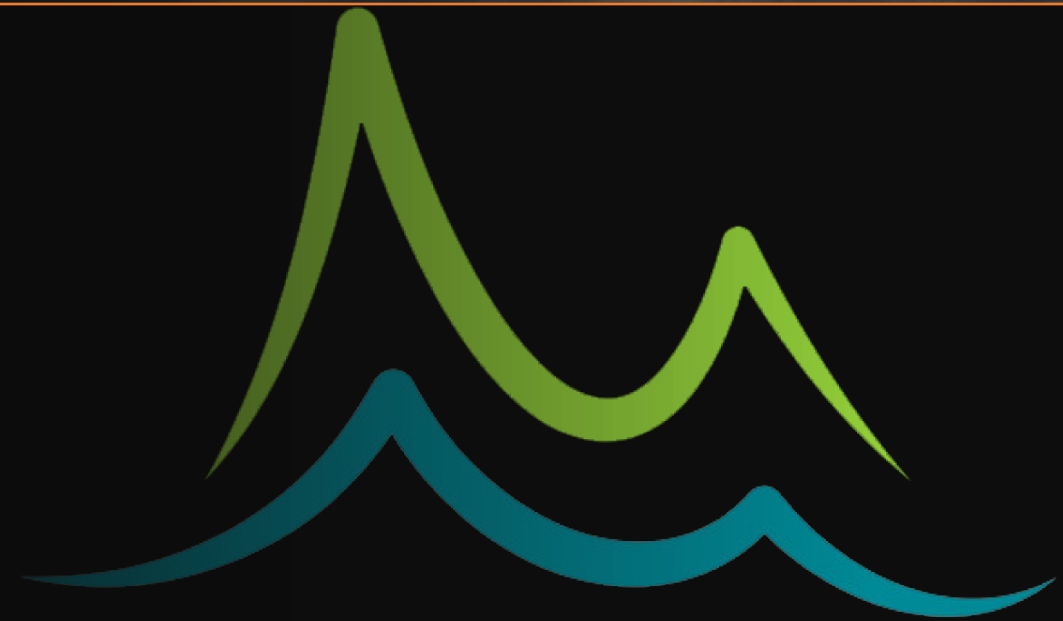


The Stabilization of Gull Lake Filtration System Evaluation

Paul G. Anderson, M.Sc.
Past President
Gull Lake Watershed Society



The Stabilization of Gull Lake Filtration System Evaluation

History of Gull Lake Water Levels and Stabilization Efforts

Is Pumping Necessary?

What are the Impacts and Benefits of Lake Stabilization?

Why has pumping stopped?

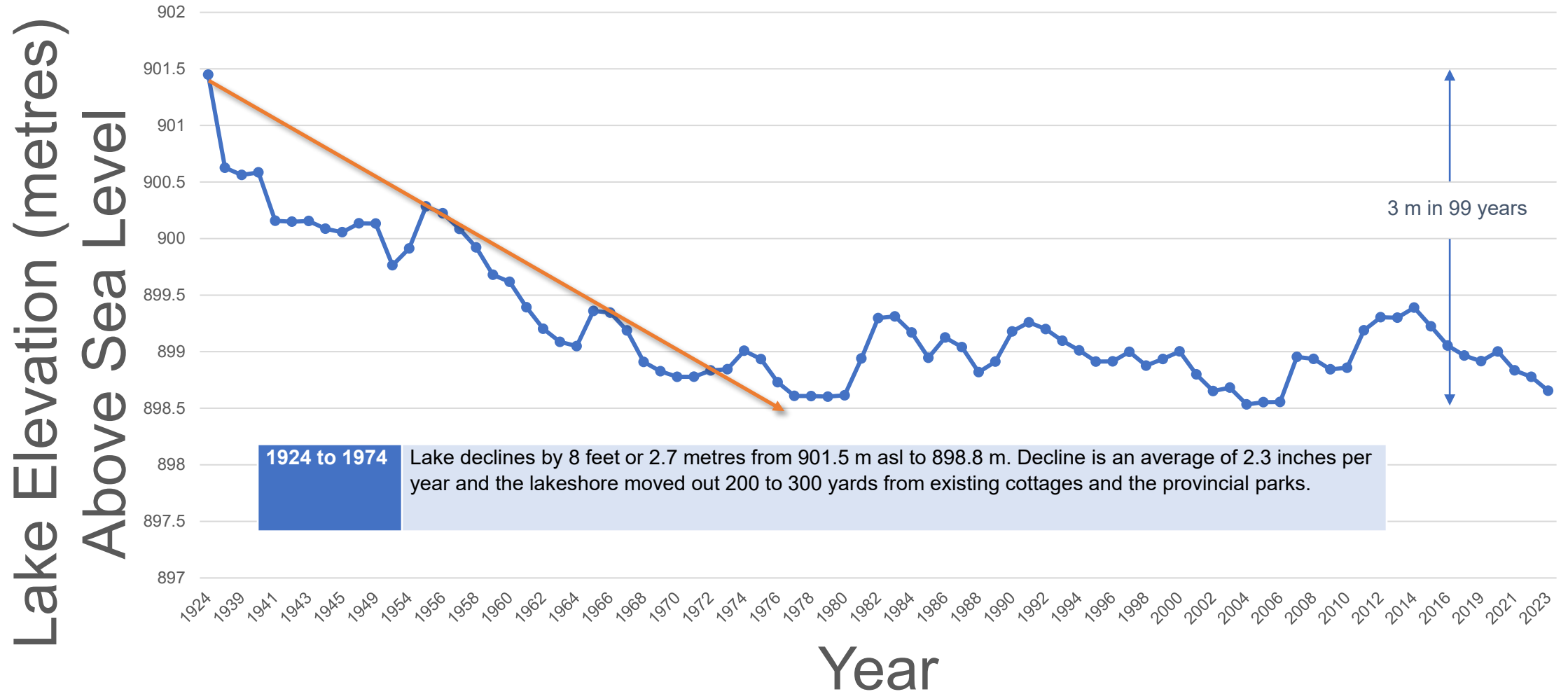
Pressurized Filtration Feasibility Projects

Current Status and Next Steps

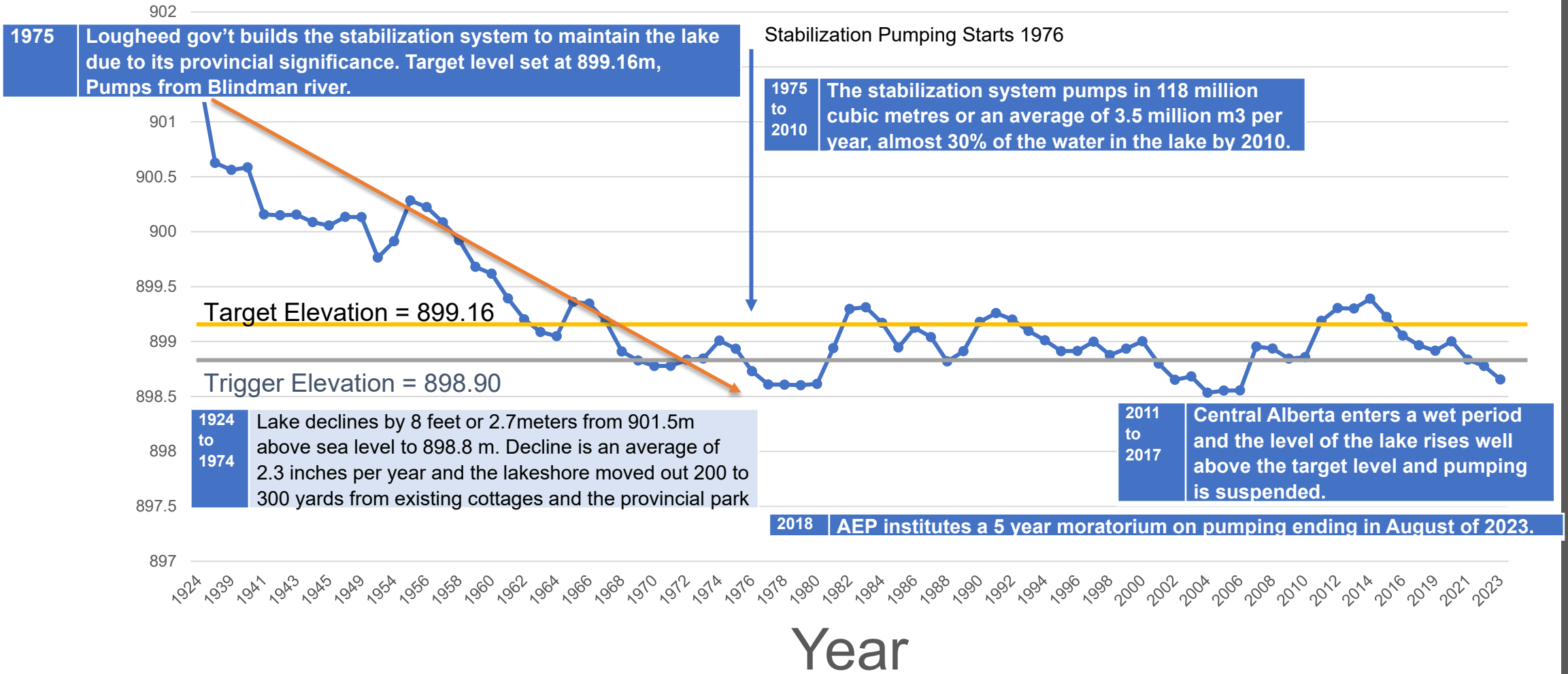


Photograph Courtesy of Gull Lake Watershed Society

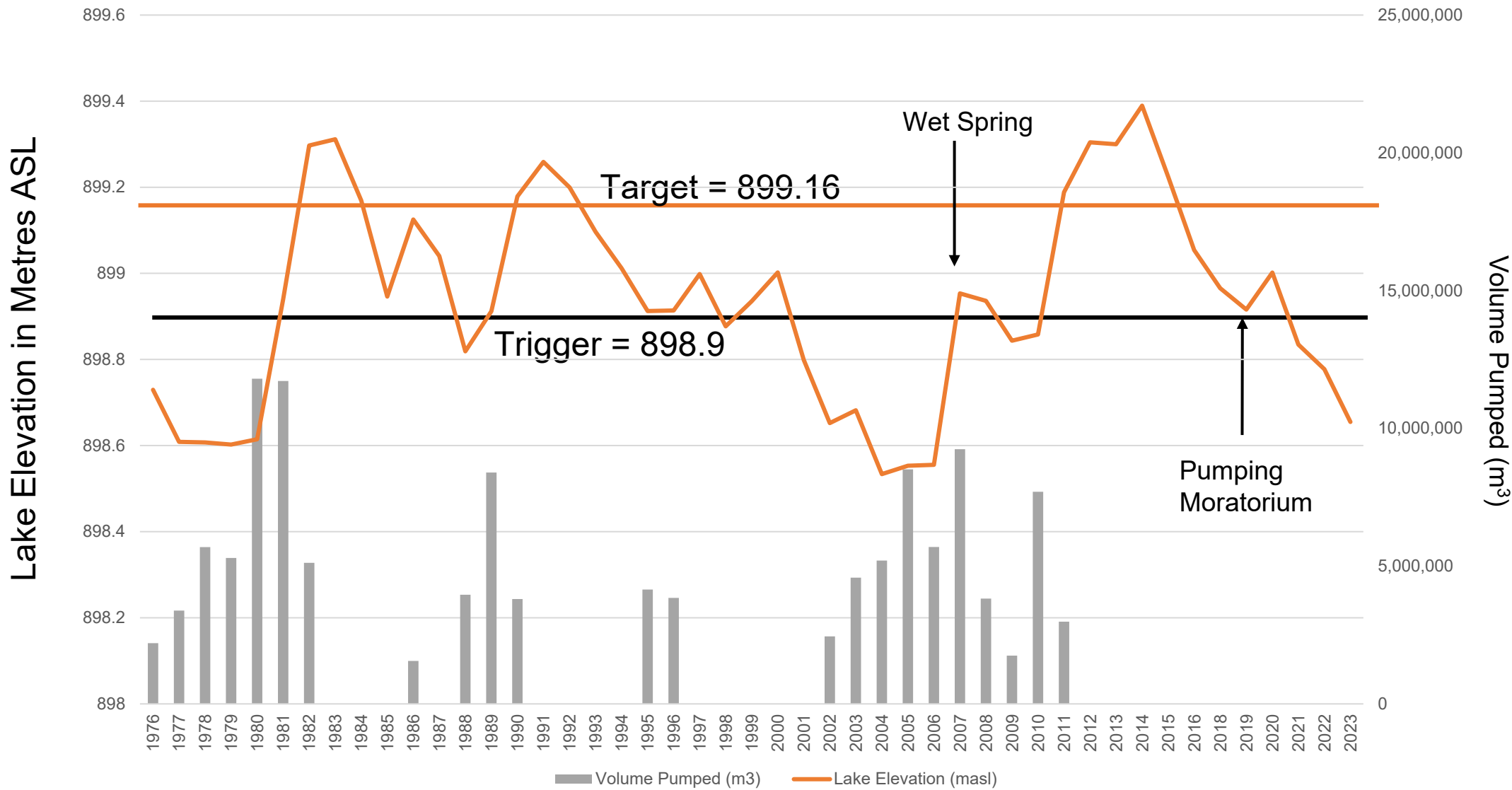
Historical Mean Lake Levels for Gull Lake



Historical Mean Lake Levels for Gull Lake



Water Levels of Gull Lake and Volume Pumped Since Stabilization Began



The History of Lake Stabilization Pumping

For 50 years the lake declined 6 cm per year

Since 1976 the system has pumped 118 million m³ – 30% of total lake volume

Capacity of pumping system is 11 MM m³ per year

Average pumped is < 4 MM m³

Wet period 2011-2016 raised lake 1 foot above target level

Decline since 2016, now 0.60 m below target = 2 feet

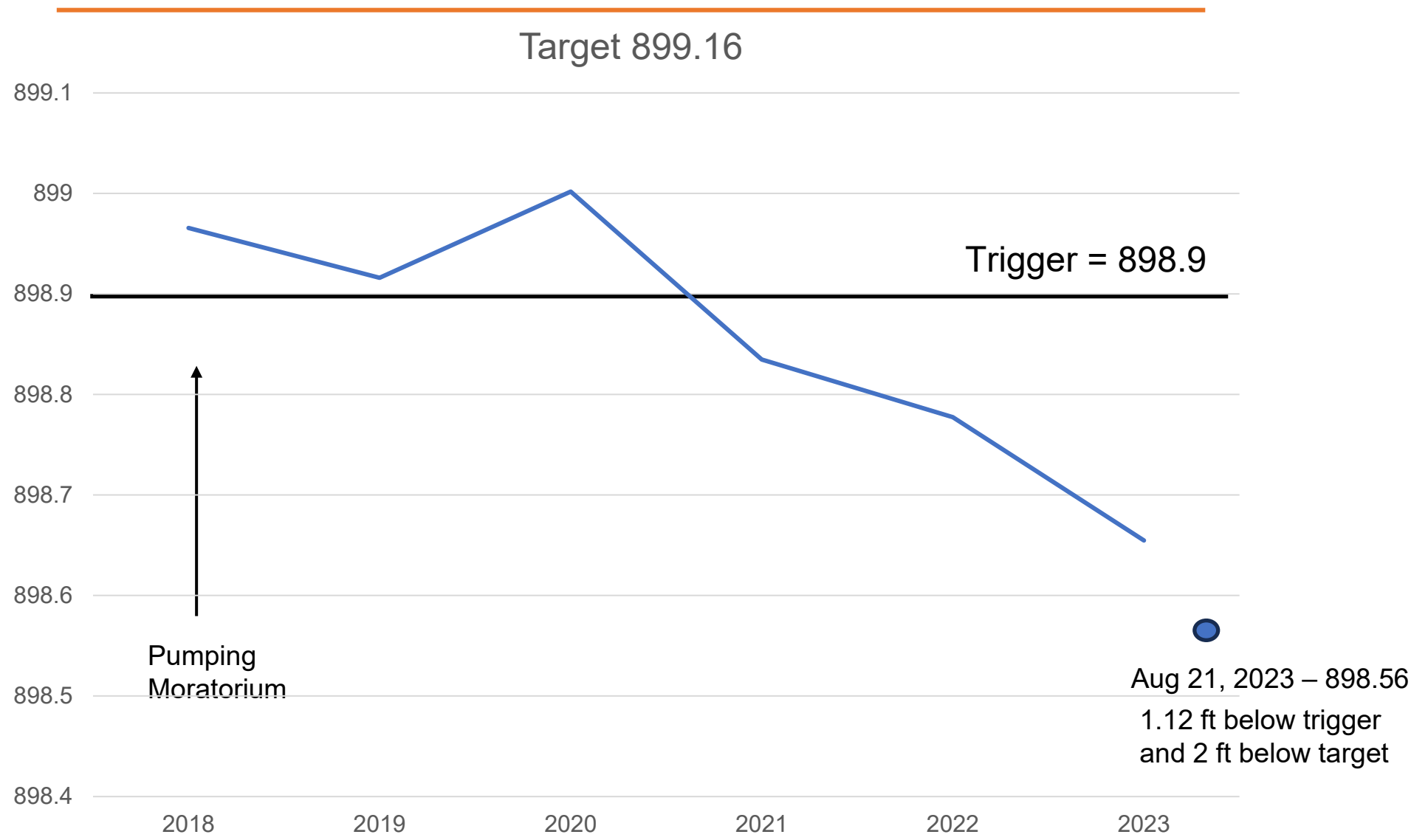


Photography by Jeremy Crawford from APPKITT



Is Pumping Necessary?

Lake Elevation in Metres ASL



Historical Monthly Mean Lake Levels for Gull Lake



Impacts & Benefits of Pumping

Cost Benefit

Gull Lake is major amenity to the area and key driver to development

Approximately 3000 lake properties with total property values exceeding \$1 Billion

Property values and assessments now much higher but are at risk

A 10% decline in property value could easily occur with low lake levels

Lost value translates to reduced taxes and severely reduced tourism



Impacts of Low Water Levels

- Impacts to recreation
 - 2000 Camping Spots
 - Plus > 2000 day use users
 - Beaches
 - Boat launches
 - Marinas
- Impacts to fishery
 - Dewater spawning and nursery beds
 - Loss of habitat
- Impacts to wildlife
 - Loss of nesting habitat for waterfowl



Impact of Pumping

25% of water in the lake had been pumped in after evaporation

Without pumping Gull Lake can be expected to return to long term historic decline rate

Will ultimately decline several metres according to HCL Study



Photography by Jeremy Crawford from APPKITT

Impact of Pumping – HCL Hydrogeological Consultants 2011

2003-2010 Pumped 46 Mm³, over 94% was still in the lake, raising lake by 2ft.

The AENV model was flawed, overstating evaporation by >70%

New equilibrium 5 m below (~894masl). 1km from boat launch to water's edge.

Benefits of the Diversion Pumping to Gull Lake
Gull Lake, Alberta
Tp 040 to 043, R 27 and 28, W4M and Tp 040 to 043, R 01 and 02, W5M

Prepared for
Gull Lake Water Quality Management Society



Prepared by
hydrogeological consultants ltd. (HCL) 1.800.661.7972

March 2011

Our File No.: 11-105.00

PERMIT TO PRACTICE
HYDROGEOLOGICAL CONSULTANTS LTD.
Signature _____
Date _____ March 21, 2011
PERMIT NUMBER P 385
The Association of Professional Engineers,
Geologists and Geophysicists of Alberta

© 2011 hydrogeological consultants ltd.

 **HCL** groundwater consulting environmental sciences 

Impact of Pumping on Water Quality

Levels of total phosphorus and chlorophyll-a in Gull Lake have not increased significantly since monitoring began thirty years ago, nor has the general mineral content of the lake changed.

The four large streams that enter the southeast side of the lake represent 70% of the external watershed supply of phosphorus, based on 1999 data.

Concentrations in these streams are very high compared with streams elsewhere in the province, contributing higher total phosphorus on a mass load basis.

AN ASSESSMENT OF WATER QUALITY IN GULL LAKE (1999-2000)

Prepared by:

P. Mitchell, M.Sc. P.Biol.
Patricia Mitchell Environmental Consulting

and

Doreen LeClair, B.Sc.
Technologist

Environmental Monitoring and Evaluation
Alberta Environment

May 2003

W0206



Why was pumping stopped?

Invasion of Prussian Carp

Invasive Prussian carp spread from SE irrigation canals to Red Deer and Blindman rivers.

First documented in Red Deer River Watershed in 2017

Incredibly invasive species especially well evolved for invading new areas

Modifies its habitat, making it unsuitable to native species



Gull Lake Watershed Society urging action on falling lake levels

Filter available to ensure invasive species not pumped into Gull Lake from Blindman River

Invasion of Prussian Carp

AEP commissions a study to exclude Carp. The study fails to look at pressurized filtration.

AEP institutes a 5-year moratorium on pumping ending in August of 2023.



Inspiring sustainable thinking



Alberta Environment and Parks - Operations Infrastructure

Final Report

February 2018



Gull Lake and Buffalo Lake
Prussian Carp Risk Assessment



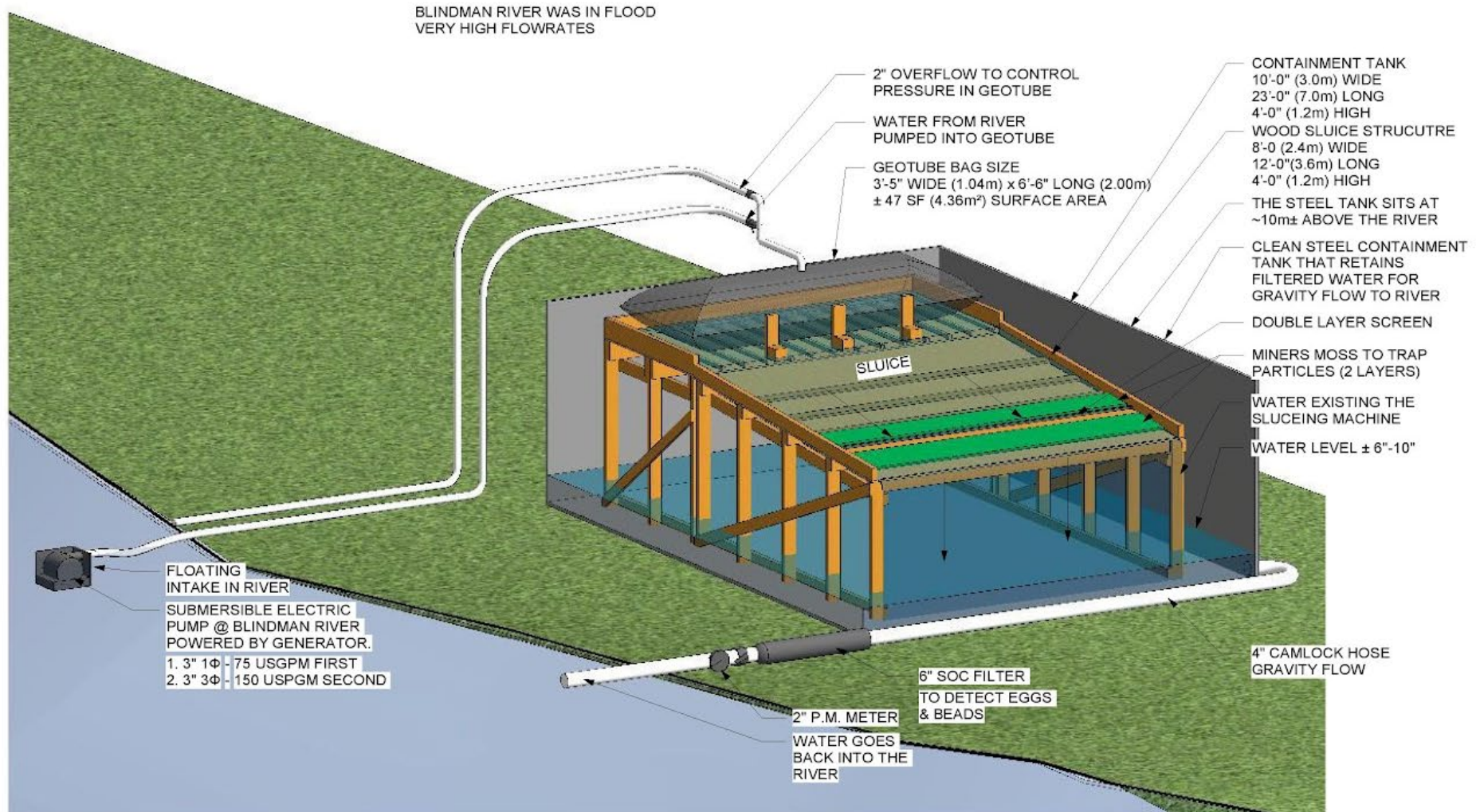
Pressured Filtration Feasibility

Geomembrane Filtration Pilot Project



Geomembrane Filtration Pilot Project

GEOTUBE FILTER TEST APPARATUS



ABBREVIATIONS
P.M. - POSITIONAL DISPLACEMENT

Forsta Filter Pilot and Demonstration Project



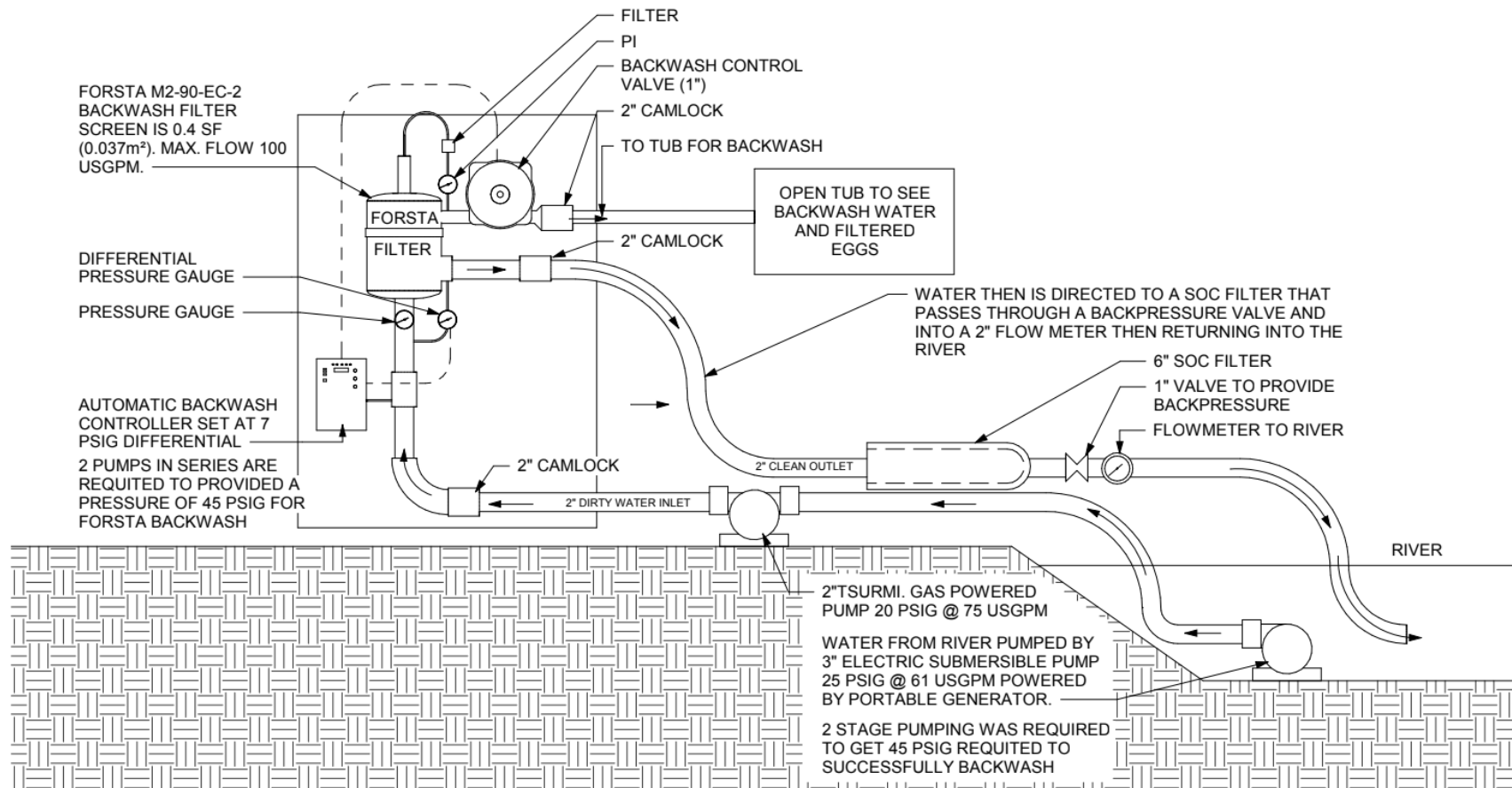
2020 Pilot Scale
Capacity of 100 usgpm or 0.38 m³/min



2021 Demonstration Scale
Capacity of 1000 usgpm or 3.8 m³/min

Forsta Filter Pilot and Demonstration Project

FORSTA TEST FILTER APPARATUS



Filtration Project Feasibility

Based on support from previous Env. Minister Nixon and MLA Ron Orr

GLWS undertook pilot testing of various filtration types in 2020

GLWS conducted a demonstration scale project of Forsta Filter in 2021

Many visitors to both Pilot and Demonstration scale projects

Pilot Project demonstrated geofilter was not viable, but backwash filter was effective



Pumped Filtration Benefits



Filtration Project Feasibility

Projects run by GLWS volunteers including engineers and fisheries biologist

GLWS produced a report of the results of pilot project to AEP

GLWS retain Stantec involvement in testing and production of report

AAI concludes that filtration is viable and passes the report on to other parts of AEP.

AAI would need to submit a formal regulatory application to lift the license suspension



Filtration Project Efficacy

“It is Stantec’s opinion that a properly designed pressurized filtration system operated with the failure mitigation methods outlined will be 100% successful in avoiding the transference of Prussian Carp or their eggs to Gull lake through the stabilization pumping system”.

Stantec Report – February 2022

Stantec also suggests modernization of the pumping station to reduce power cost.



Gull Lake Watershed Society
Filtration System Evaluation and
Conceptual Design

Final Report

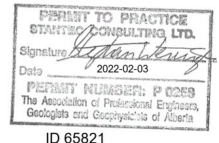
February 1, 2022

Prepared for:

Gull Lake Watershed Society
“GLWS”

Prepared by:

Stantec Consulting Ltd



Forstra Filter Full Scale Design

- Full scale filter capacity is 5,000 usgpm (19 m³/min)
- In our case we would expect to use a triple filter on a single header built by Forsta to handle the 15,000 usgpm (53 m³/min) pumping capacity
- >\$165,000 for filtration equipment
- ~\$500,000 total project costs



Full Scale Filter
Capacity of 5,000 usgpm or 19 m³/min per filter



Current Status and Next Steps

Timeline of the Gull Lake Stabilization System - GLWS - WNH July 2023

Recent Summary of GLWS Activities to Lift Suspension of License for Lake Stabilization Pumping at Gull Lake

2020	Lambourne Environmental suggests that pressurized filtration could prevent transference of Carp. GLWS presentation to minister Nixon who directs his staff to work with us pilot testing pressurized filtration at the stabilization site. Pilot testing carried out of two filtration systems and the Forsta filter succeeds. AEP staff, MLA Orr, AEP Minister Nixon and Premier Kenny witness some of the successful tests.
2021	In cooperation with AEP operations GLWS carries out large scale testing of the Forsta pressurized backwash filter and it passes with flying colors. Tests are witnessed by several AEP staff. GLWS retain Stantec engineering to participate in the testing and provide a report on the reliability of pressurized filtration.
2022	February - Stantec Engineering issues their report and concludes that. "It is Stantec's opinion that a properly designed pressurized filtration system operated with the failure mitigation methods outlined will be 100% successful in avoiding the transference of Prussian Carp or their eggs to Gull lake through the stabilization pumping system". Stantec also suggests modernization of the pumping station to reduce power cost.
2022	In the next few months AEP operations concludes that filtration is viable and passes the report on to other parts of AEP. However no formal response has been received from the regulatory branch of AEP.
2022	GLWS writes to then new AEP minister Issik and MLAs Orr and Nixon about moving ahead with pressurized filtration.
2022	October - without stabilization the lake declines to 898.64 meters or nearly 20 inches below target level and beaches move out more than 100 meters at the provincial park.
2023	March - former MLA Ron Orr advises AEP will not approve filtration but did not provide significant reasons. Our impression is that AEP, like many organizations, suffers from the "not invented here syndrome" or perhaps they're concerned about being blamed as it's likely the carp will get in the lake eventually through a careless boater or a gull or duck excreting viable eggs.
2023	MLA Orr Advises that stabilization operations has been transferred to Alberta Agriculture and Irrigation. GLWS writes to Min. Horner who asks staff to look at it.
2023	June - Agriculture Operations suggest they are considering applying to AEP regulatory side for lifting of the suspension and installation of filtration.
2023	August 31 - GLWS meets with Agriculture Operations and Albert Environment and learn they want to do another hydrological study to determine if pumping is really needed.



SUPPLEMENTAL SLIDES

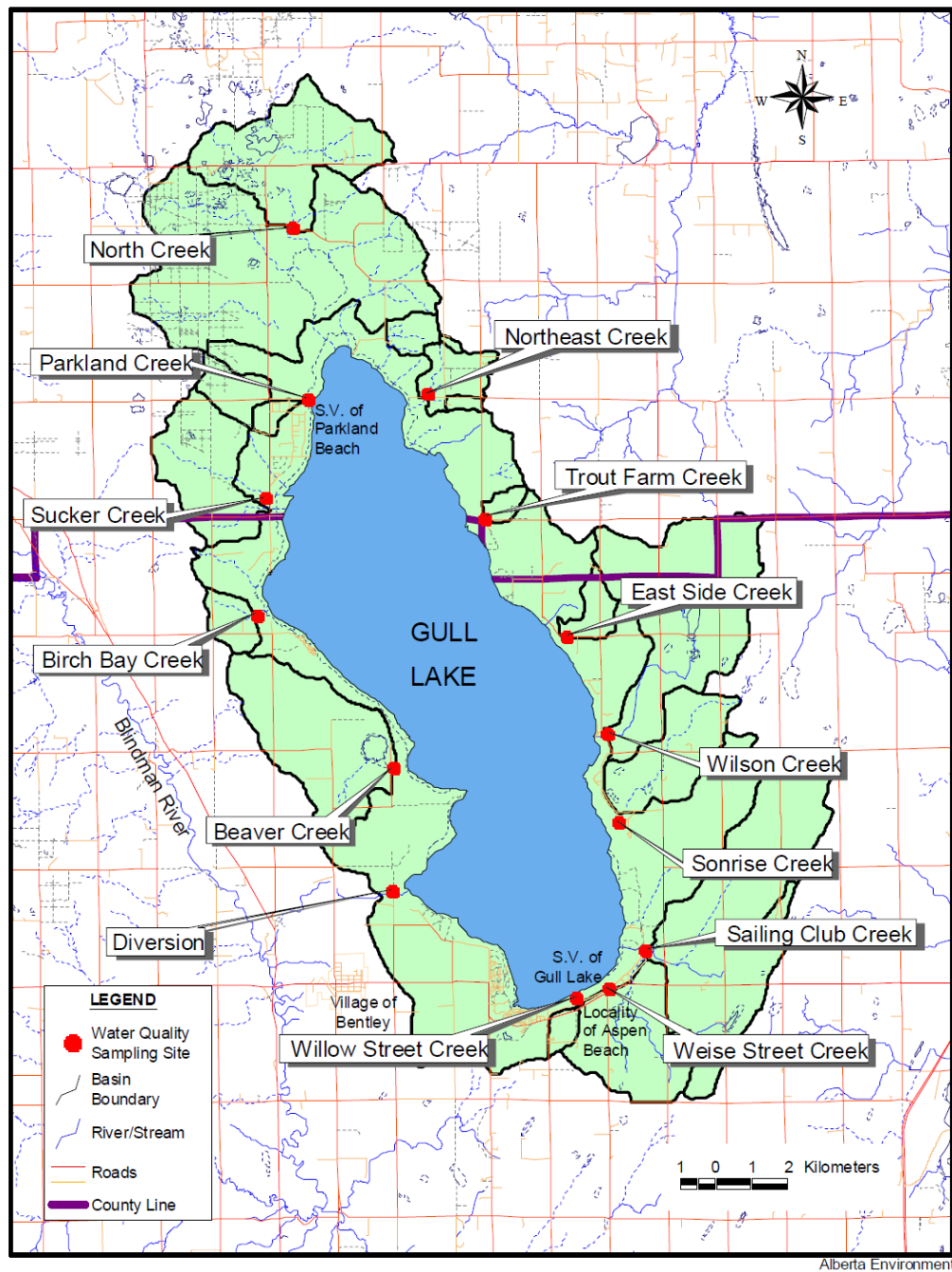


Figure 1 Location of water quality sampling sites on streams in the Gull Lake study area, 1999-2000

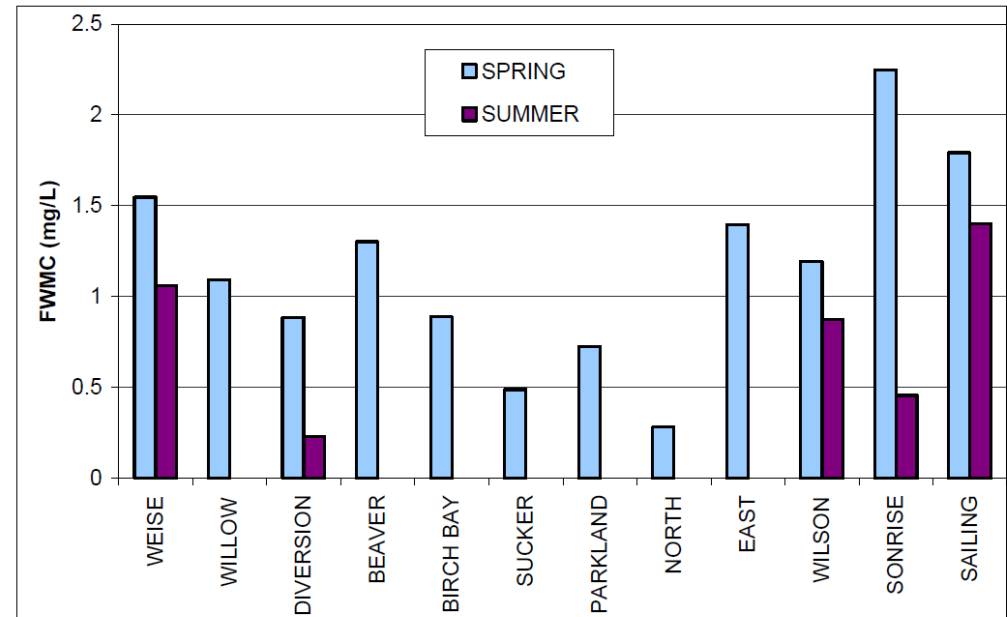
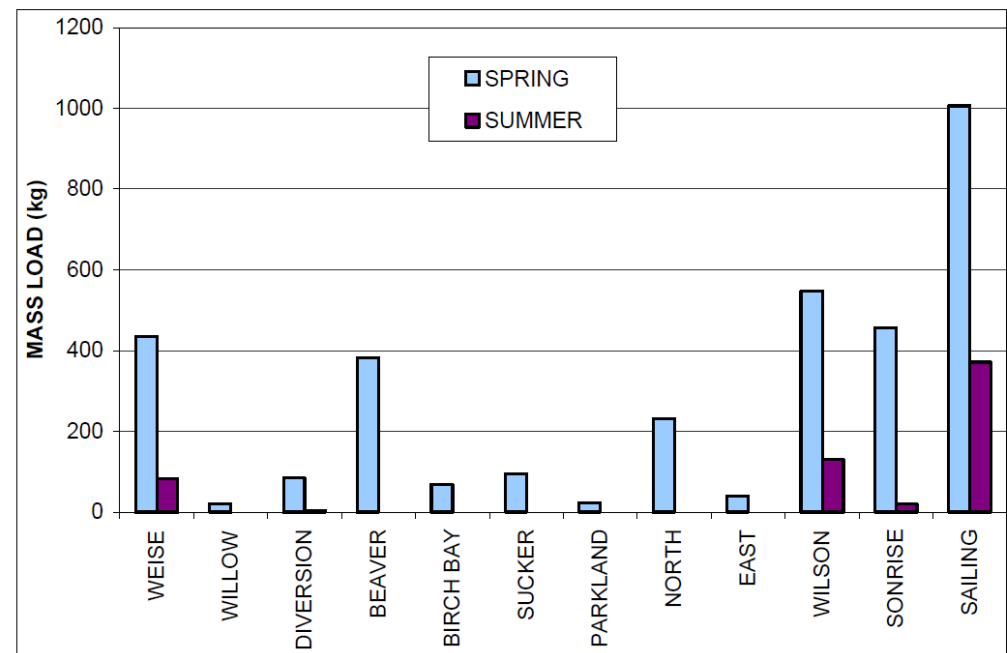
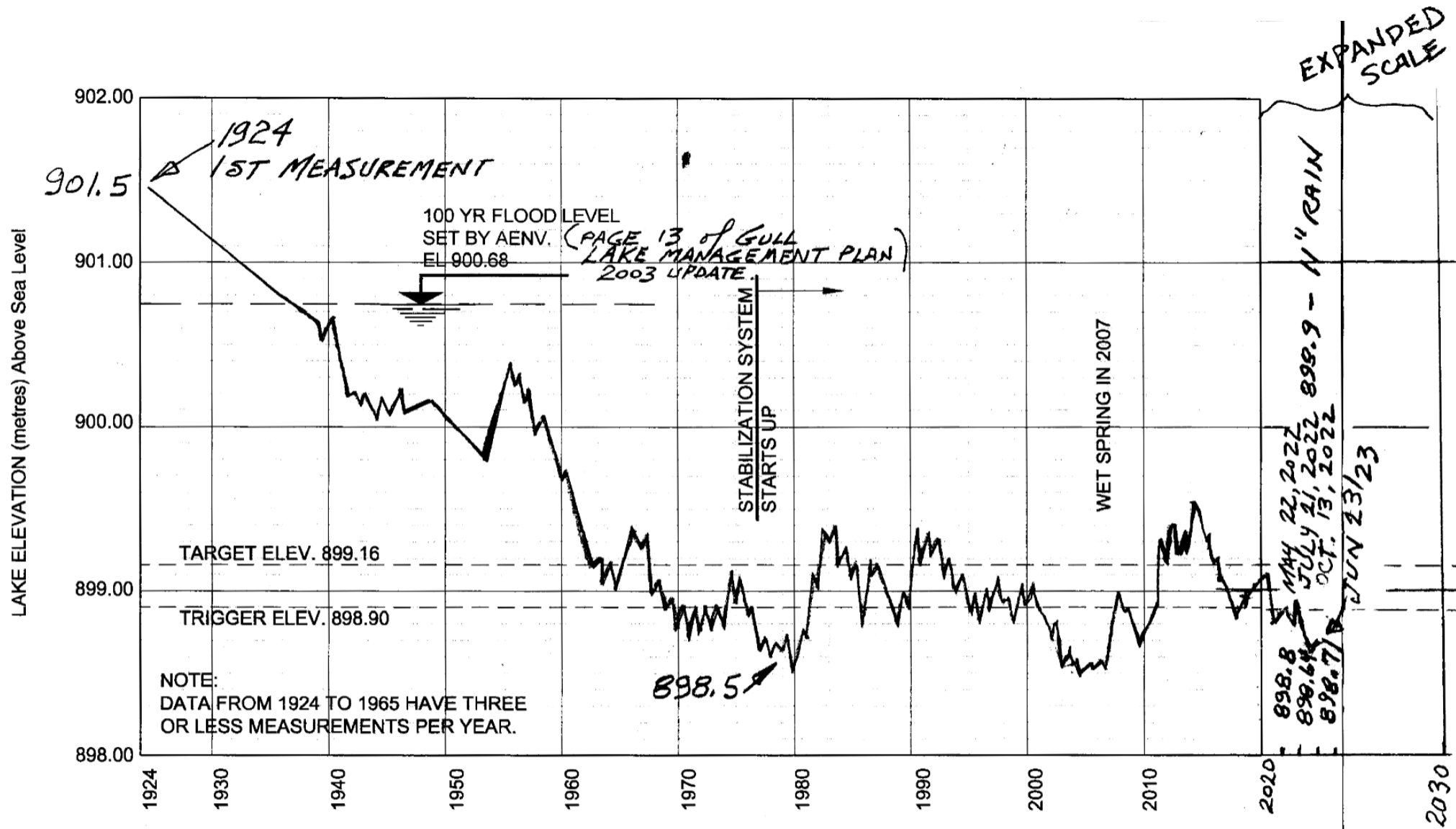


Figure 7 Mass loads and flow-weighted average concentrations of total phosphorus in Gull Lake streams monitored during 1999



Historical Monthly Mean Lake Levels for Gull Lake

Timeline of the Gull Lake Stabilization System

History of Lake Stabilization Pumping at Gull Lake

1924 to 1974	Lake declines by 8 feet or 2.7meters from 901.5m above sea level to 898.8 m. Decline is an average of 2.3 inches per year and the lakeshore moved out 200 to 300 yards from existing cottages and the provincial parks.
1975	Lougheed gov't builds the stabilization system to maintain the lake due to its provincial significance. Target level set at 899.16m, Pumps from Blindman river.
1975-2010	The stabilization system pumps in 118 million cubic meters or an average of 3.5 million m ³ per year, almost 30% of the water in the lake by 2010.
1998	Gull lake Water Quality Management Society formed, name later changed to GLWS - works with AEP on sampling streams and studying lake water quality
2010	AEP advises that due to budget cuts they will no longer fund the power for pumping although they will maintain the system.
2011	GLWS Funds report by Hydrological Consultants Ltd. which concludes that without stabilization the lake will resume its old level of decline. The four municipalities around the lake agree that they will pick up the power cost.
2011 to 2017	Central Alberta enters a wet period and the level of the lake rises well above the target level and pumping is suspended.
2012 to 2022	GLWS completes a number of projects with partners to reduce the flow of nutrients into Gull Lake, such as settling ponds and stream bed protection.
2017	Invasive Prussian carp spread from SE irrigation canals to Red Deer and Blindman rivers.
2018	AEP commissions a study by ISL Engineering to exclude Carp from the suction of the stabilization pumps. The study looks at various methods but fails to look at pressurized filtration downstream of the pumps which is used elsewhere.
2018	AEP institutes a 5 year moratorium on pumping ending in August of 2023.