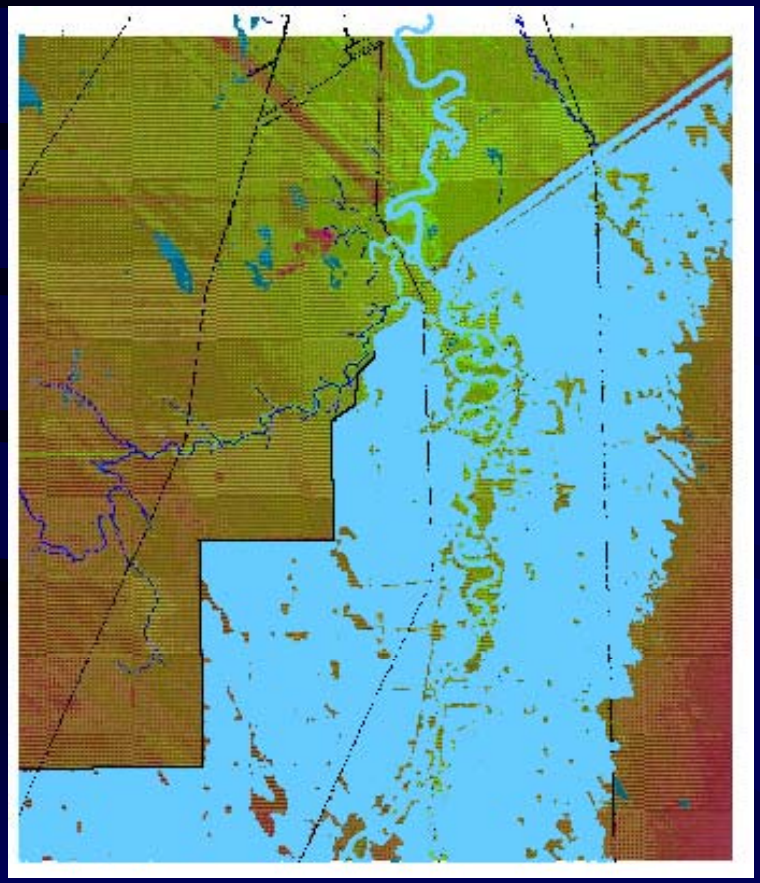
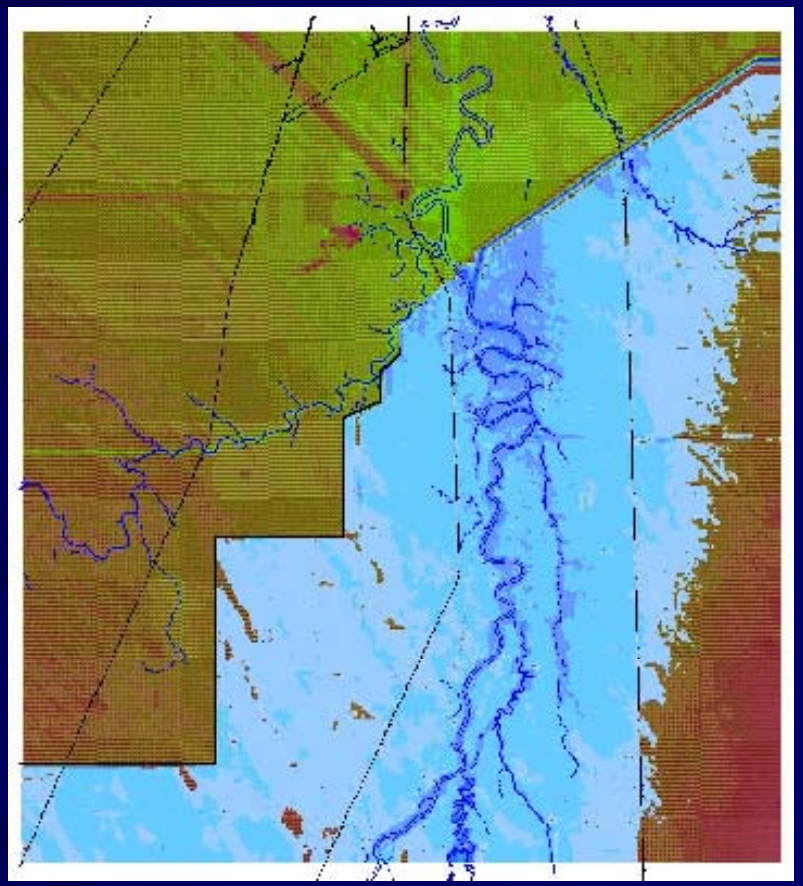
Mike-11 Model of Red River Valley

Model Results for May 4, 1997

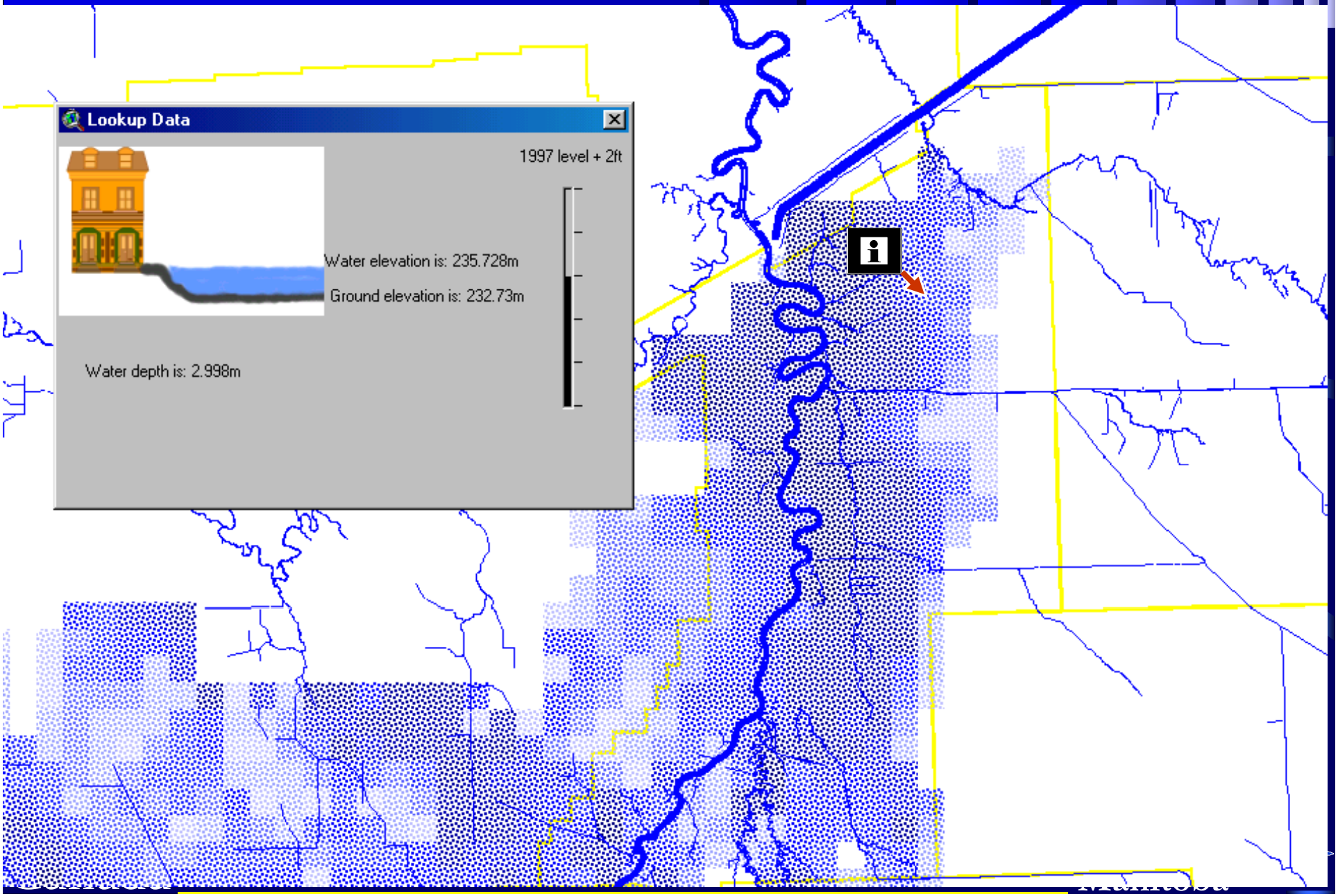


Satellite Image



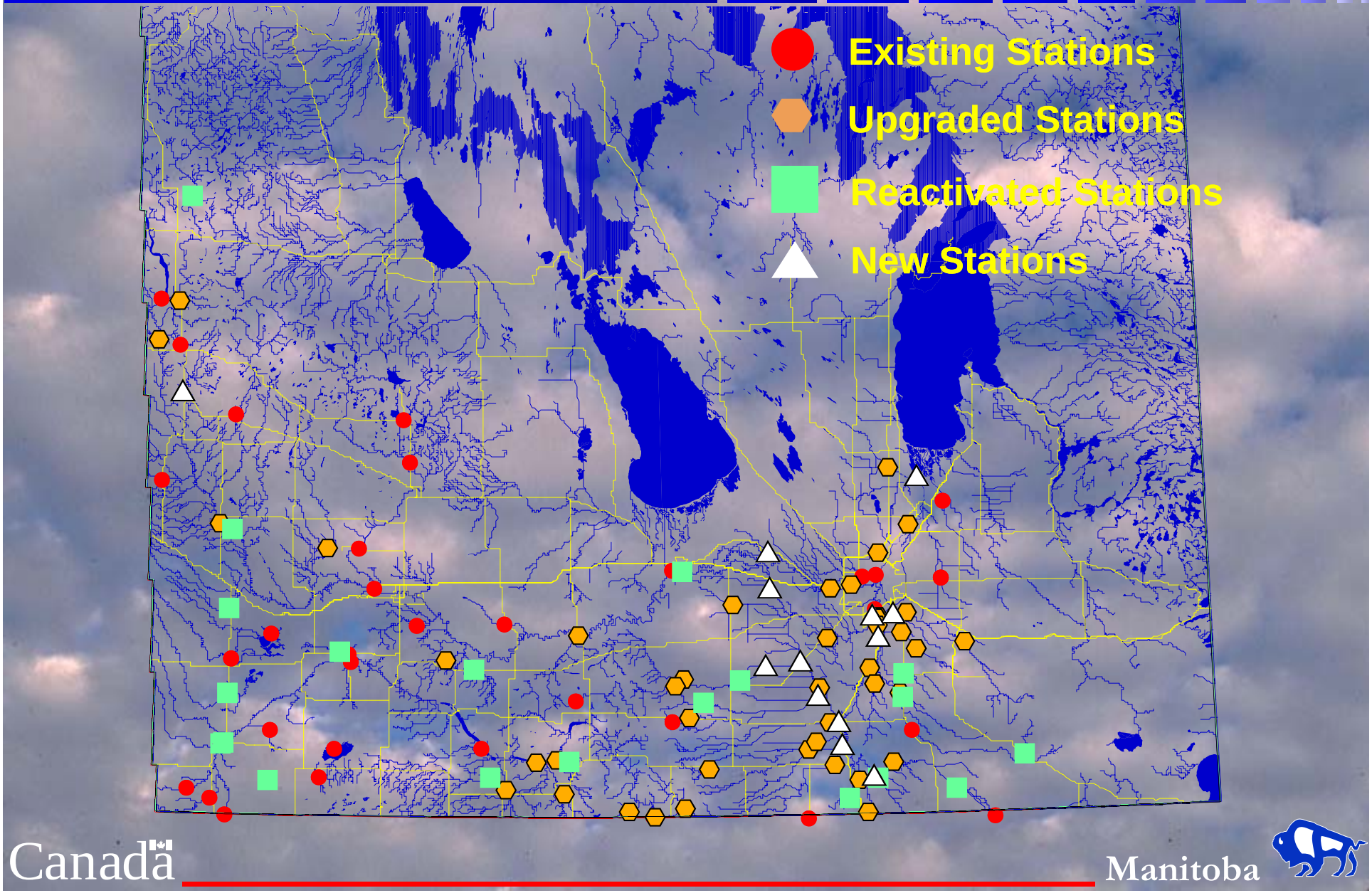
Modeled

Web-based GIS Tool



Program Element 4: Enhanced Hydrometric Network

Environmental Impact Mitigation & Scientific Data



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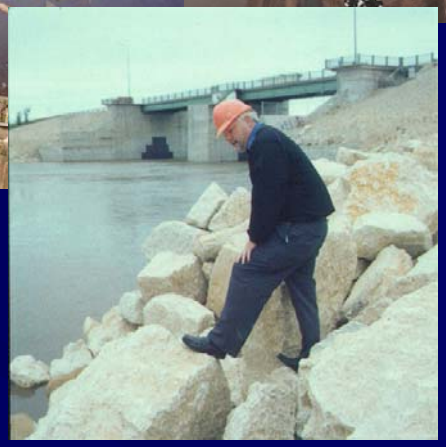
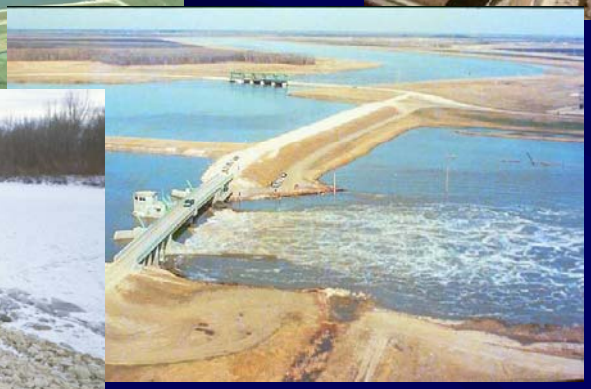
Program Element 5: Provincial Infrastructure Works

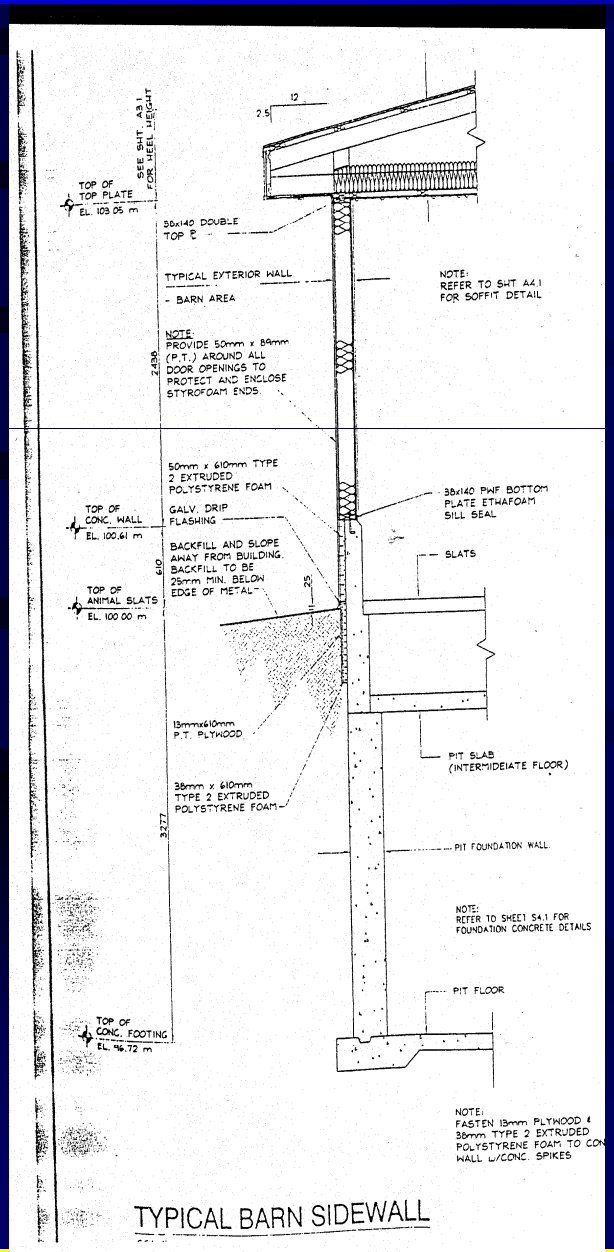
- **Provincial Flood Control Projects Rehabilitated**
  - West Dike Extension
  - Red River Floodway Rip Rap
  - Red River Floodway Gates
  - Portage Diversion & Shellmouth Dam
  - Assiniboine River Dikes








Designated Flood Area Legislation Amendments



All new development is required to meet 1997 plus 2 feet flood protection level

Regulation requires two stage permitting (1st strip foundation, 2nd main floor)

Strict penalties for non-compliance

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(IJC) International Joint Commission Task Force

"Flood Protection For The City of Winnipeg" Report

- **Report Highlights:**
  - Little margin for error for the City during the 1997 Flood
  - 58 vulnerabilities identified for extreme flood events
  - Major vulnerabilities
    - Lack of floodway hydraulic capacity
    - City's internal drainage system
    - Catastrophic failure of flood control infrastructure

Flood Magnitude	Potential Damages	Flood Probability
1997	$ 760 M	37% chance of occurring in next 50 Years
1826	$ 5.8 B	20% chance of occurring in next 50 years

Floodway Expansion - Channel Excavation

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Floodway Expansion - Springhill Ski Hill

Floodway Expansion – Inlet Control Structure

Floodway Expansion – Outlet Structure Widening

Floodway Expansion – Trans Canada Bridge

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Floodway Expansion – West Dike Raising

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Floodway Expansion - Centerline Drain Inlet

Ice Jam Mitigation - Amphibex

Concluding Remarks

- Within the designated flood zone, there is 95% compliance for structures in the Red River Valley.
- Enhance flood proofing will help facilitate with emergency diking for a flood of greater magnitude than that of 1997.
- To date Floodway Expansion has increased the City of Winnipeg Flood Protection to a 300 year level, 700 year by 2009.

- Better data bases, forecasting tools
- 100% of the IJC recommendations have or will be met

3-D View of 1826 Flood