# *INVESTIGATION OF THE FEASIBILITY OF RE-CONNECTING ABANDONED OXBOWS IN THE OKANAGAN RIVER UPSTREAM OF OSOYOOS LAKE*

**Osoyoos Lake Water Science Forum**
**September 18, 2007**

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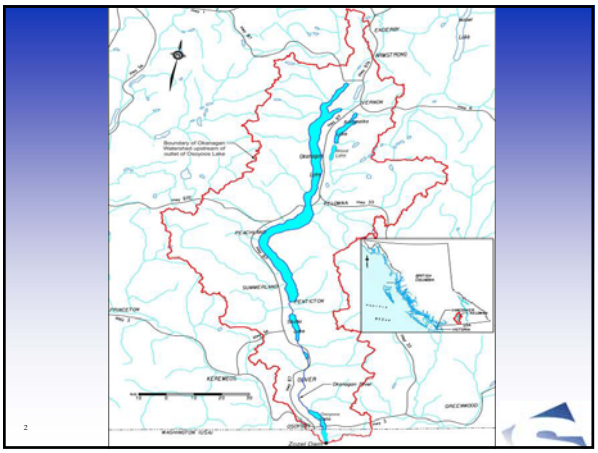



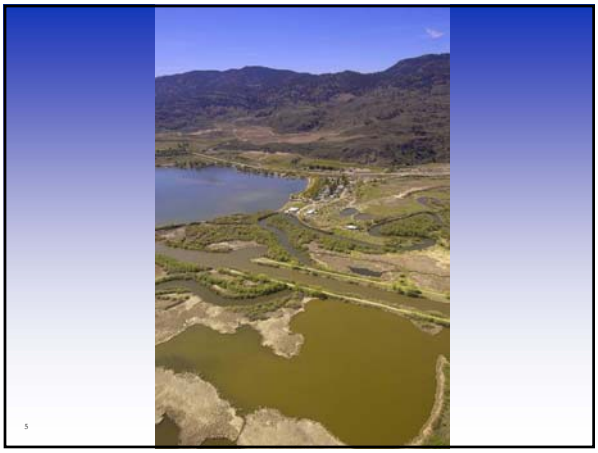


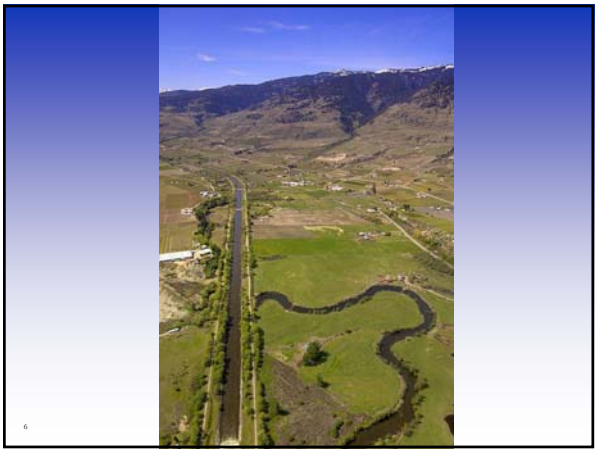

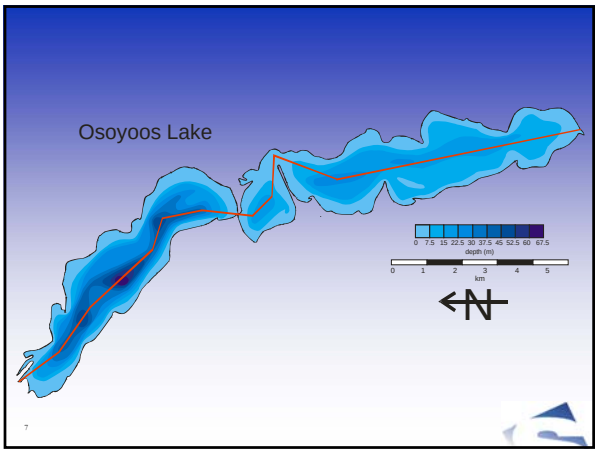


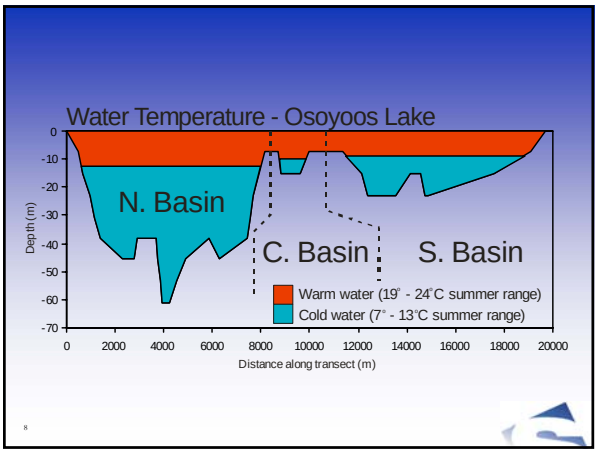


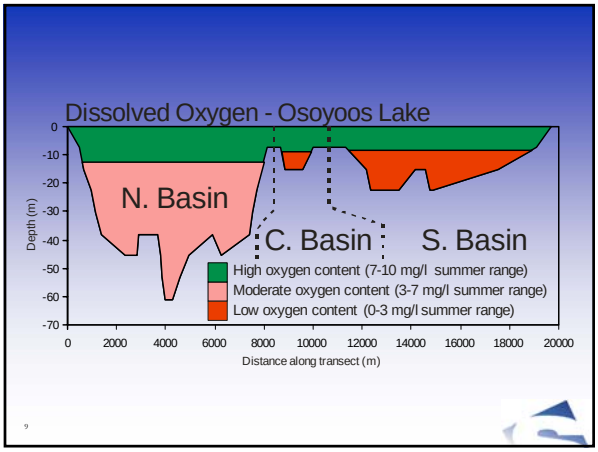


## PROJECT OVERVIEW

- Okanagan River was channelized in 1950s, resulting in abandonment of meander bends and limited riparian function upstream of Osoyoos Lake
- Concept: could flow be restored to some or all of the abandoned meanders (oxbows)?
- Potential benefits include restored riparian processes, improved water quality in Osoyoos Lake, reduced chemical use for West Nile-hosting mosquitoes

## PROJECT OVERVIEW (continued)

- Phase 1 (completed 2006): Business Plan, consultation with local landowners, fundraising, preliminary hydraulic feasibility study
- Many landowners are supportive of the idea
- Study looked at river and oxbow hydraulics including flow rates, water surface elevations, and slopes

## RECOMMENDATIONS OF PRELIMINARY HYDRAULIC STUDY

- There are several opportunities to increase flow into oxbows, good mapping already exists, there are cost-sharing opportunities with MOE, and there are no hydraulic show stoppers
- Recommended a pilot project - monitoring in 2-3 oxbows (and river and groundwater) - water levels, flows, water/sediment quality, sedimentology; also conduct test flushes
- Consider existing water rights, fish access, wildlife management objectives, and links to other projects

## PROJECT OVERVIEW (continued)

- Phase 2: Ongoing business planning, fundraising and consultation, plus beginning of long-term feasibility study
- Feasibility study is intended to thoroughly assess and test the risks, potential benefits, constraints, and costs, and develop one or two preferred options to the conceptual design stage
- Year one of a monitoring and data analysis program has been completed …

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## YEAR ONE MONITORING AND ANALYSIS (Fall 2006 – Summer 2007)

- 3 oxbows: Shippet (intensive program), Thompson, Quintal (water level, water temperature, water quality, sediment quality)
- Okanagan River: 2 sites – one upstream and one downstream of the three oxbows (water level, water temperature)
- 3 wells adjacent to oxbows (Hoover, Bodnard and Quintal) - groundwater level and quality
- Controlled water flush from Shippet oxbow

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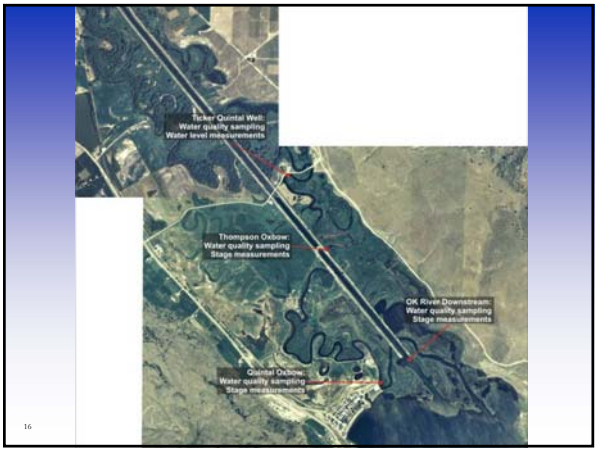


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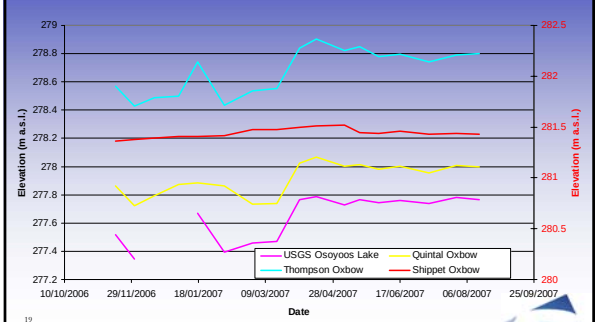
## MONITORING – WATER LEVEL

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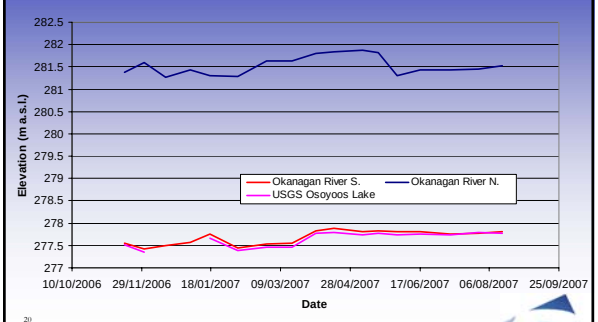


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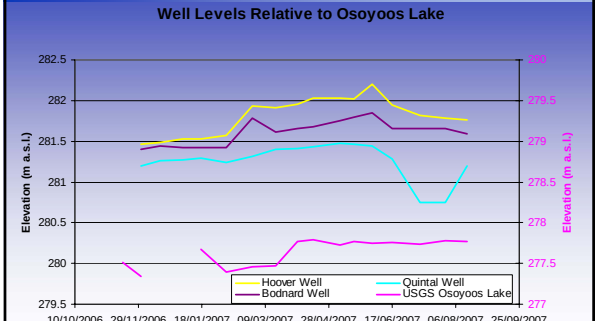


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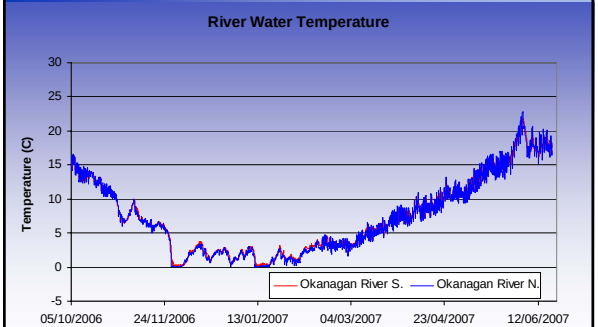
## MONITORING – WATER TEMP

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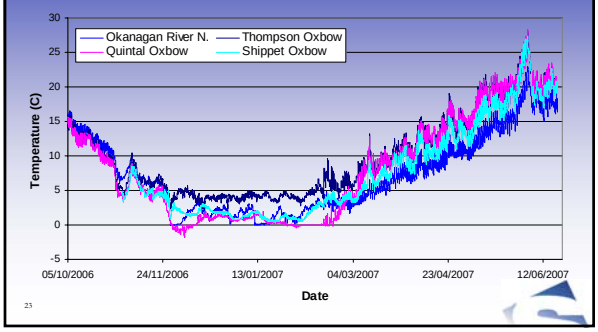


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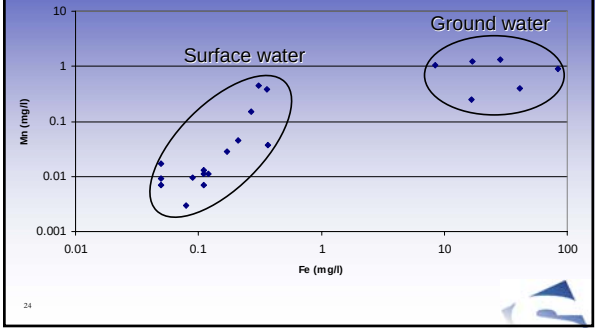
## MONITORING – WATER QUALITY

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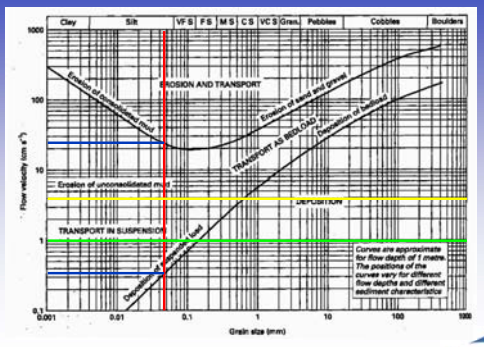
## FLUSH TEST

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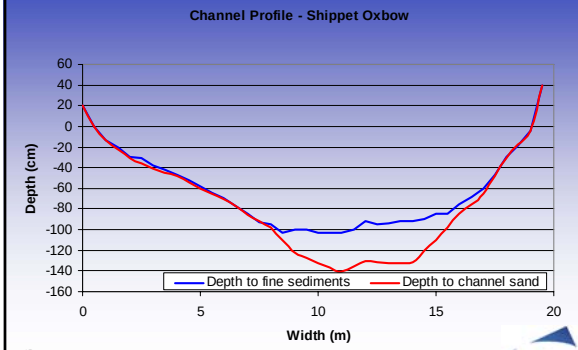


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## SEDIMENT CHEMISTRY

| Parameter | Qty (µg/g) | Potential Loading (kg) | | | |
|---|---|---|---|---|---|
| Available Nitrate & Nitrite N | 1 | 6.84 | Nickel Ni | 17 | 116.24 |
| Available Nitrate | 0.8 | 5.47 | Selenium Se | 1.8 | 12.31 |
| Antimony Sb | <10 | 68.38 | Silver Ag | 2 | 13.68 |
| Arsenic As | <10 | 68.38 | Tin Sn | 5 | 34.19 |
| Barium Ba | 52 | 355.56 | Vanadium V | 31 | 211.97 |
| Beryllium Be | <1 | 6.84 | Zinc Zn | 44 | 300.85 |
| Cadmium Cd | <0.5 | 3.42 | Boron B | 5 | 34.19 |
| Chromium Cr | 27 | 184.62 | Iron Fe | 14800 | 101196.48 |
| Cobalt Co | 5 | 34.19 | Manganese Mn | 185 | 1264.96 |
| Copper Cu | 16 | 109.40 | Phosphorus P | 913 | 6242.73 |
| Lead Pb | 5 | 34.19 | Potassium K | 1540 | 10529.90 |
| Mercury Hg | 0.01 | 0.068 | Sodium Na | 205 | 1401.71 |
| Molybdenum Mo | <4 | 27.35 | Strontium Sr | 92 | 629.06 |

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## PRELIMINARY CONCLUSIONS OF PHASE 2

- Water levels in Quintal and Thompson oxbows are controlled by Osoyoos Lake
- This implies the existence of a shallow water table controlled by the lake
- Well water levels are not related to either the river or lake
- Surface and ground waters have distinct chemical signatures
- These results suggest that the deep aquifer being tapped by domestic wells is not GUDI

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## PRELIMINARY CONCLUSIONS OF PHASE 2

- Temperature in the Shippet is lower than in non-connected oxbows due to some river flow through it
- There is a significant amount of fine-grained sediment accumulated on the original river sand bed in the oxbows
- Initial chemical analyses of this sediment don't suggest any major contamination
- Flow through the Shippet Oxbow is not currently adequate to erode fines, and max. flow would have to be increased by factor of almost 10 to erode fines

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## RECOMMENDATIONS BASED ON YEAR ONE

- Complete a riparian and aquatic habitat assessment comparing the Shippet Oxbow to an oxbow not connected to the river
- Do a mineralogical analysis on the fine-grained sediments to determine the solubility of trace minerals
- Survey additional oxbows to determine the total volume of accumulated fine sediment
- Analyze oxbow sediments for pesticides, herbicides and other industrial chemicals
- Assess first year results against those of other related studies in the area

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## FUTURE DIRECTIONS

- Integrate current work with regional work to develop holistic understanding of Osoyoos Lake system
- Identify optimal restoration and long-term management approach(es) for Osoyoos Lake and the oxbows
- Develop more comprehensive water quality objectives for Osoyoos Lake

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