NMLG Model Results for White Bear Lake, Ultimate Demand Scenarios

Glen Champion | Hydrologist

DEPARTMENT OF NATURAL RESOURCES

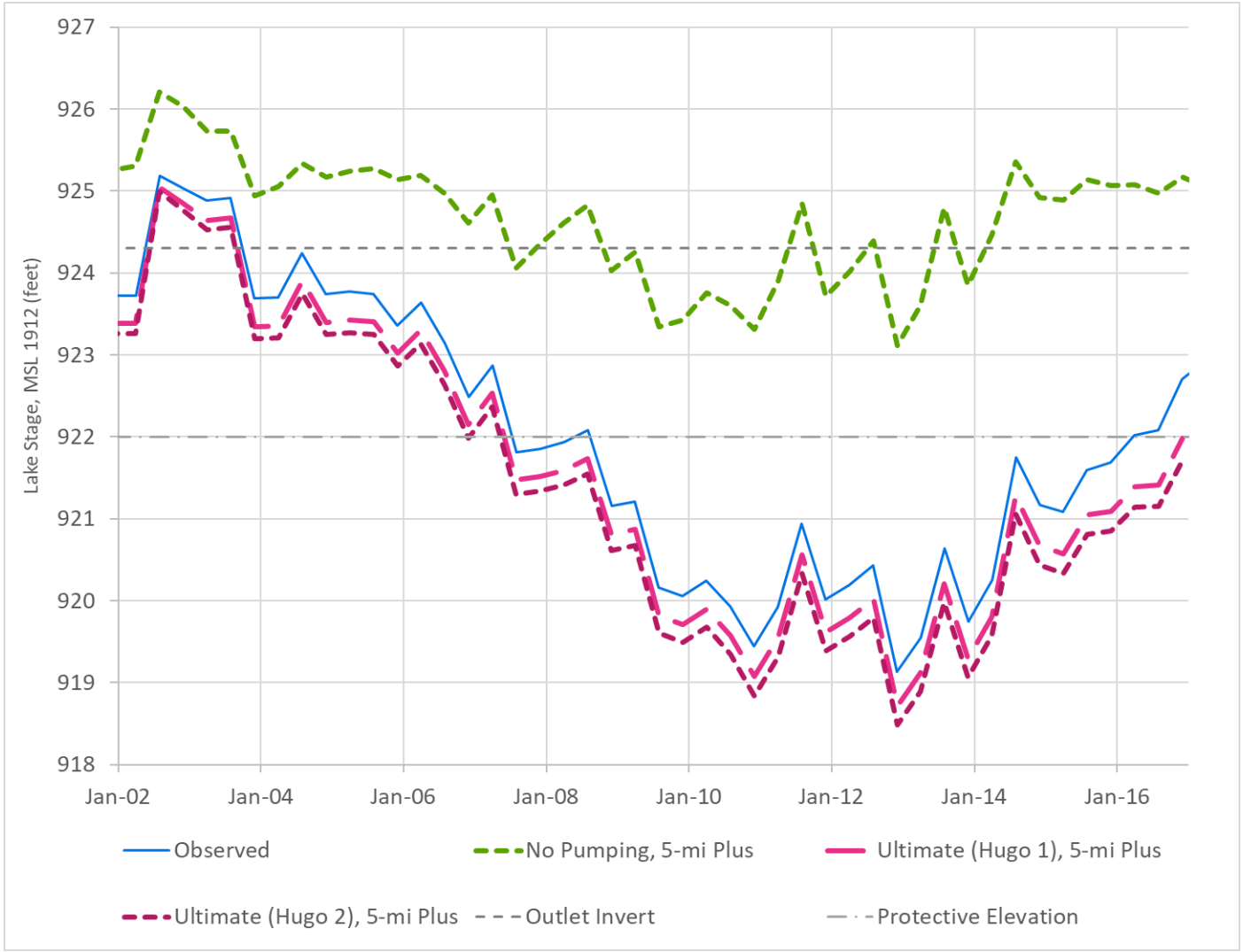
Overview

- Review ultimate demand scenarios
- 75 gpcd residential and 90 gpcd total demand goals
- Groups of water systems off groundwater (surface-water supply)
- Lake augmentation (example)
- Injection of treated wastewater into bedrock aquifer

Summary of Ultimate-Demand Scenarios

Scenario	Descripton
Ultimate (Hugo 1)	Long-term groundwater use at projected Ultimate demands (2030/2040 MUSA in Hugo)
Ultimate (Hugo 2)	Long-term groundwater use at projected Ultimate demands (expanded MUSA in Hugo)

All Groundwater



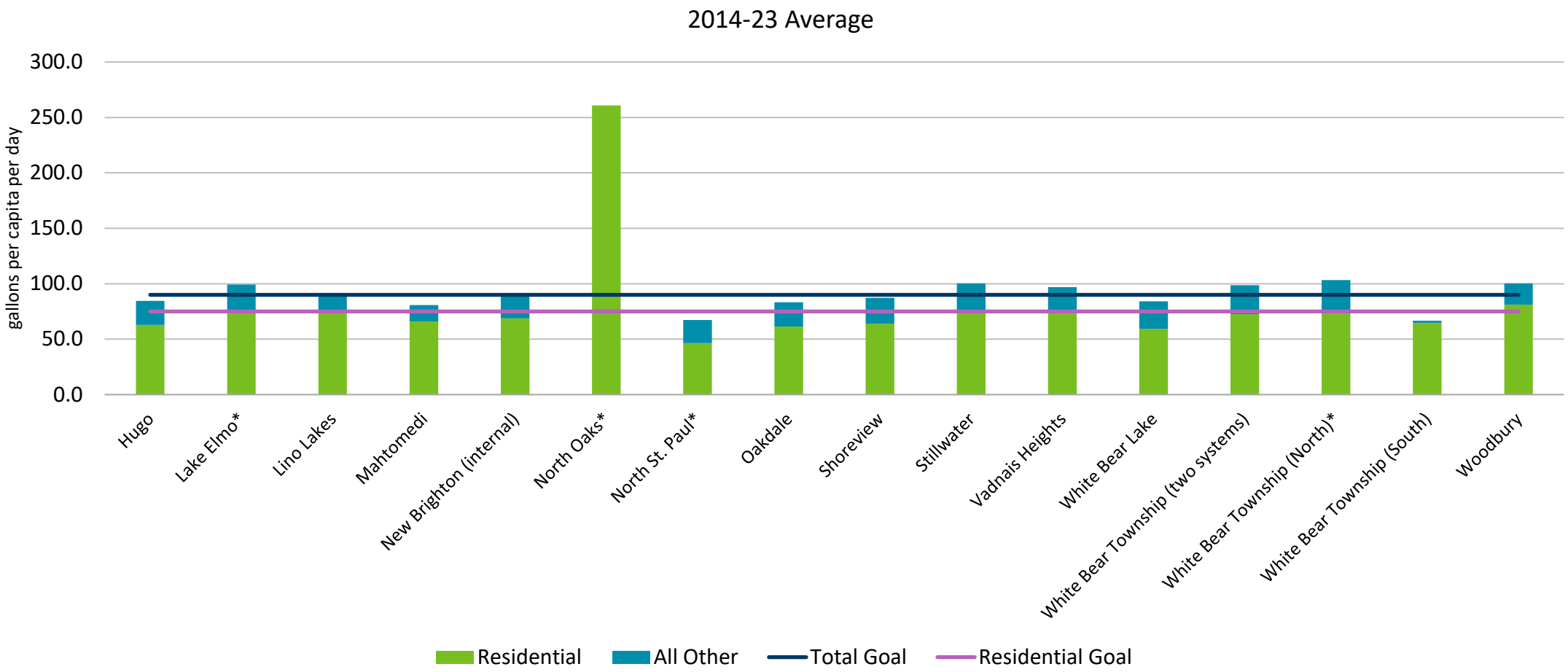
Water Demands and Goals

Court Order applied to groundwater users in 5-mile buffer around WBL

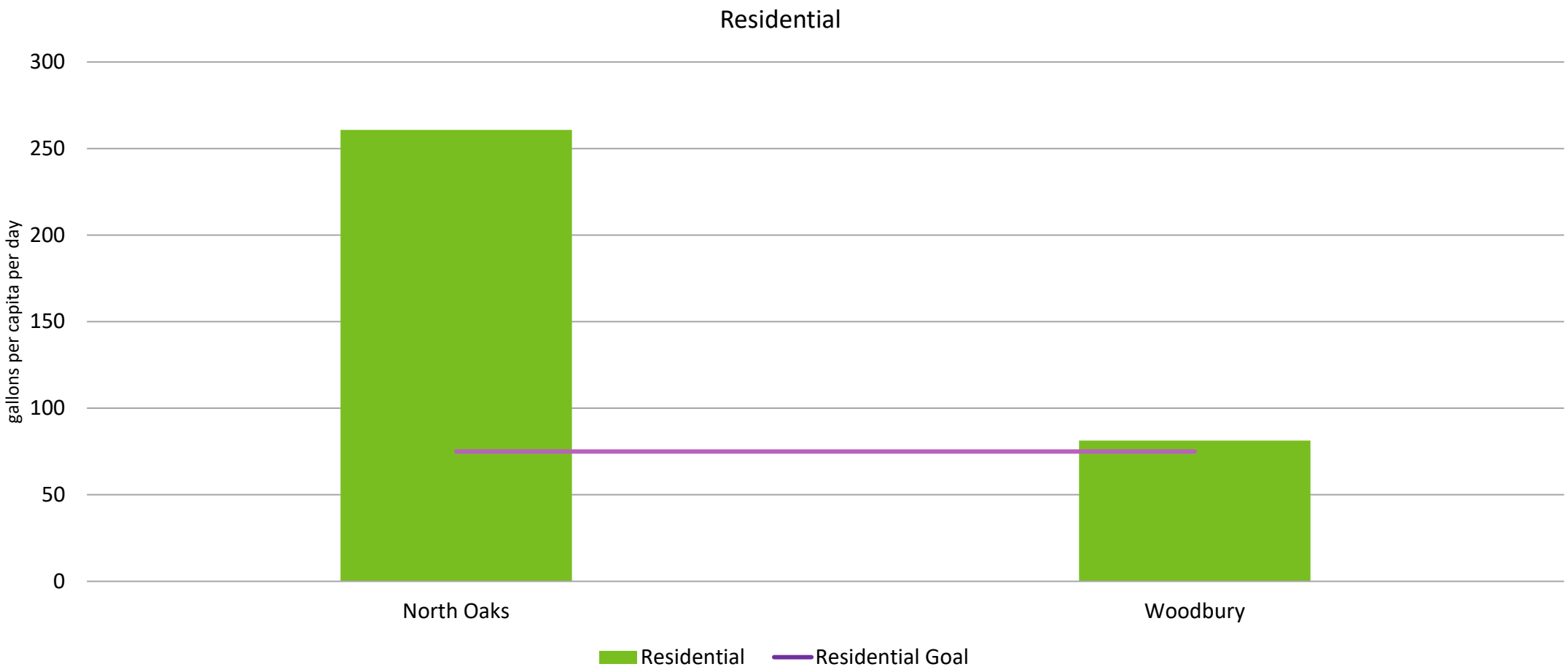
“. . . all existing permits include an enforceable plan to phase down per capita residential water use to 75 gallons per day and total per capita water use to 90 gallons per day.”

How would meeting the 75 and/or 90 goals for communities remaining on groundwater affect scenario results?

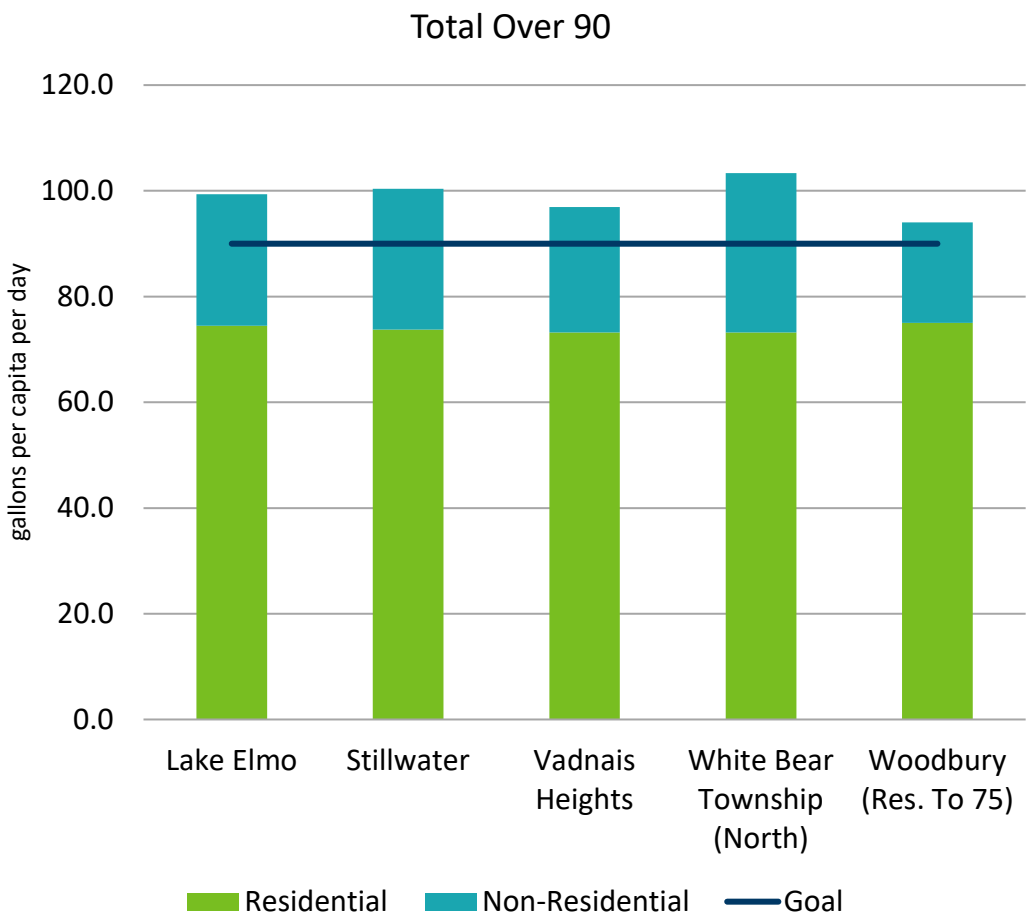
Per Capita Demands

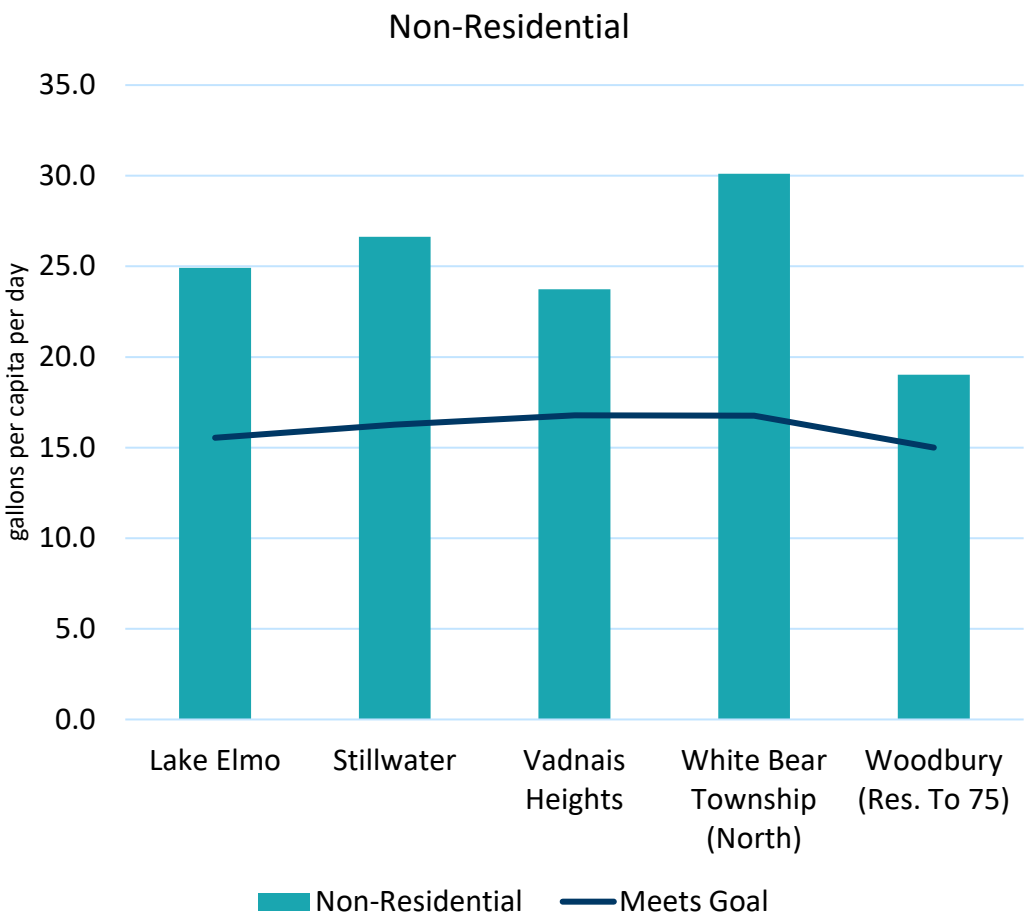


Per Capita Demand Goals - Residential



Per Capita Demand Goals





Alternative Future Demand Considerations

- Systems over 75 gpcd residential→ 75 gpcd
- Systems over 90 gpcd → ?
- Possibilities for further reductions in future per capita demands?
  - Reduce non-residential, per capita demands by X%?
  - Non-residential only → 20% to 45% per capita reductions
  - Per capita residential reductions (median = 71)?
- Uncertainties in Ultimate and actual populations served

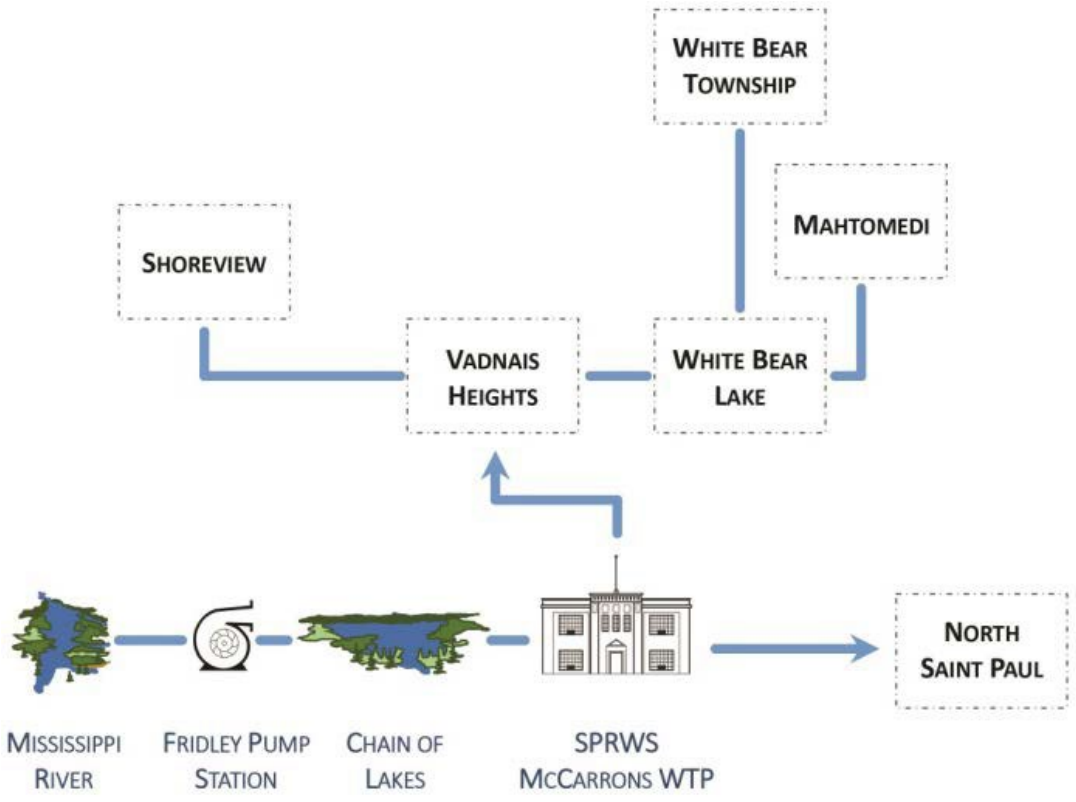
Alternative Future Demand Scenario

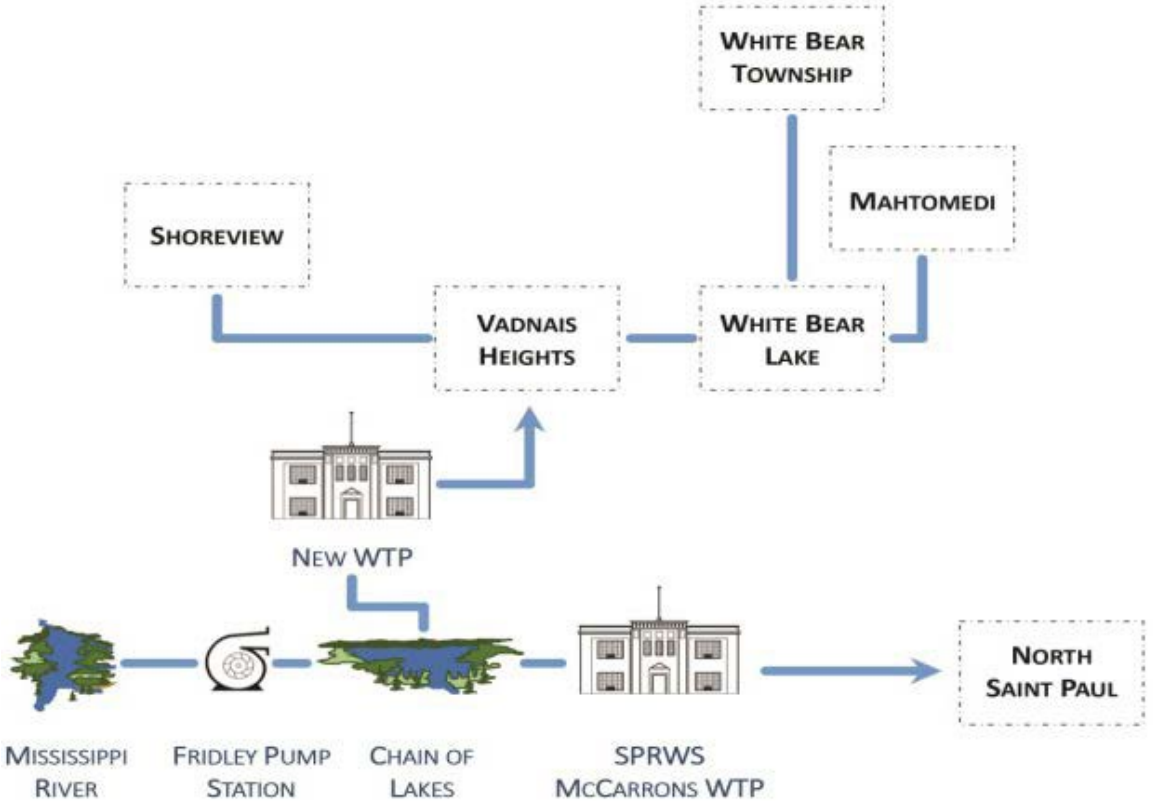
- Initially tested adjusting residential per capita to 75 gallons
  - North Oaks and Woodbury
- Other possibilities?

Replace Groundwater Supplies – Approach

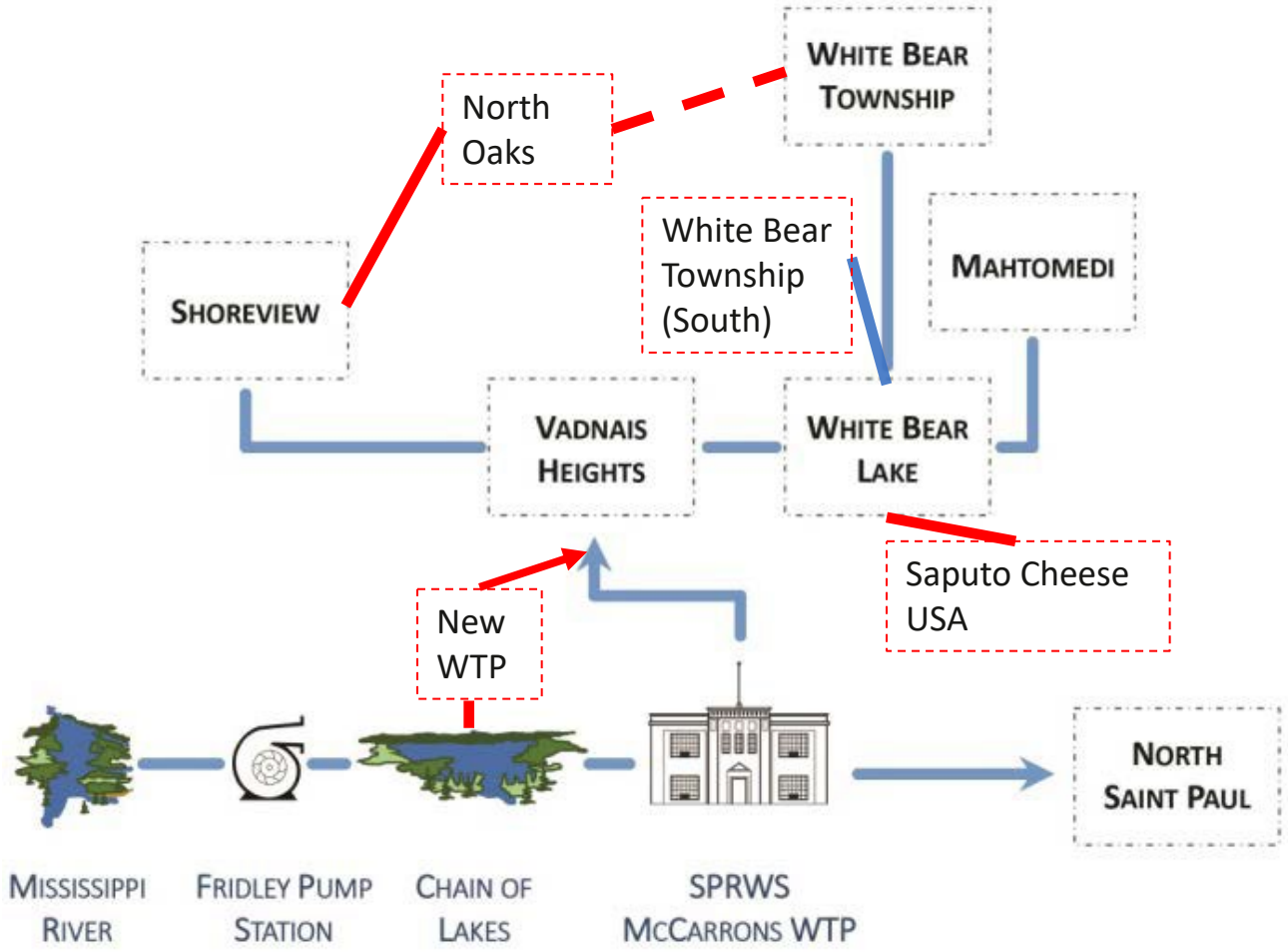
- Tested multiple replacement scenarios in model
- 2014 Met Council study
- Hugo 1 and Hugo 2 development options
  - Same in groundwater model if extra development area supplied with surface water

Replace Groundwater Supplies – Previous Study (2014)

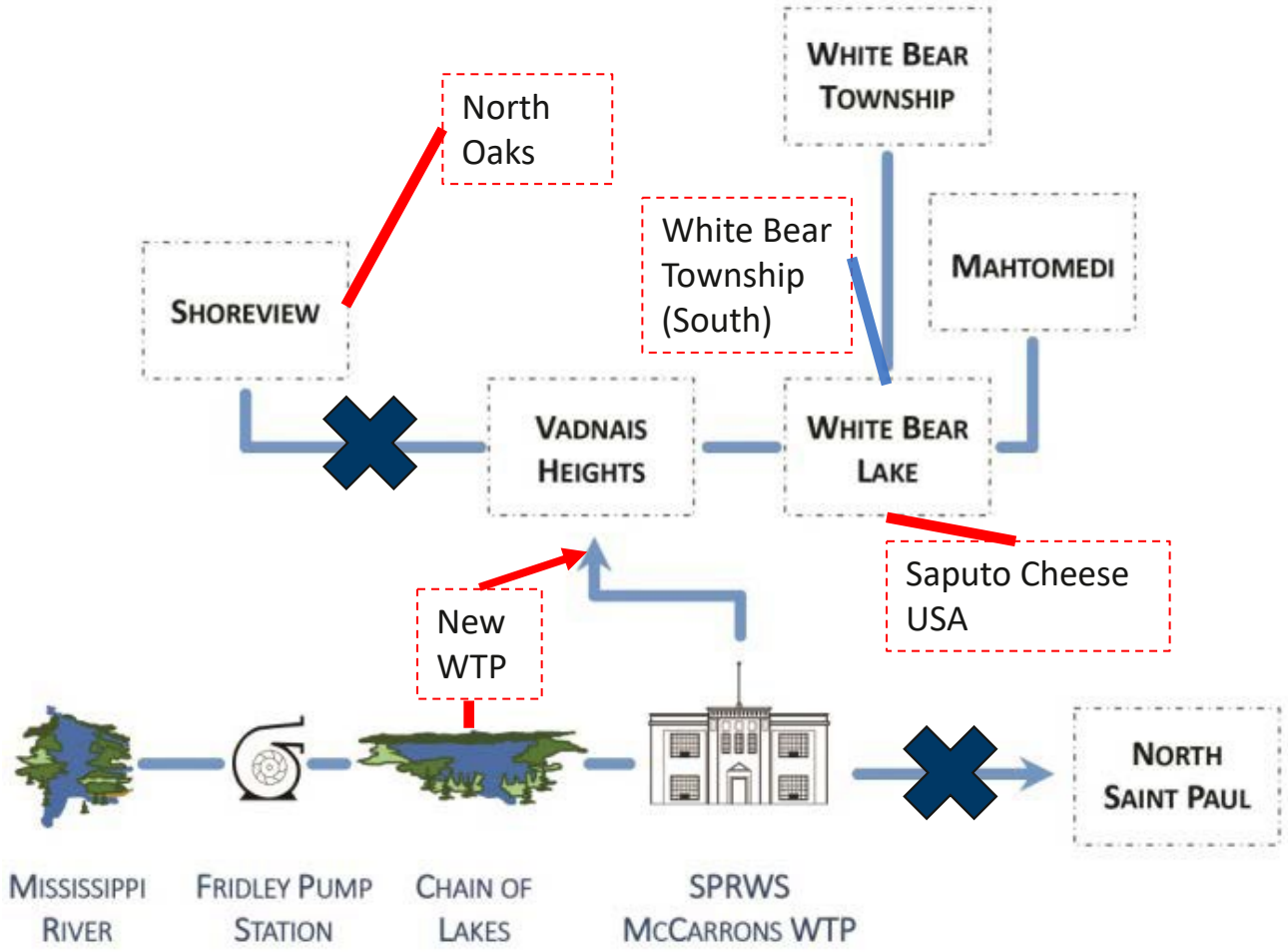




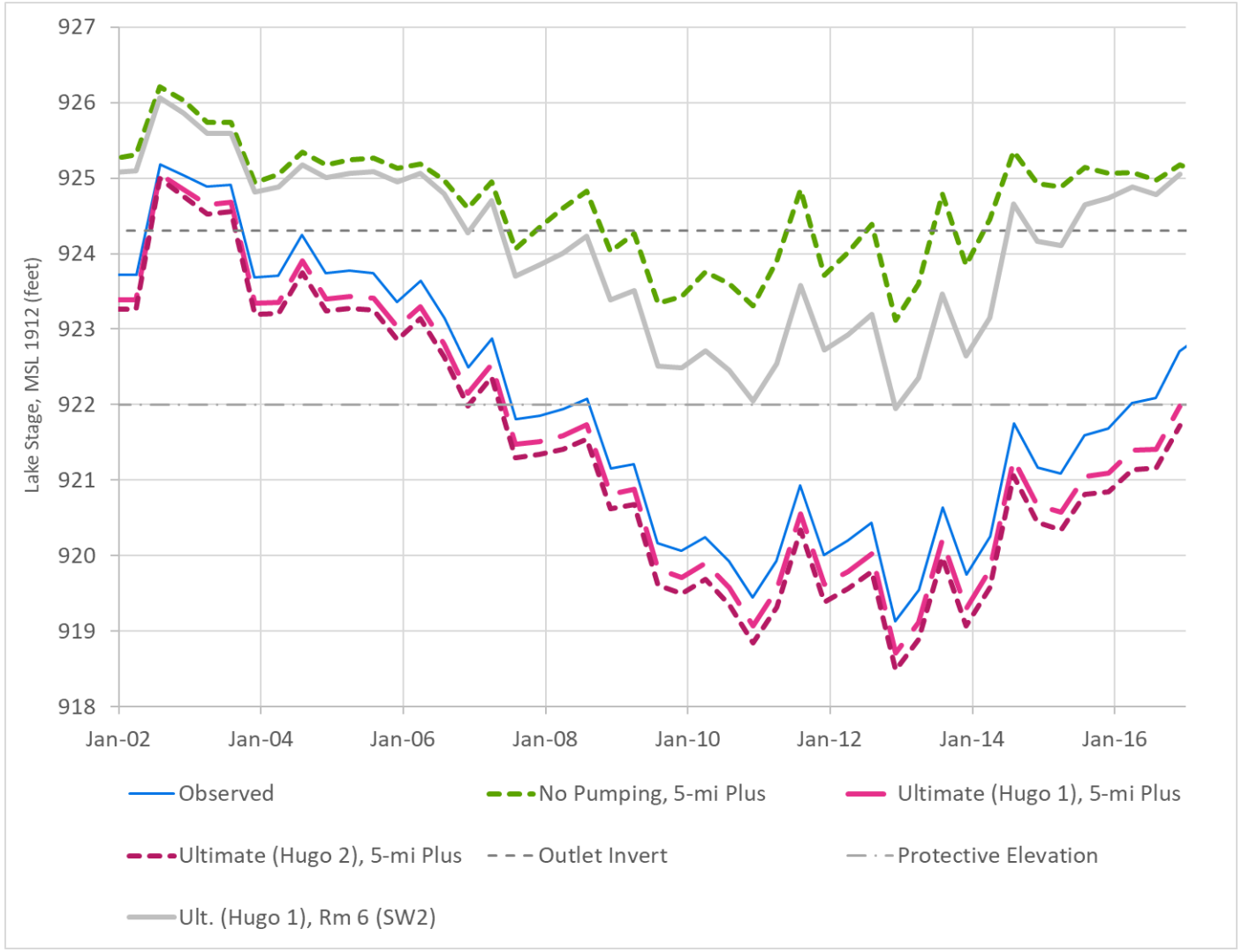
Replace Groundwater Supplies – Present Analysis



Replace Groundwater Supplies – Replace 6 (SW 2)

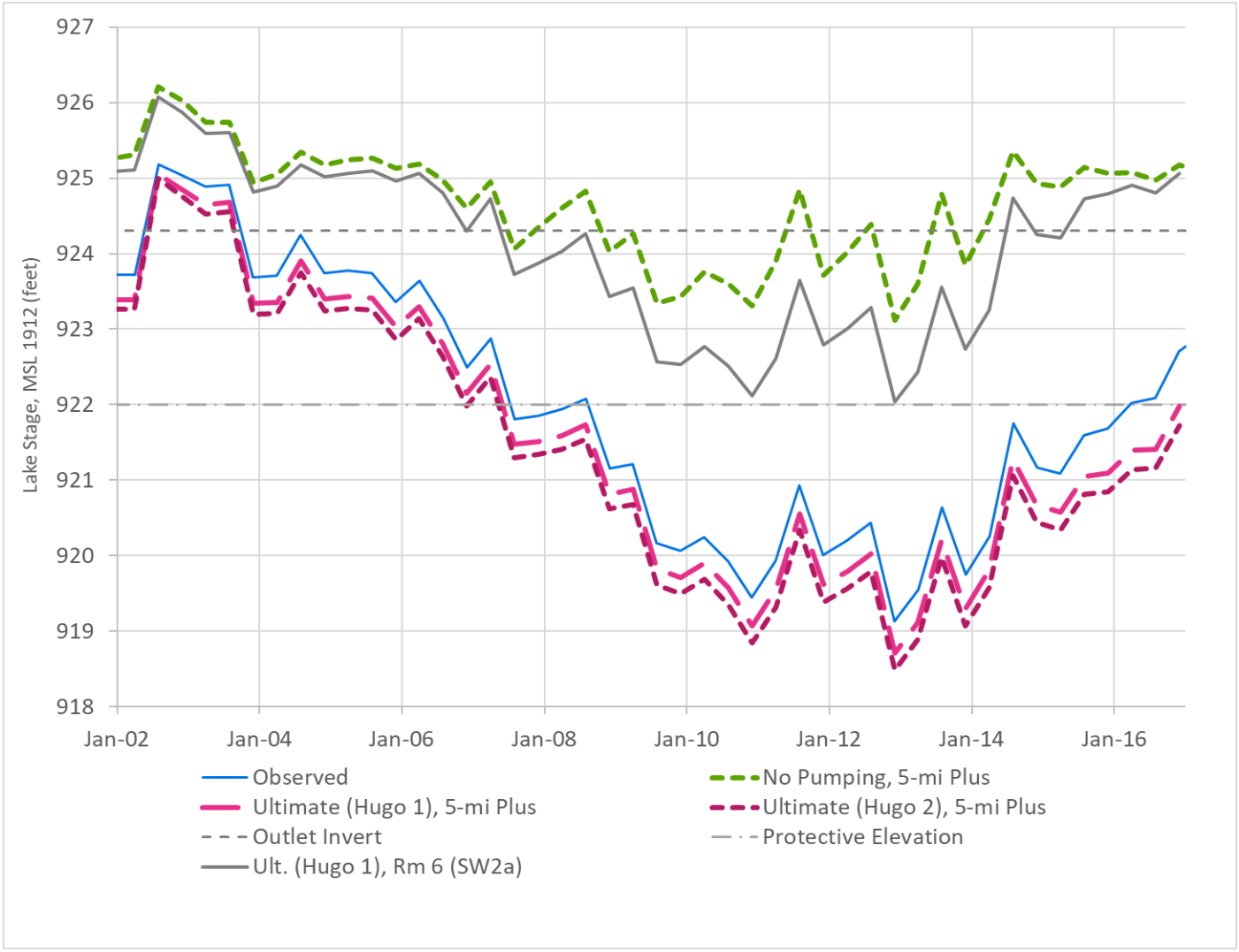


Model Results– Replace 6 Permits (SW 2)



- Hugo 1
- Replace 6 permits, 4 communities

Model Results– Replace 6 Permits (SW 2a)



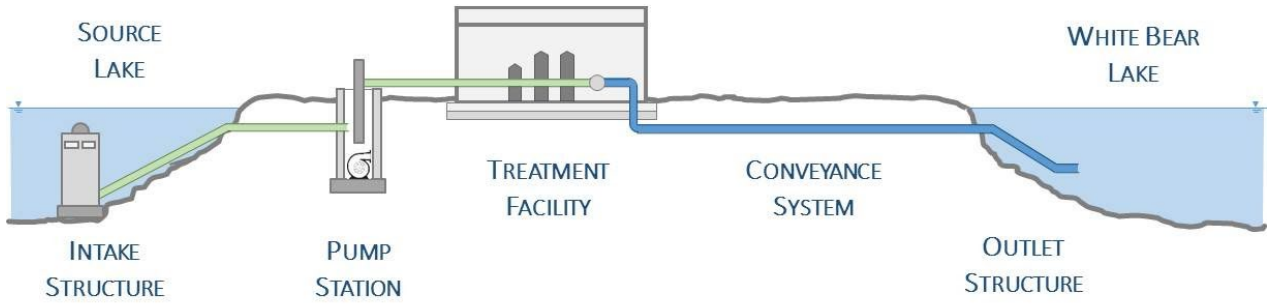
- Hugo 1
- Replace 6 permits, 4 communities
- North Oaks and Woodbury → 75 gpcd residential
- Other demand reduction options?

Replace Groundwater Supplies - Summary

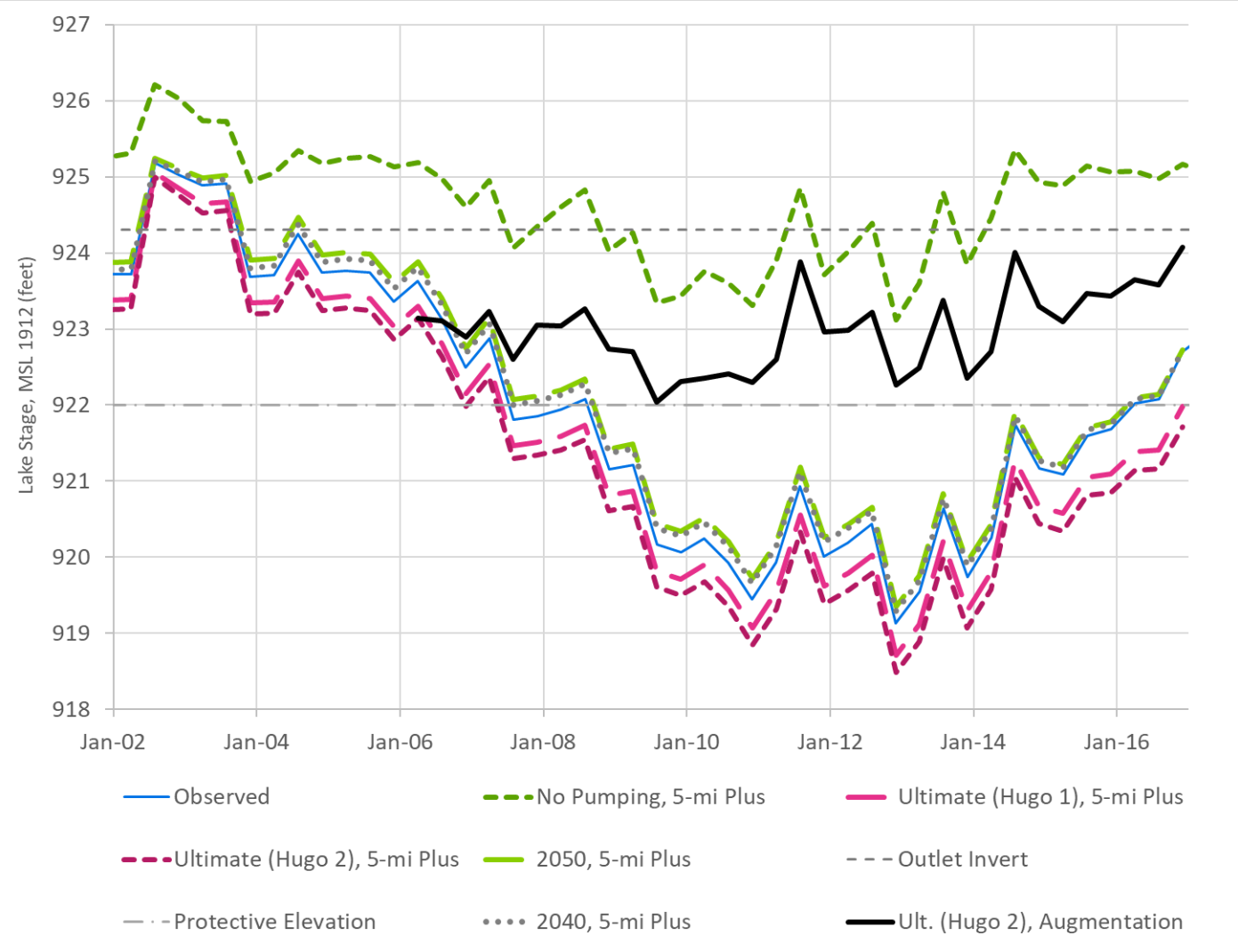
Scenario	Brief Description	Communities / Permits
SW 2a (Hugo 1)	Replace 6 permits with reduced demands	Mahtomedi, Saputo Cheese USA, Vadnais Heights, White Bear Lake, White Bear Township (2 systems)
SW 3 (Hugo 1)	Replace 7 permits	Mahtomedi, North St. Paul, Saputo Cheese USA, Vadnais Heights, White Bear Lake, White Bear Township (2 systems)
SW 3-2 (Hugo 2)	Replace 7 permits with reduced demands	Mahtomedi, North St. Paul, Saputo Cheese USA, Vadnais Heights, White Bear Lake, White Bear Township (2 systems)
SW 4 (Hugo 1), SW 4-2 (Hugo 2)	Replace 9 permits	Mahtomedi, North St. Paul, Saputo Cheese USA, Shoreview and North Oaks(joint system), Vadnais Heights, White Bear Lake, White Bear Township (2 systems)
SW 5 (Hugo 1)	Replace 7 permits	Mahtomedi, North Oaks, Saputo Cheese USA, Vadnais Heights, White Bear Lake, White Bear Township (2 systems)
SW 6a (Hugo 1)	Replace 6 permits with reduced demands	Mahtomedi, North Oaks, Vadnais Heights, White Bear Lake, White Bear Township (2 systems)
SW 2c (Hugo 1)	Replace 6 permits and injection of 1 mgd treated wastewater	Mahtomedi, Saputo Cheese USA, Vadnais Heights, White Bear Lake, White Bear Township (2 systems)
SW 7 (Hugo 1)	Replace 4 permits and injection of 2 mgd treated wastewater	Saputo Cheese USA, White Bear Lake, White Bear Township (2 systems)

Lake Augmentation

- Two previous conceptual cost studies (Met Council, 2014 and DNR and Met Council 2016)
- Water-quality study starts soon
- Initial model test
  - Hugo 2, all communities remain on groundwater supplies
  - Augmentation during open-water season
  - Trigger - 923 ft if not rising
  - Up to 780 MGY (< ½ previously studied)
  - Max rate ~ 4 mgd

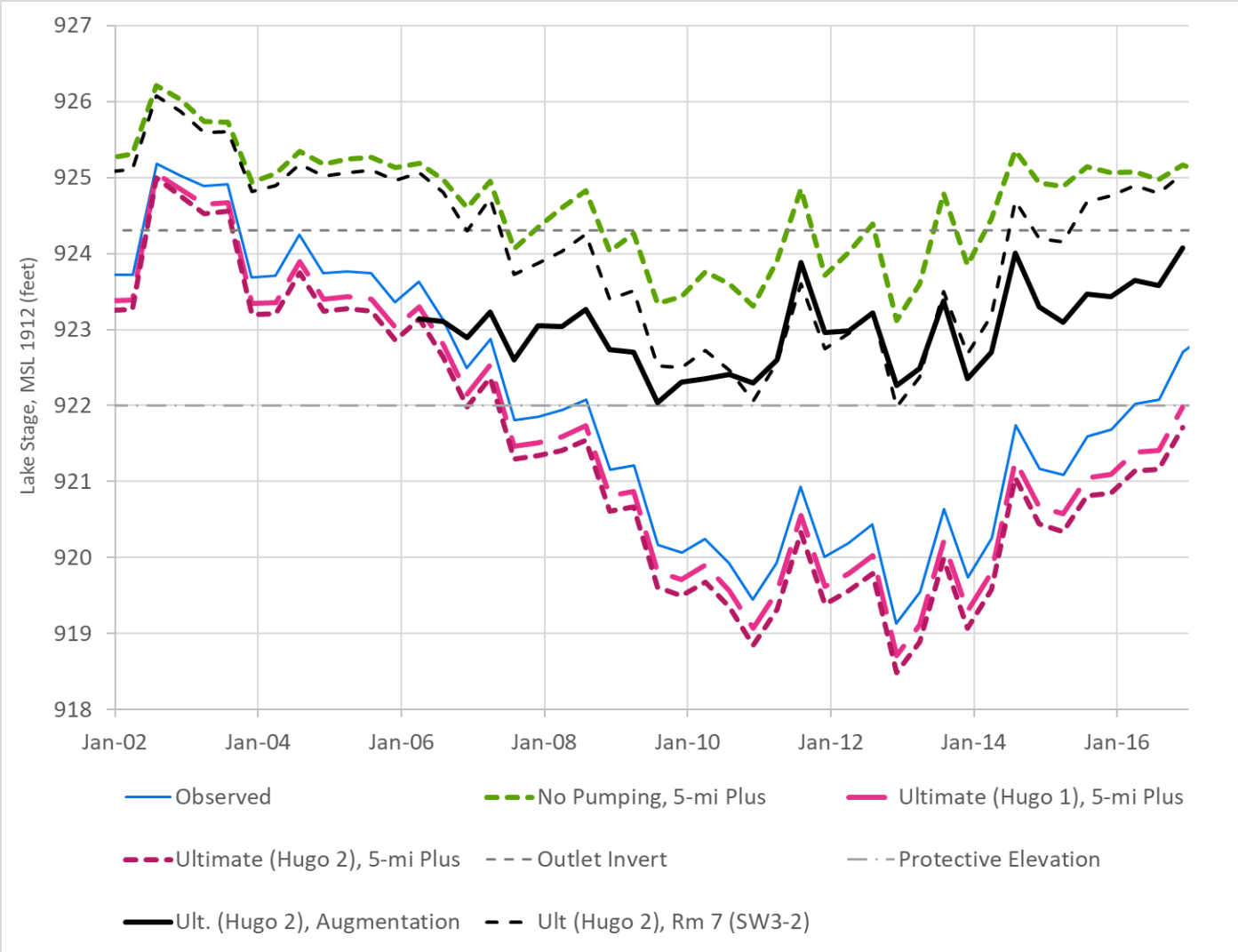


Augmentation Example



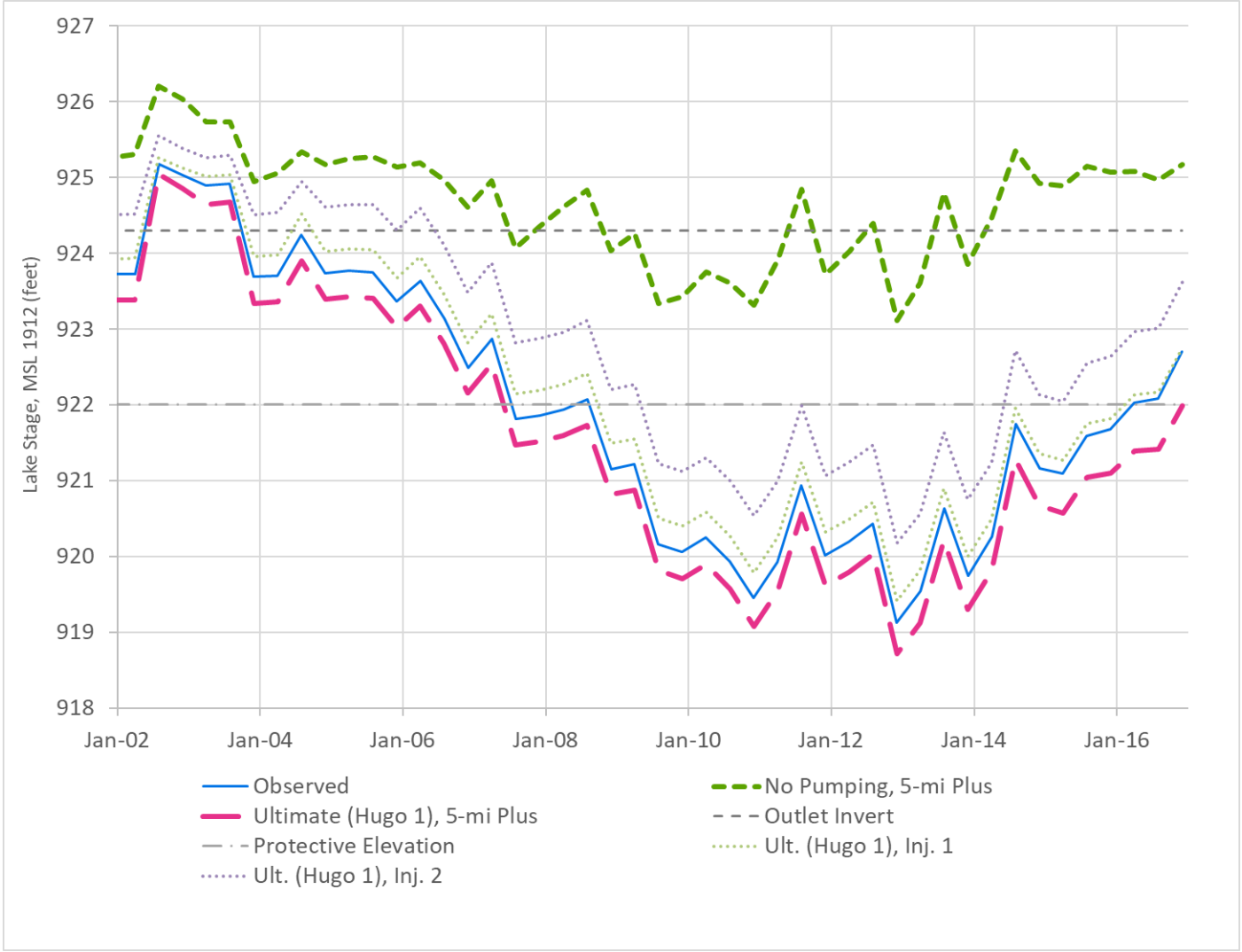
- Hugo 2
- Augmentation during open-water season 2006-07, part of 2008, 2009-10, part of 2011, and part of 2012

Replacement vs. Augmentation Comparison



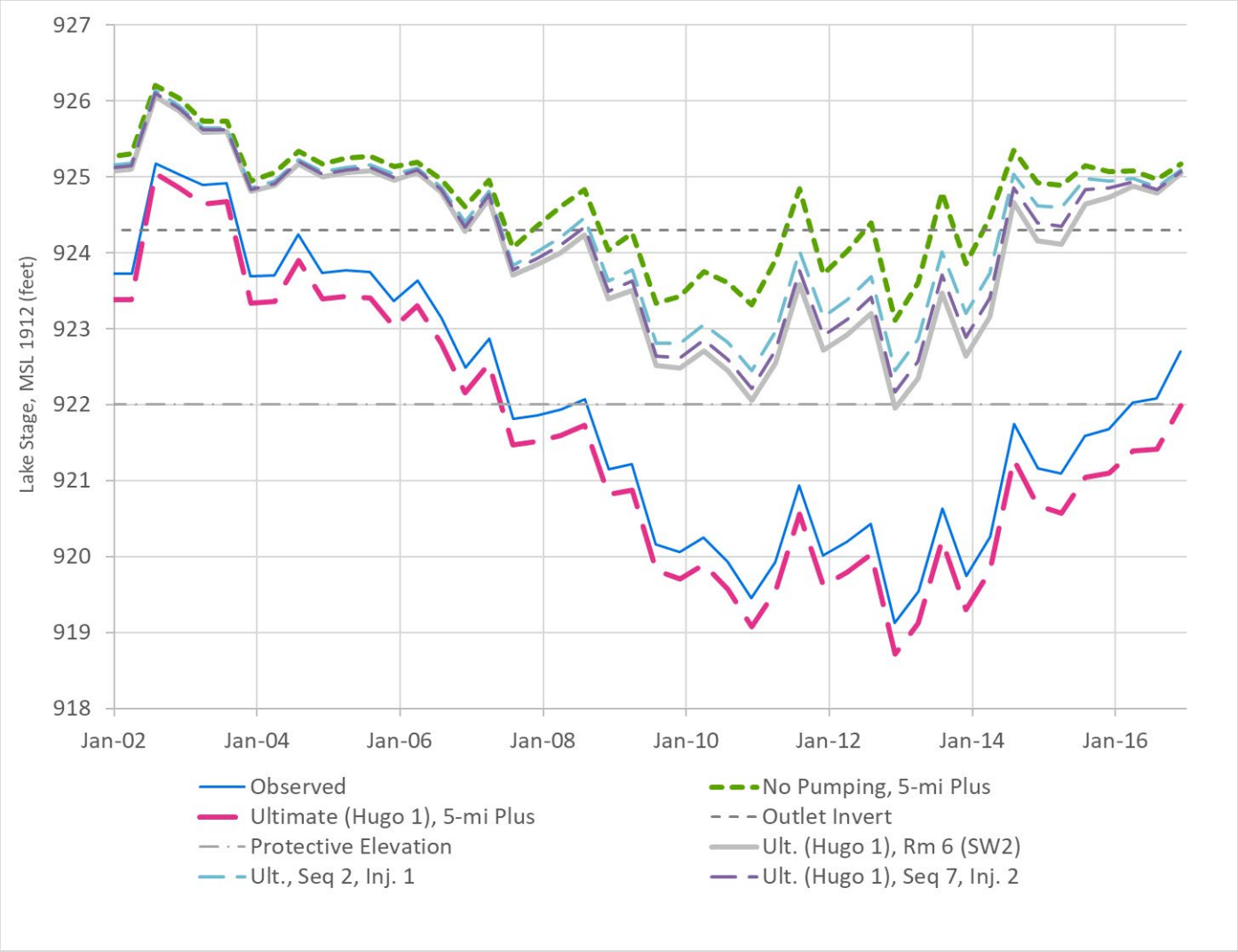
- Hugo 2
- Augmentation vs. SW 3-2 (Replace 7 permits, 5 communities)

Injection of Treated Wastewater



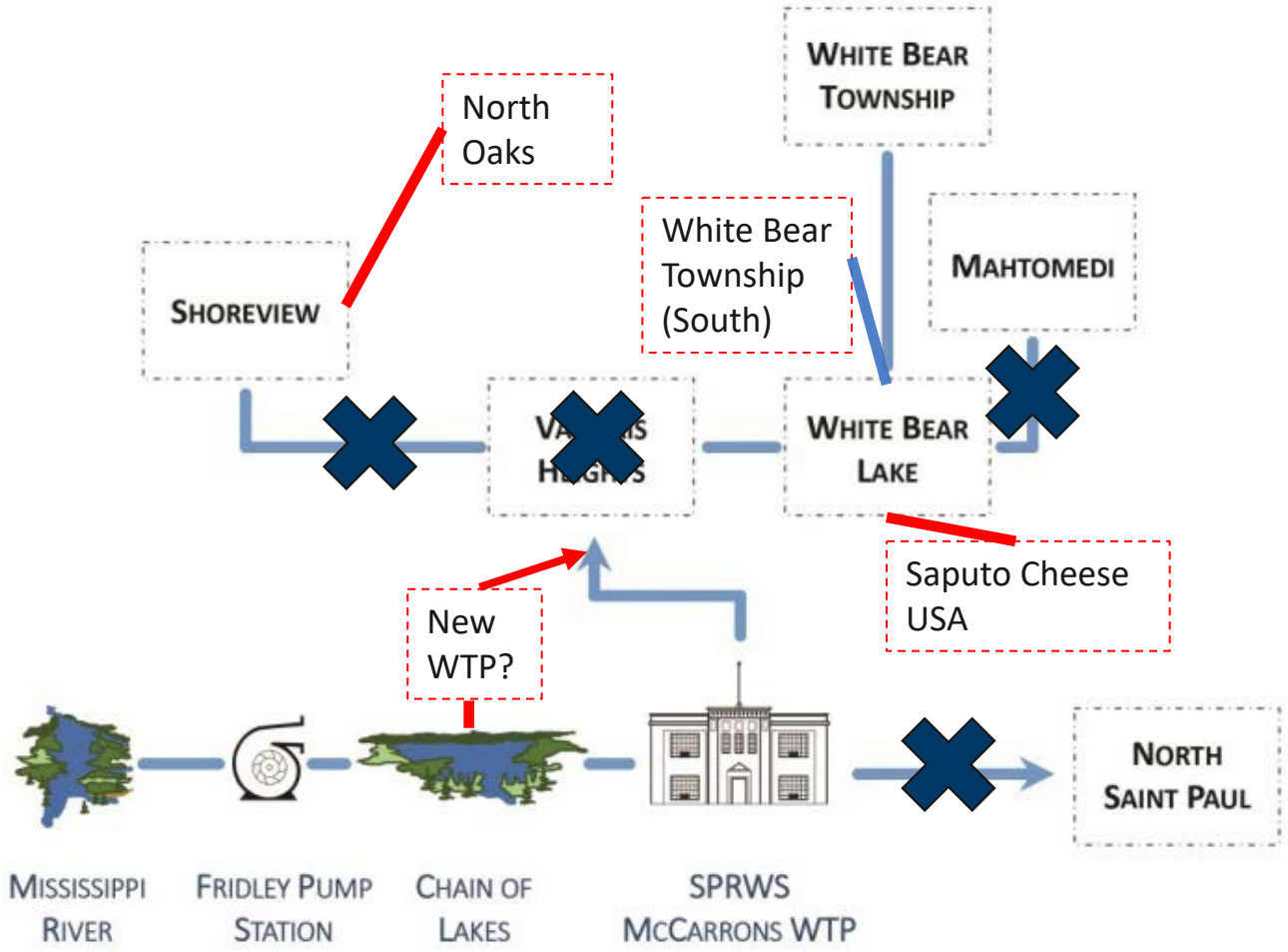
- Ultimate (Hugo 1)
- Injection well(s) adjacent to WBL, 1 mgd or 2 mgd

Injection of Treated Wastewater and Replace Groundwater Supplies



- Ultimate (Hugo 1)
- Injection well adjacent to WBL, 1 mgd
- Replace 6 permits, 4 communities (SW 2)
- Injection well(s) adjacent to WBL, 2 mgd
- Replace 4 permits, 2 communities (SW 7)

Replace Groundwater Supplies – Replace 4 Permits (SW 7)



Summary of Options

Type	Ultimate Demand Scenario	Options
Replace groundwater supplies	Hugo 1	• Replace 6 permits with demand reductions (SW 2a) • Replace 7 permits (SW 3 and SW 5) • Replace 9 permits (SW 4)
Replace groundwater supplies	Hugo 2	• Replace 9 permits (SW 4-2) • Replace 7 permits with demand reductions (SW 3-2) • Hugo 1 options with expanded Hugo area supplied with surface water
Augmentation	Hugo 1 or Hugo 2	• Augmentation trigger elevation
Combine surface-water supply with injection of treated wastewater	Hugo 1	• Replace 6 permits (2 options) with 1 mgd injection (SW 2, SW 6) • Replace 4 permits with 2 mgd injection (SW 7) • Replace < 6 permits with 1 mgd injection?
Combine surface-water supply with injection of treated wastewater	Hugo 2	Not tested, likely several options

DEPARTMENT OF NATURAL RESOURCES

Thank You!

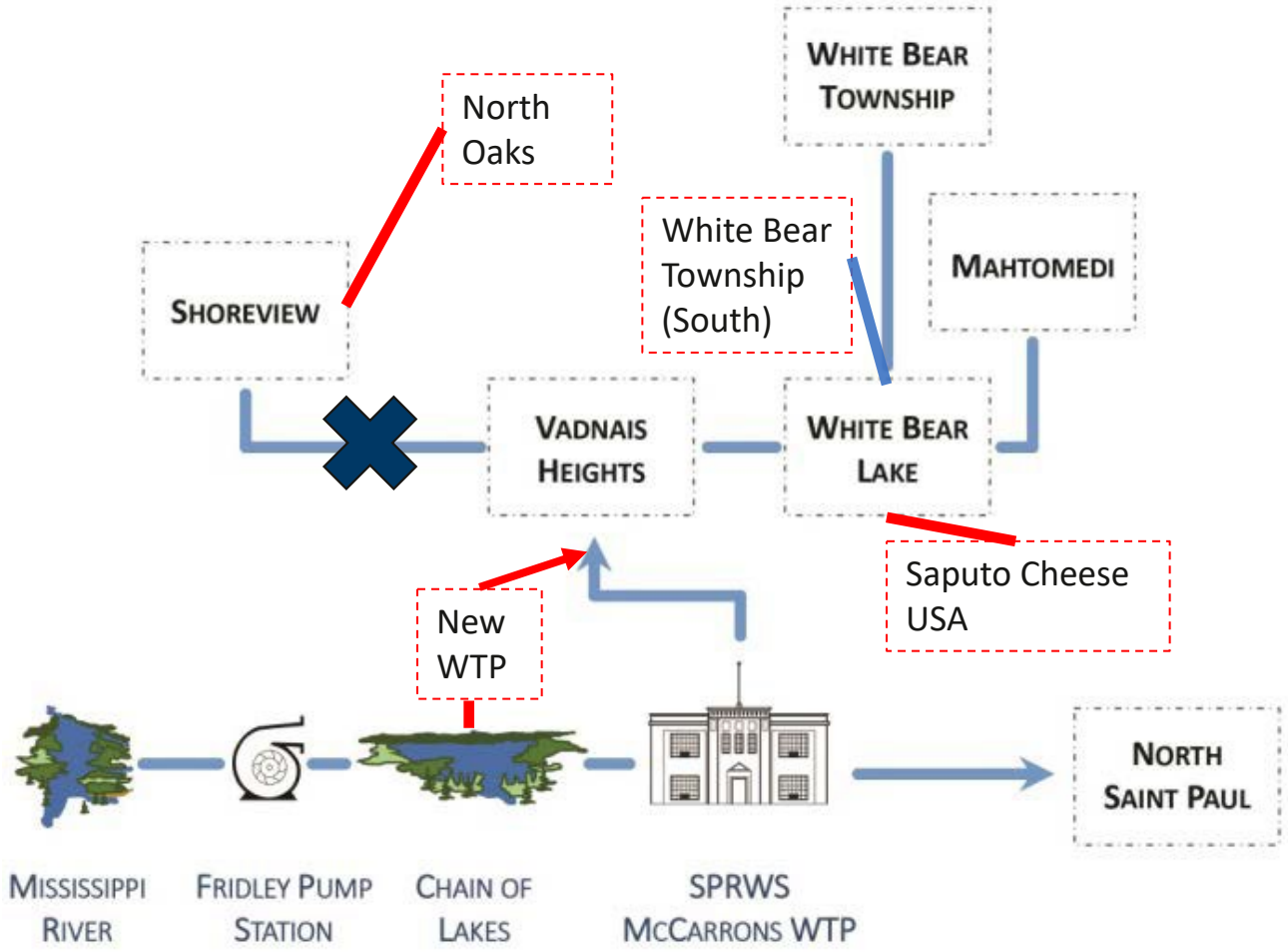
Glen Champion

glen.champion@state.mn.us

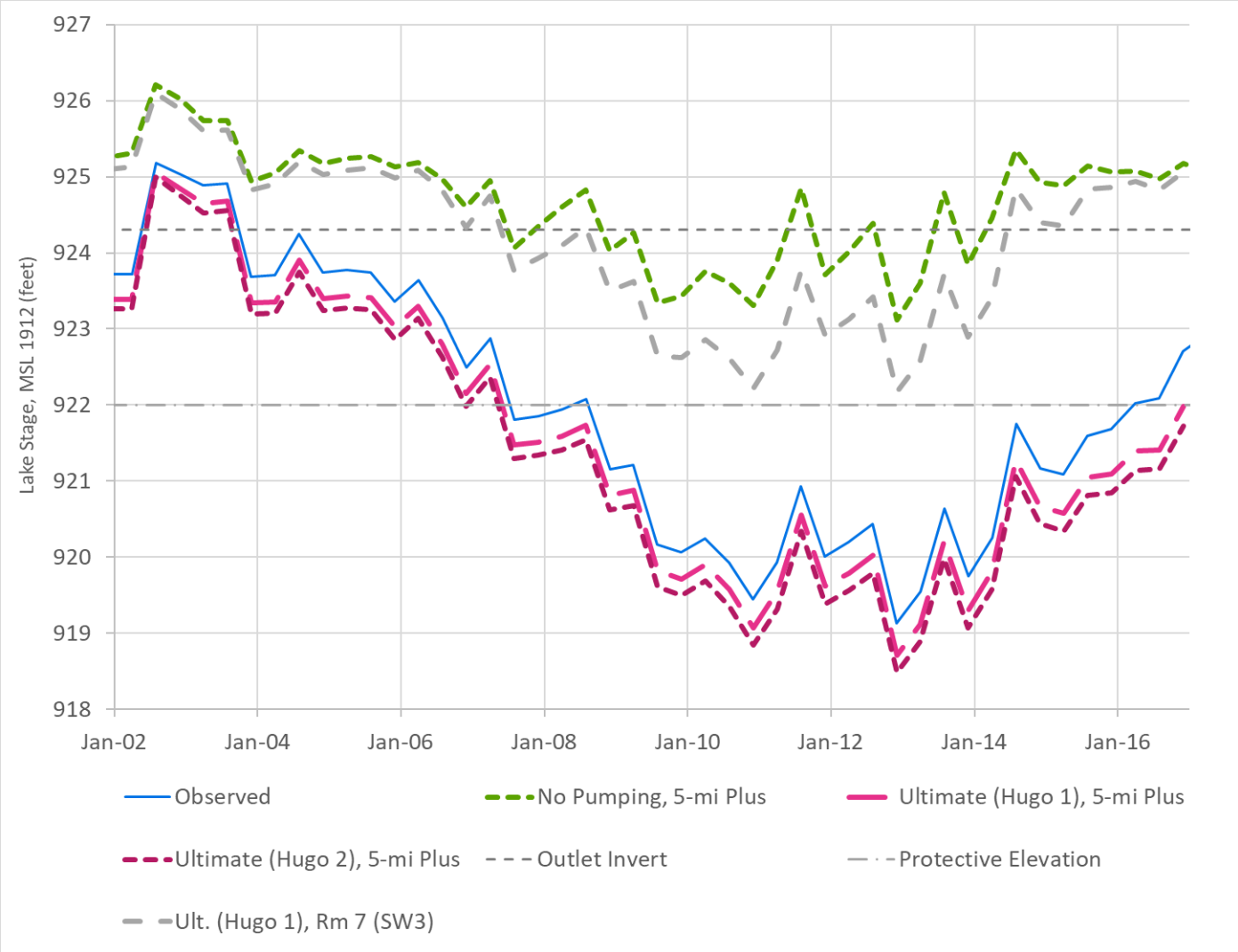
651-259-5652

Supplemental Slides

Replace Groundwater Supplies – Replace 7 Permits (SW 3)

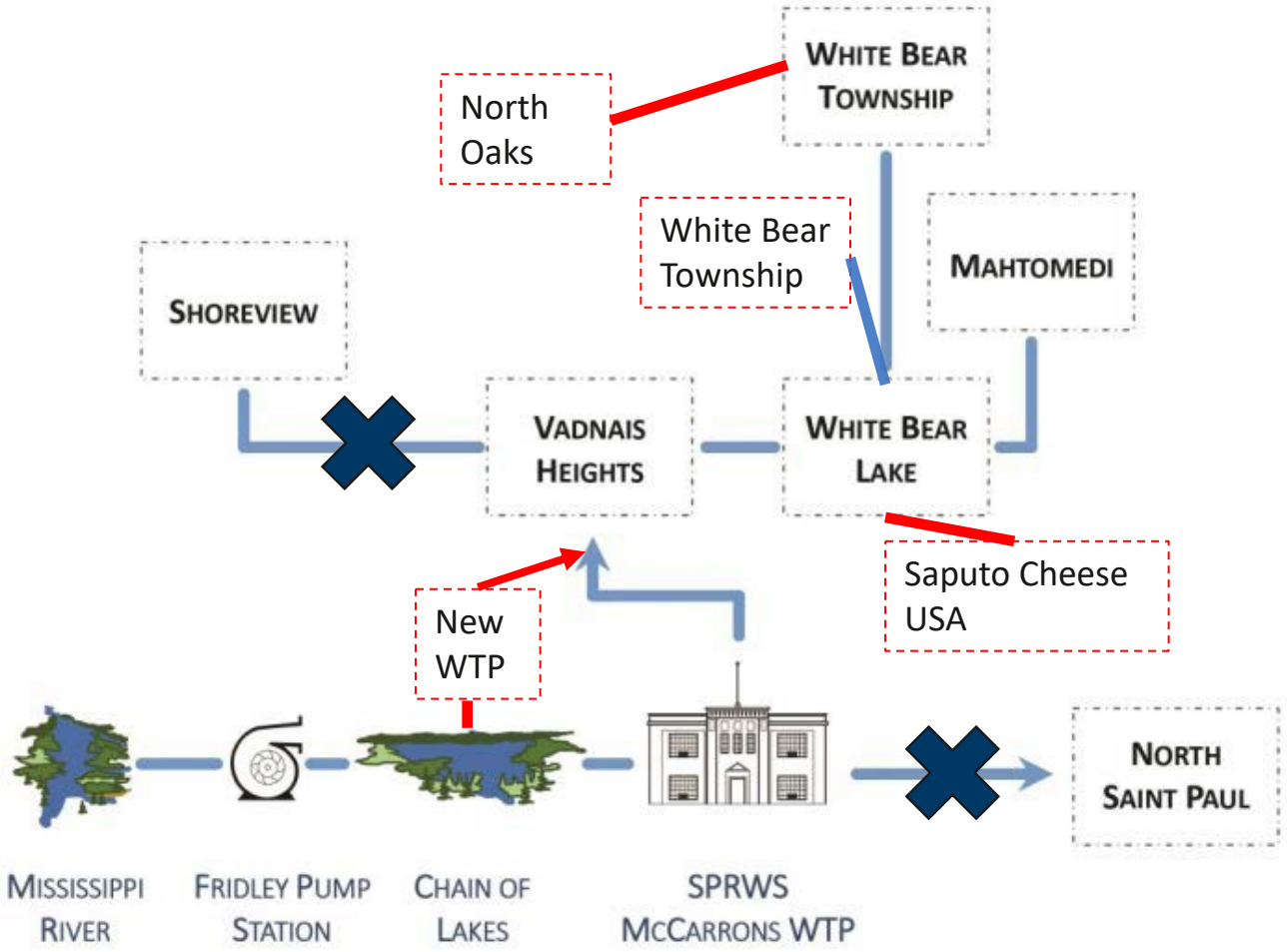


Model Results– Replace 7 Permits (SW 3)

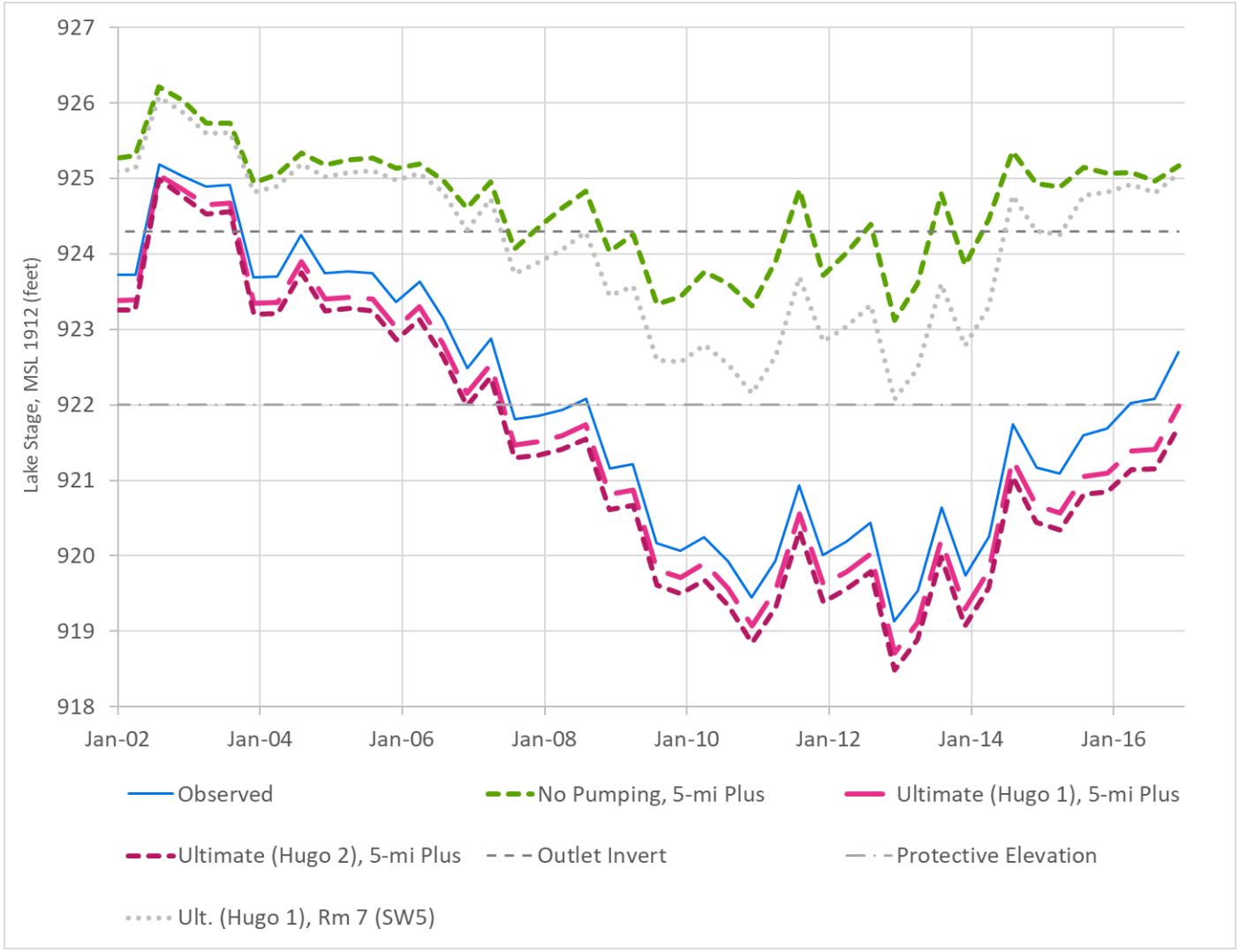


- Hugo 1
- Replace 7 permits, 5 communities

Replace Groundwater Supplies – Replace 7 Permits (SW 5)

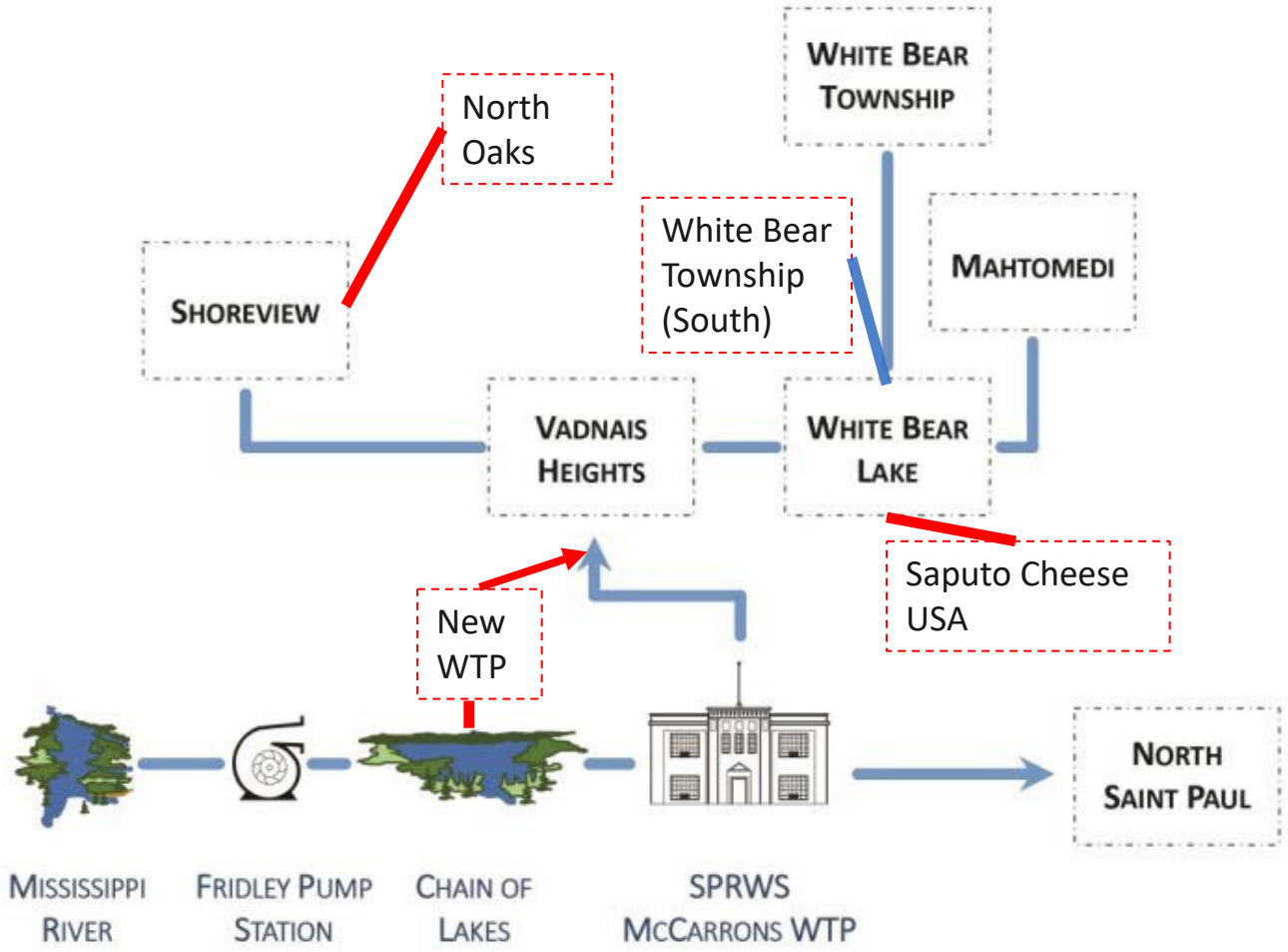


Model Results– Replace 7 Permits (SW 5)

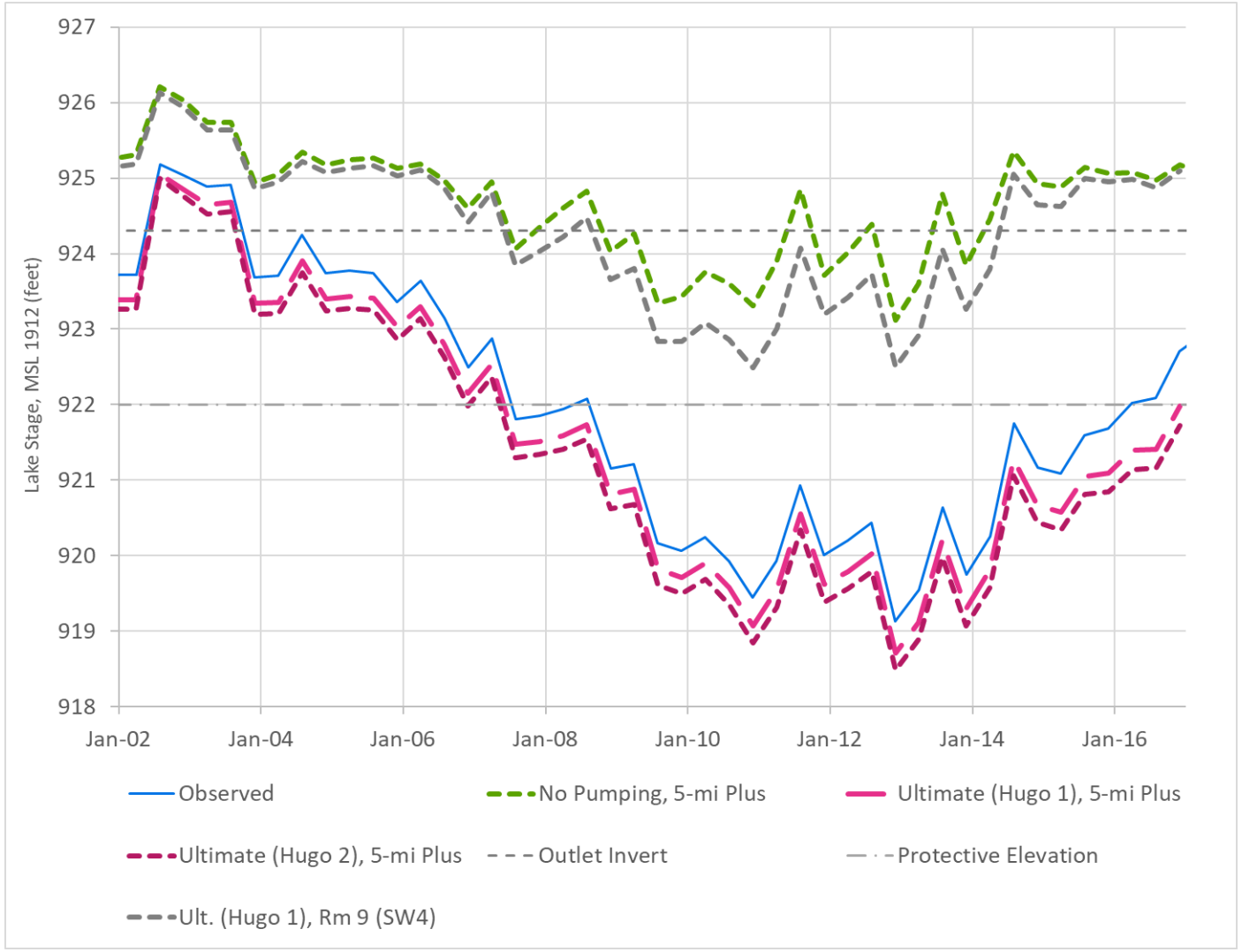


- Hugo 1
- Replace 7 permits, 5 communities

Replace Groundwater Supplies – Replace 9 (SW 4)

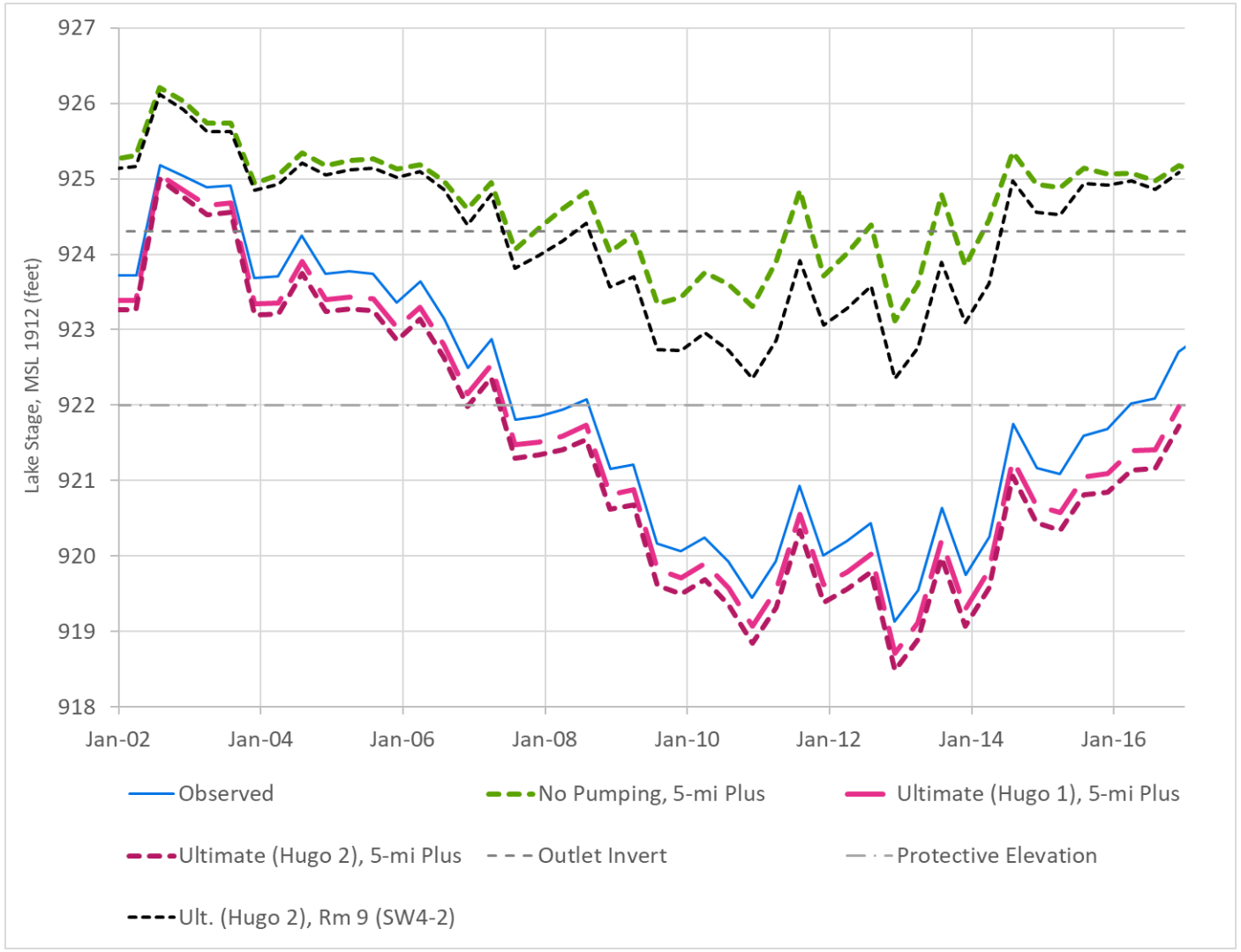


Model Results– Replace 9 Permits (SW 4)



- Hugo 1
- Replace 9 permits, 7 communities

Model Results– Replace 9 Permits (SW 4-2)

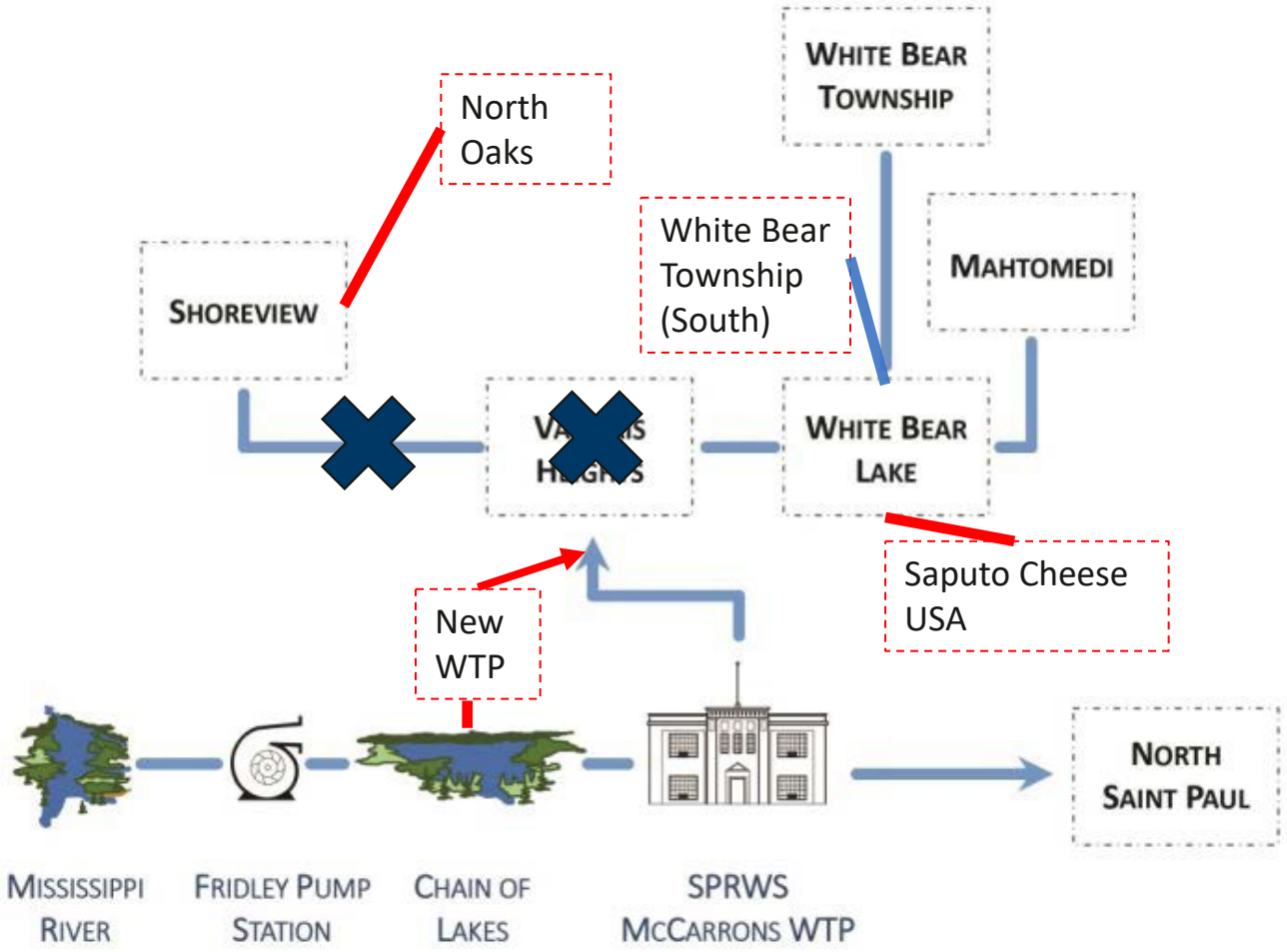


- Hugo 2
- Replace 9 permits, 7 communities

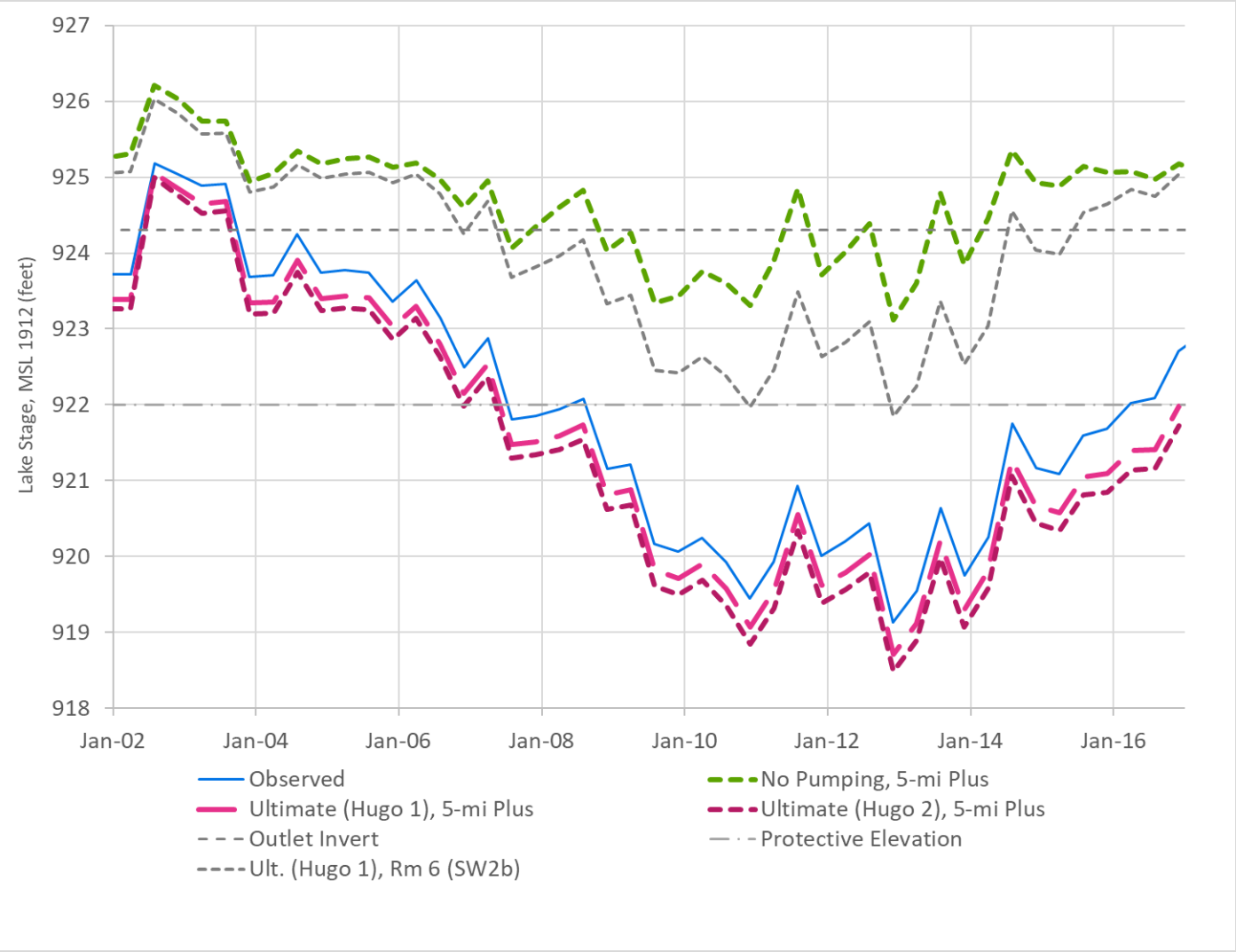
Replace Groundwater Supplies – Other Tested Scenarios

Scenario	Brief Description	Communities / Permits
SW 2 (Hugo 1)	Replace 6	Mahtomedi, Saputo Cheese USA, Vadnais Heights, White Bear Lake, White Bear Township (2 systems)
SW 2b (Hugo 1)	Replace 6 with reduced demands	Mahtomedi, North St. Paul, Saputo Cheese USA, White Bear Lake, White Bear Township (2 systems)
SW3-2 (Hugo 2)	Replace 7	Mahtomedi, North St. Paul, Saputo Cheese USA, Vadnais Heights, White Bear Lake, White Bear Township (2 systems)
SW 6 (Hugo 1)	Replace 6	Mahtomedi, North Oaks, Vadnais Heights, White Bear Lake, White Bear Township (2 systems)

Replace Groundwater Supplies – Replace 6 Permits (SW 2b)

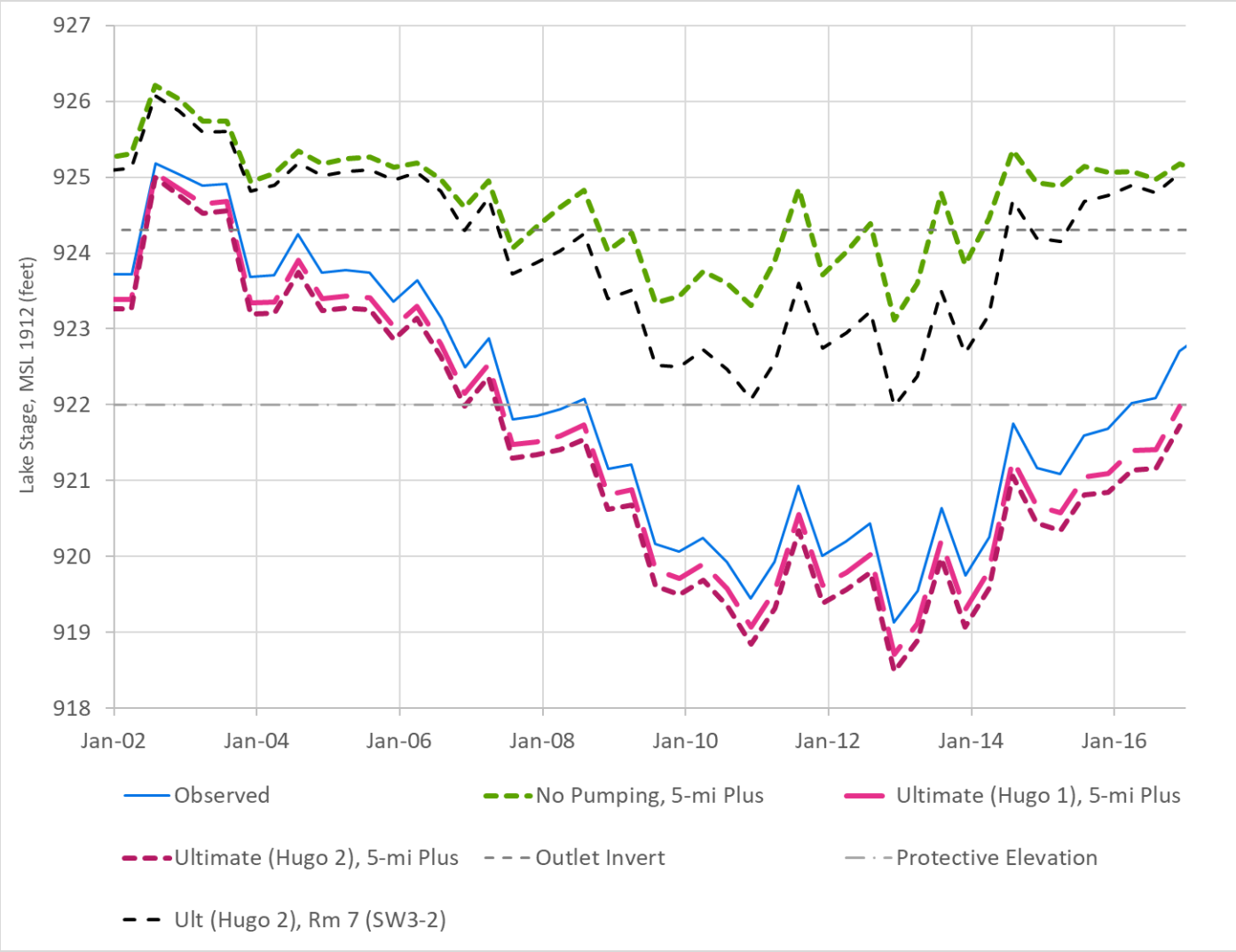


Model Results– Replace 6 Permits (SW 2b)



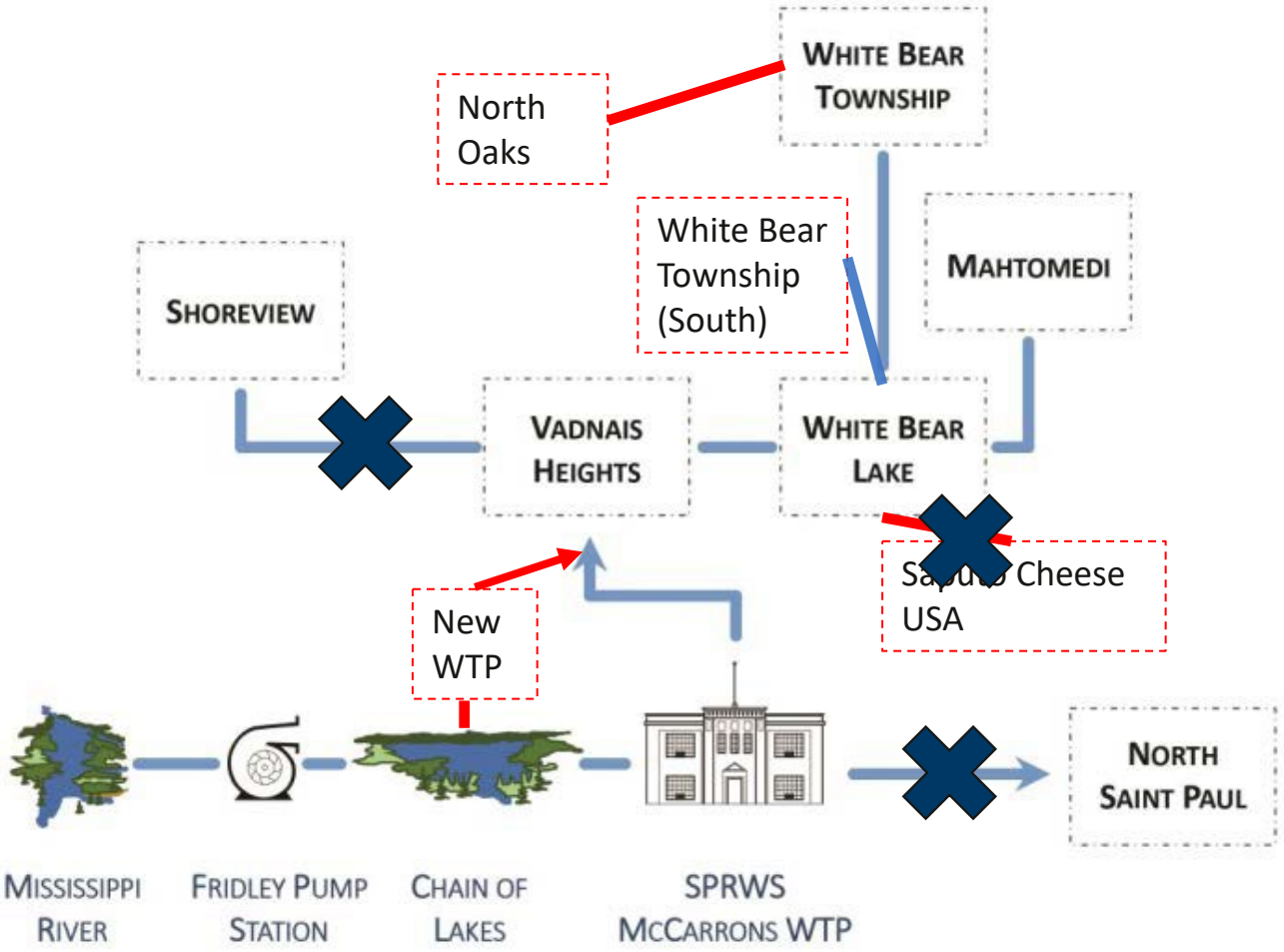
- Hugo 1
- Replace 6 permits, 4 communities
- North Oaks and Woodbury → 75 gpcd residential
- Further demand reductions?
- Other options?

Model Results– Replace 7 Permits (SW 3-2)

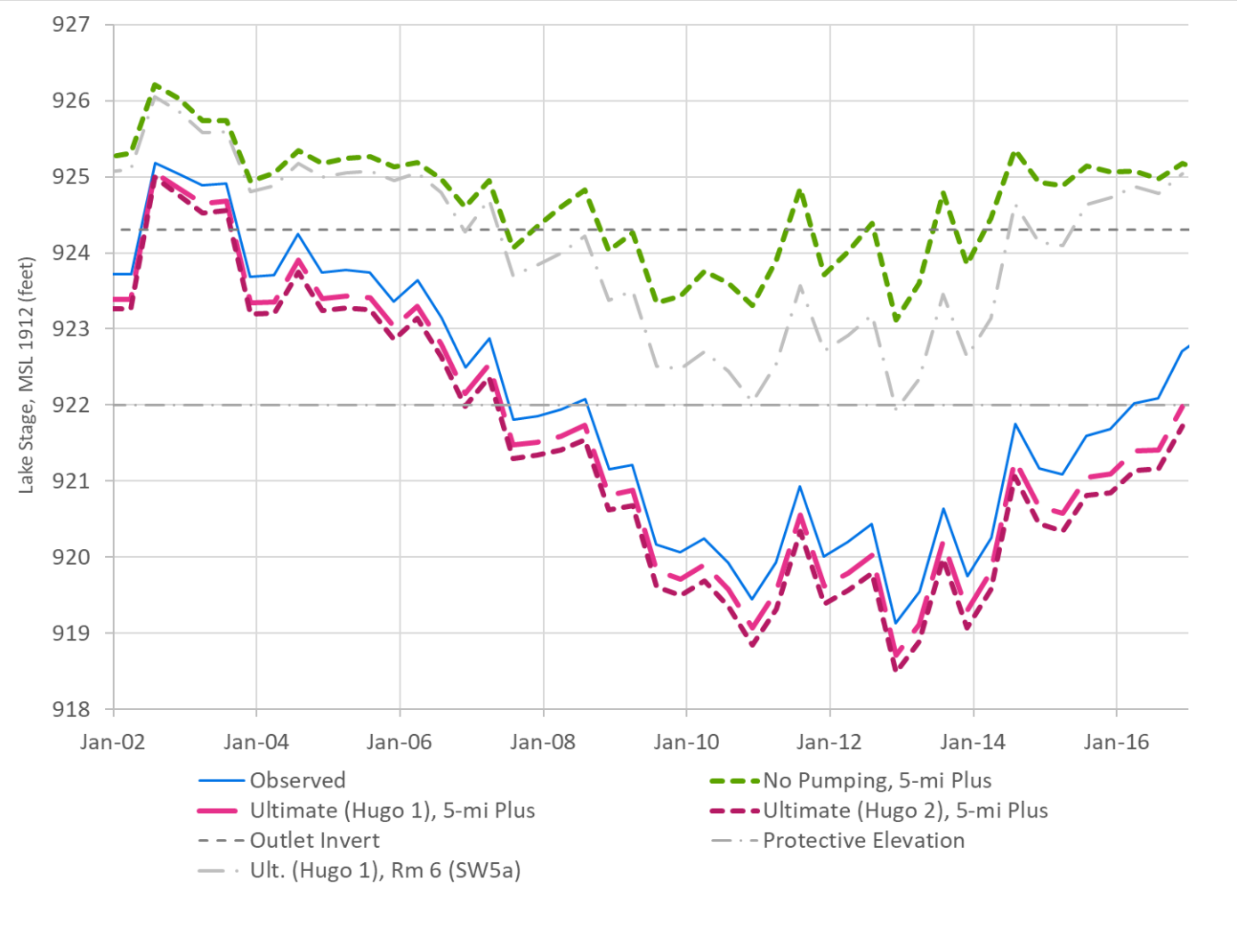


- Hugo 2
- Replace 7 permits, 5 communities
- Needs demand reductions or other options

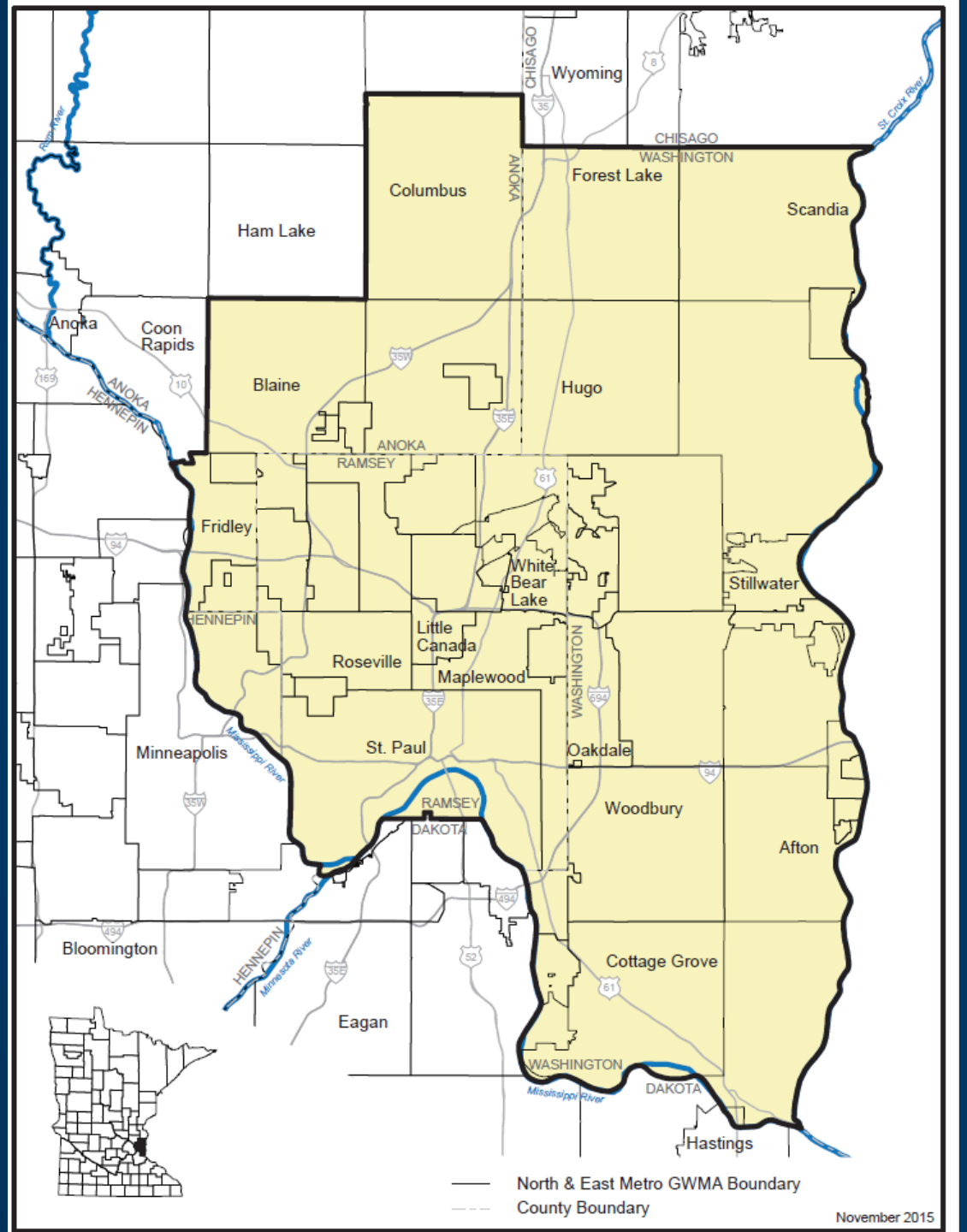
Replace Groundwater Supplies – Replace 6 Permits (SW 6)



Model Results– Replace 6 Permits (SW 6)

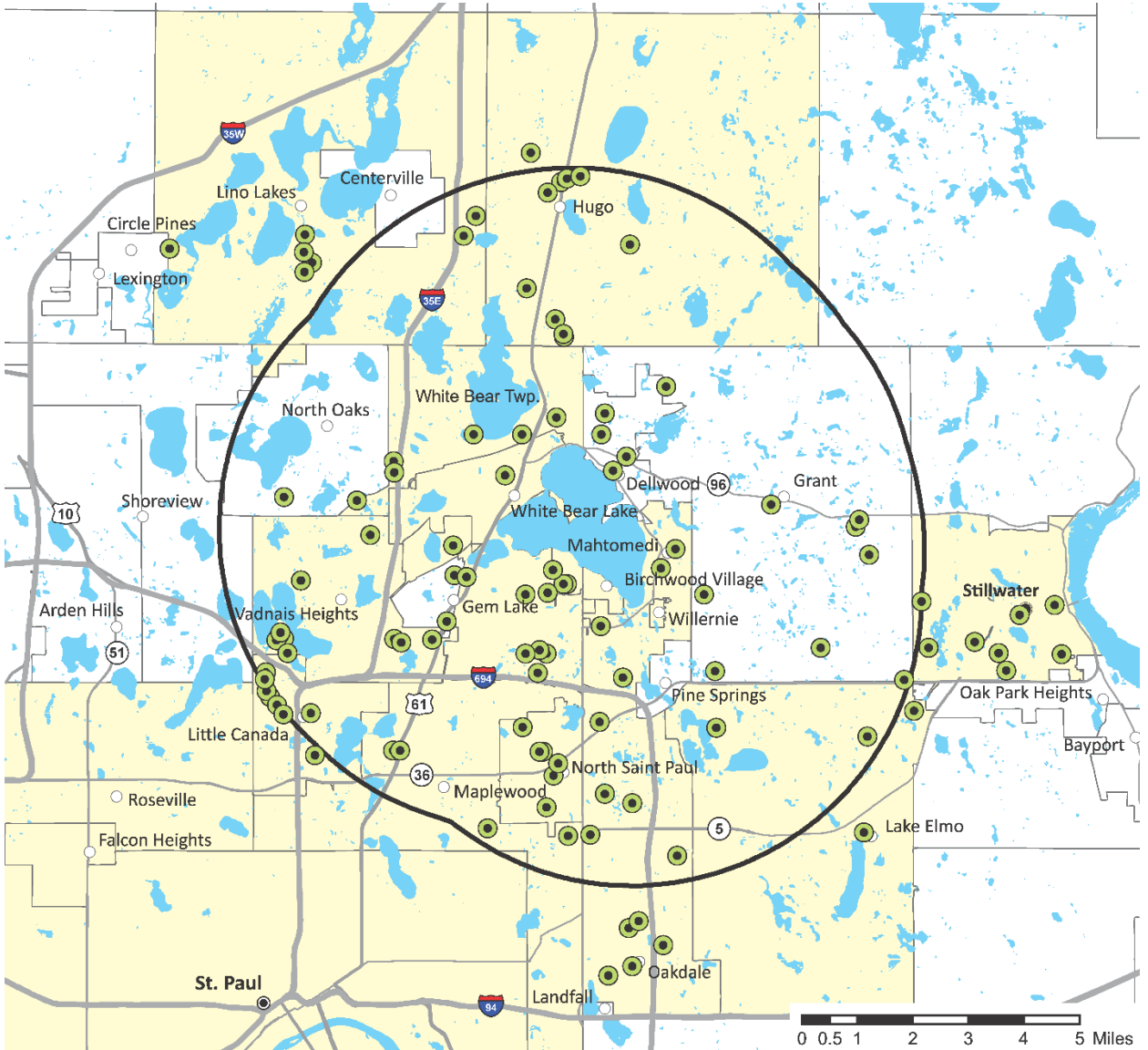


- Hugo 1
- Replace 6 permits, 5 communities
- Requires demand reductions or other options



North and East Metro Groundwater Management Area

Permits and Wells w/in 5 Mile Area



Average Annual Volume of Water Use – Recent and Projected