

Cold Lake Health Assessment



23 March 2017

Agenda

1 Introduction

2 Lake Water Balance

3 Lake Health



1 Introduction

The objective of this study was to evaluate the effects of further water withdrawals on the **water level** of Cold Lake and on **lake health**

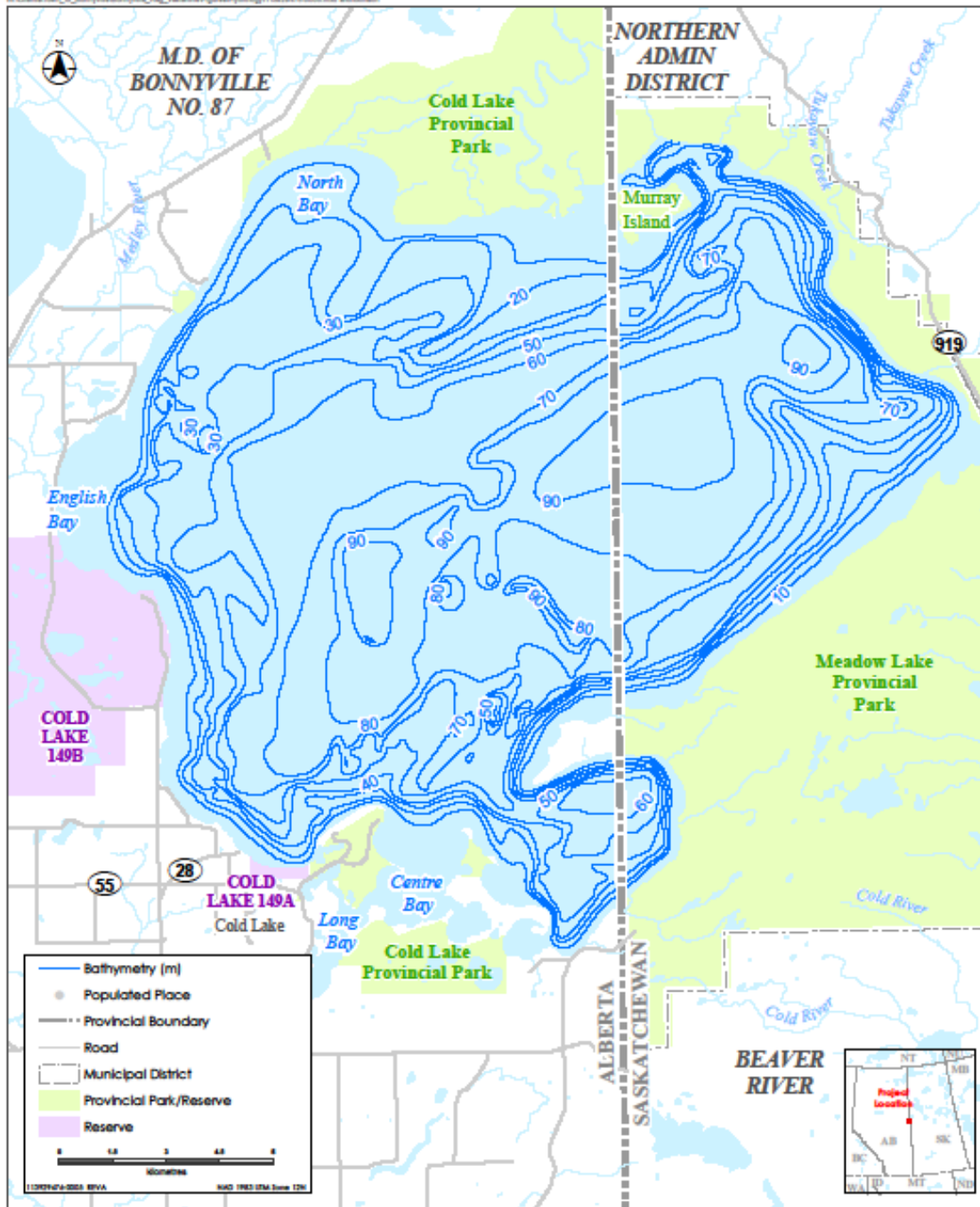
2 Lake Water Balance

- Cold Lake is one of Alberta's deepest and largest lakes
- Lake water balance is a key aspect of lake health
- Influenced by surface water inflows, groundwater inflows, precipitation, evaporation, and water withdrawals

Drainage Area (km ²)	Lake Area (km ²)	Drainage Area to Lake Area Ratio	Max Depth (m)	Mean Depth (m)
6,601	355	19:1	99.9	49.5

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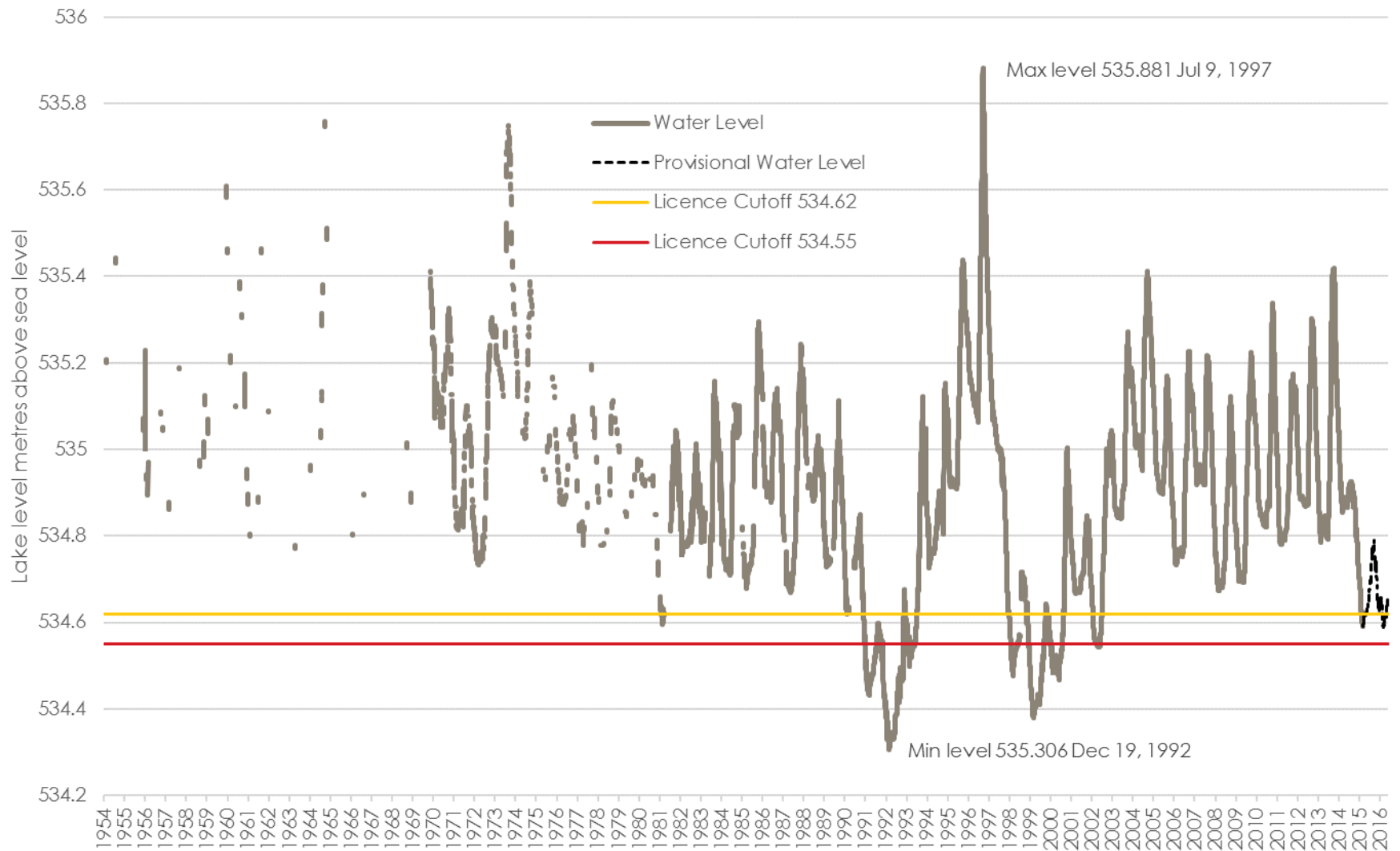


Cold Lake Bathymetry

Water Balance Model Inputs

- Weekly values of observed lake water level
- Precipitation
- Evaporation
- Groundwater inflow
- Observed outflow discharge and equation to compute stage-storage, stage-area and stage-outflow relationships (where outflow data do not exist)
- Water withdrawals from Cold Lake

Water Level



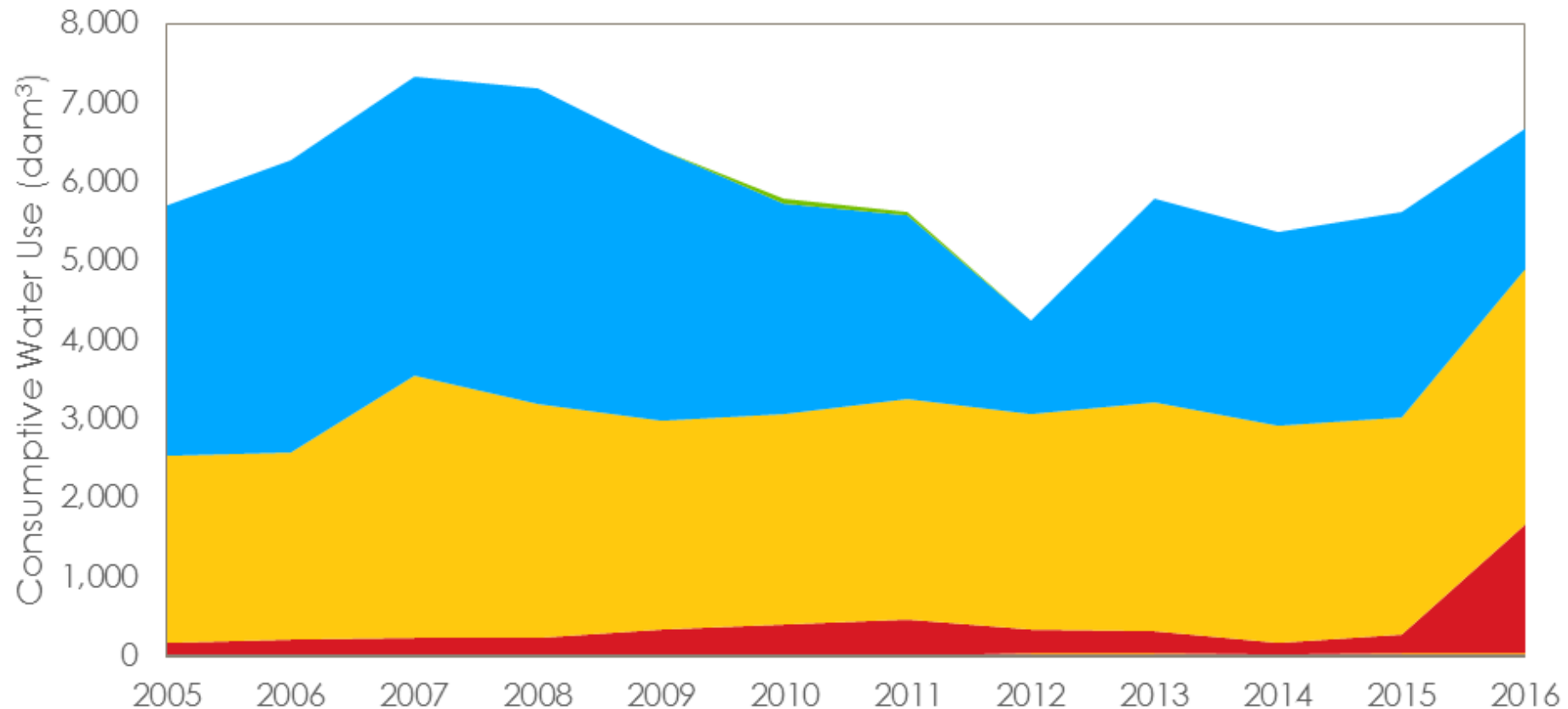
Groundwater Inflow

- Cold Lake is a “gaining” lake
- 20,000 m³/day
- Relatively insensitive (3%) to allocated groundwater extraction rates

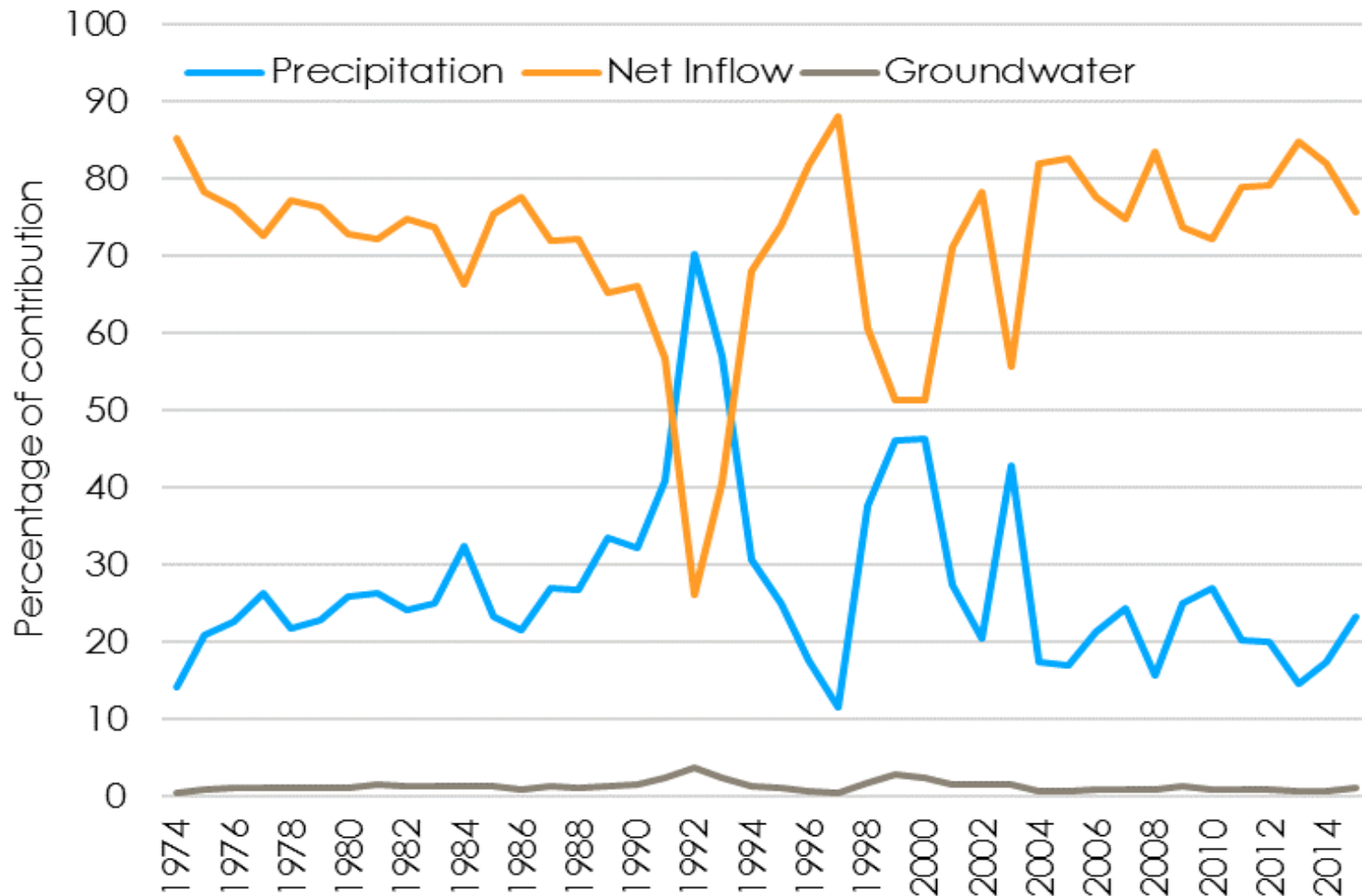
Existing Allocations

- Five Alberta water withdrawal Water Act licences have reported data on water withdrawals and returns available for Cold Lake
- Returns considered for Hatchery + Imperial Oil
- Returns not considered for CLRUSC

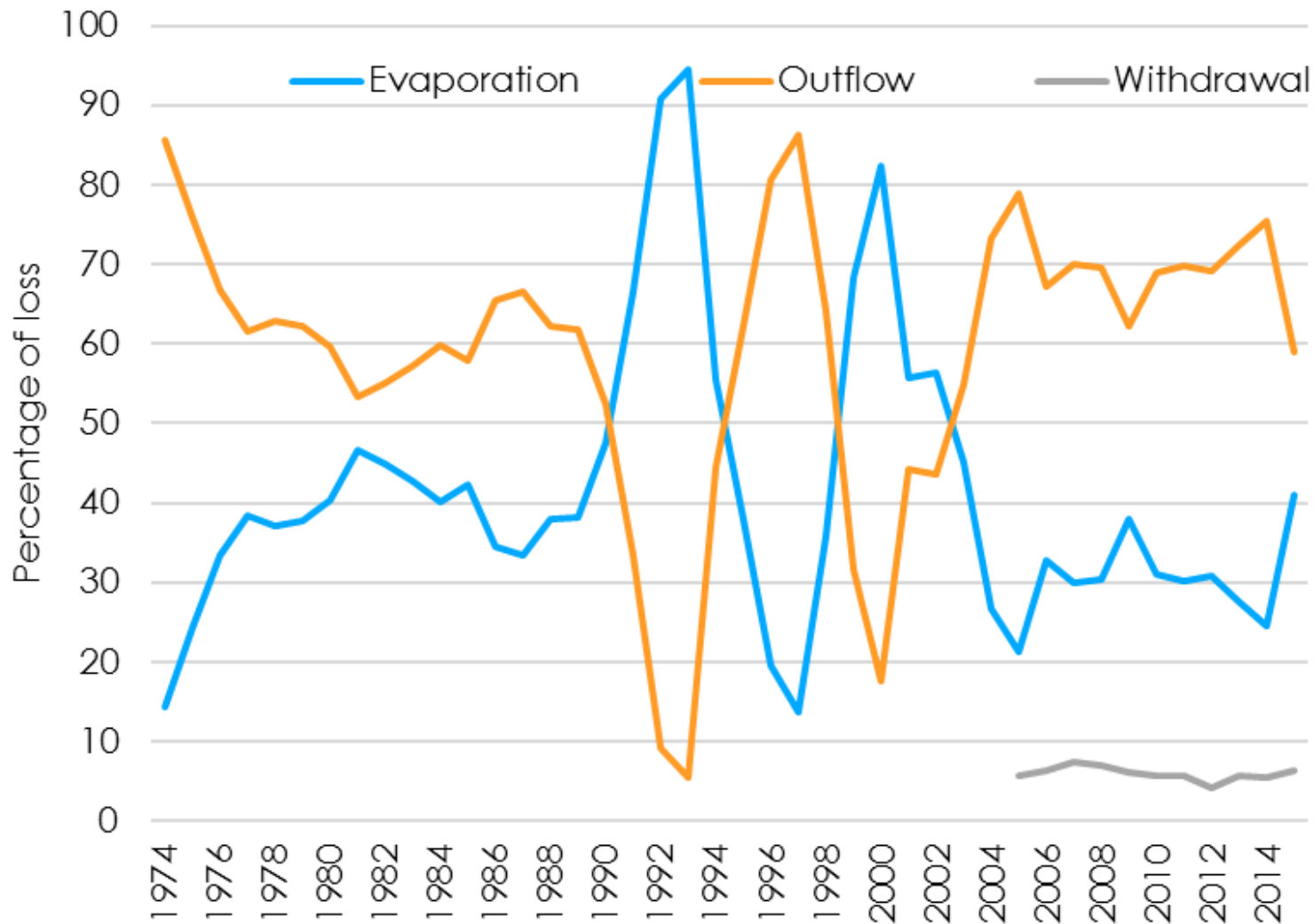
Reported Consumptive Use



Water Balance: Inputs



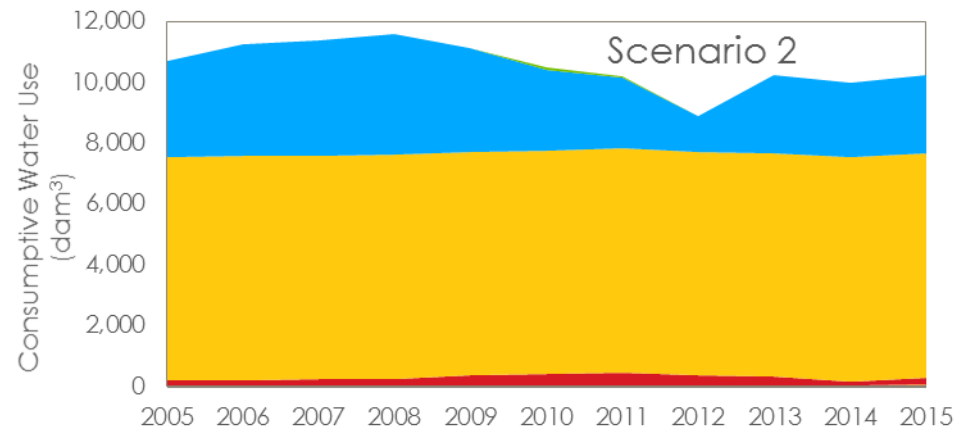
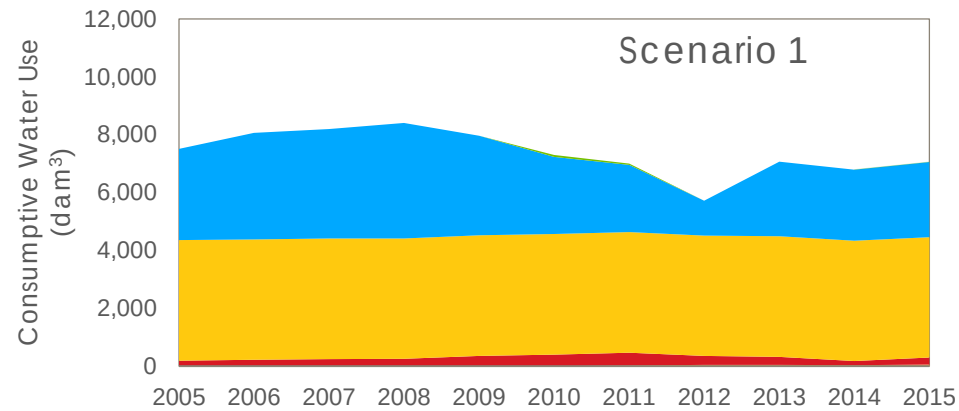
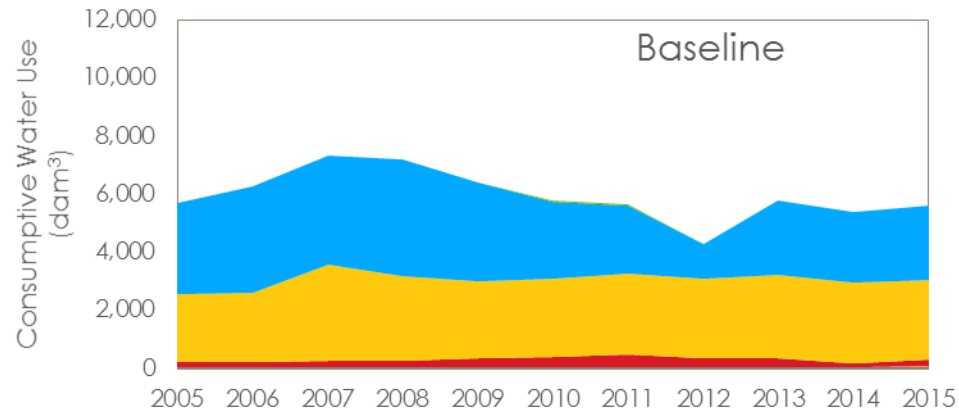
Water Balance: Losses



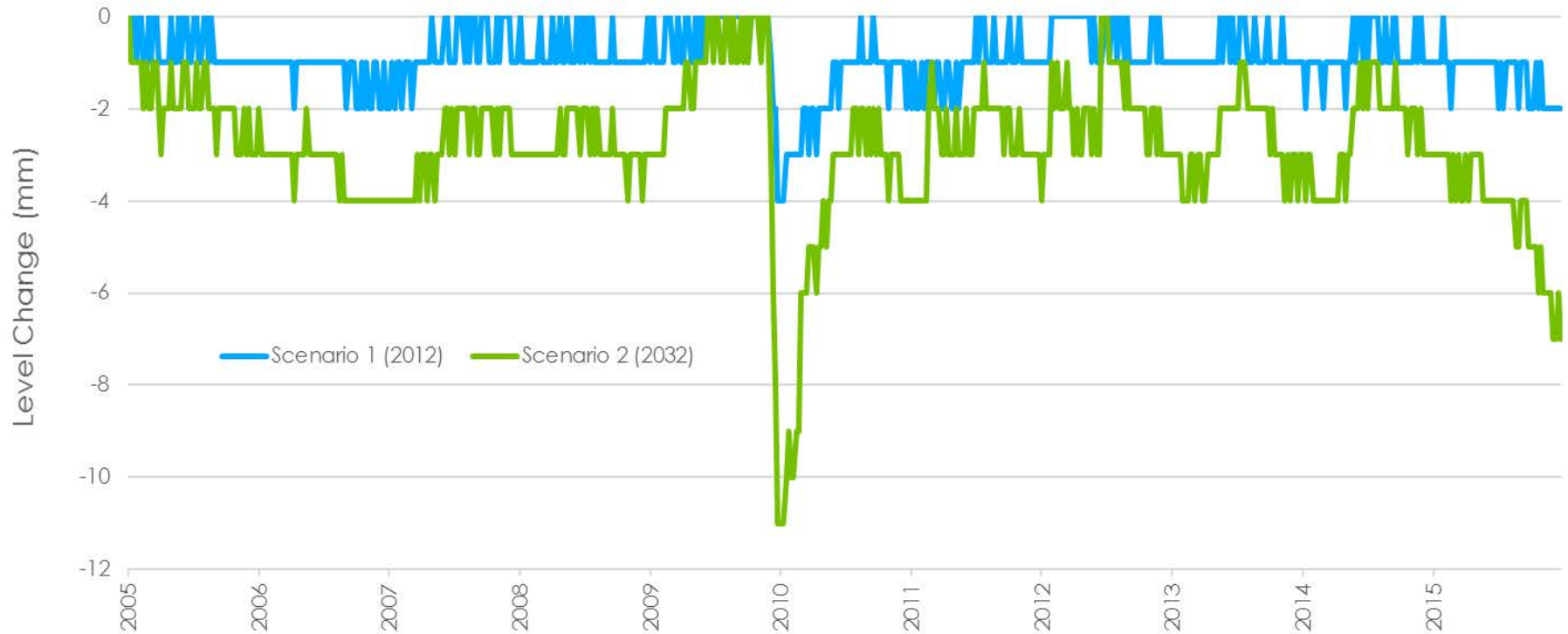
Water Balance Scenarios

- **Baseline:** Actual water balance 2005 to 2015
- **Scenario 1:** Increase CLRUSC to all users (2012)
- **Scenario 2:** Increase CLRUSC to 2032 flows (all users)

Modeled Water Use



Modeled Lake Level Change



Max change 0.4 cm (Scenario 1) and 1.1 cm (Scenario 2)

Annual lake level fluctuation 20-40 cm

A loonie is ~2 mm or 0.2 cm thick

3 Lake Health



3 Lake Health

- Lake level fluctuations can affect shallow fish habitat in the aquatic environment, and wetland and riparian vegetation in the terrestrial environment
- Changes in lakes levels from further water withdrawals are **not expected to measurably affect aquatic biota, wetlands, riparian vegetation or wildlife** due to the small predicted changes in lake water levels