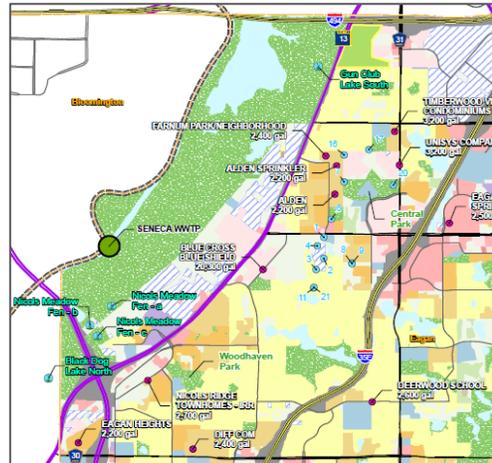


Water reuse: coming to a city near you!

Drivers, scoping, partnerships and case studies for water reuse projects

Introductions

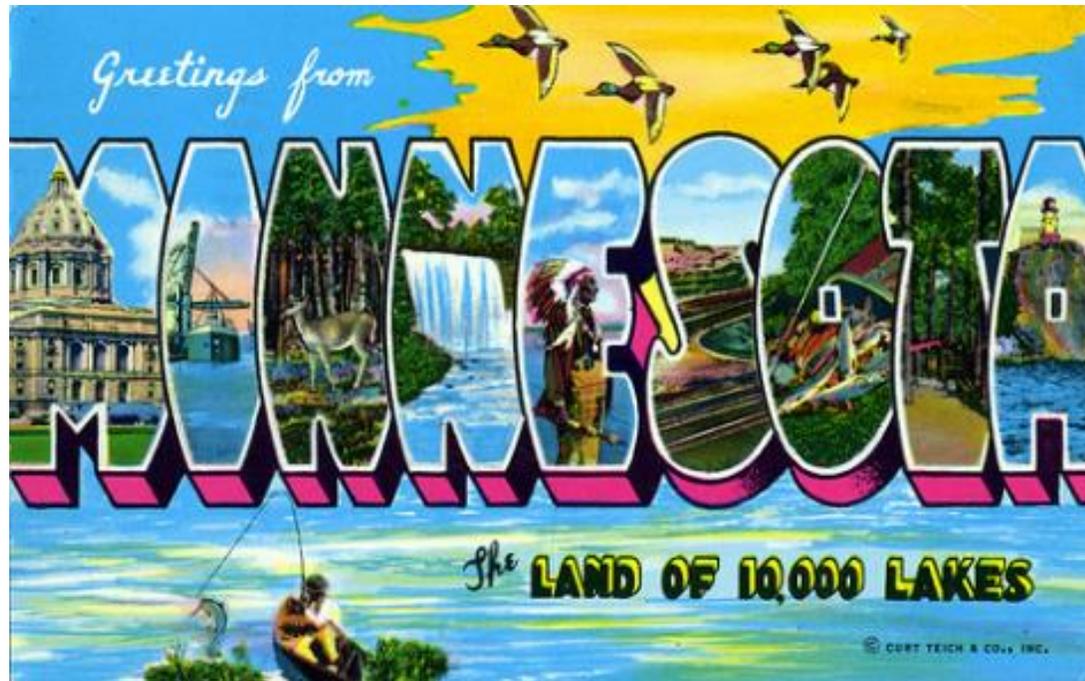
- Michelle Stockness, PE, ENV SP, Barr Engineering Co.
- Steve Klein, PH, PE, Barr Engineering Co.



Presentation outline

- **Water reuse background**
- Drivers for reuse projects
- How to identify opportunities
- Why you need partners
- Case studies

Yes, water reuse is here in the Midwest



MINNPOST

Ecolab making the case for water conservation

By Dan Haugen | 02/24/09

Ecolab is presenting at a Water Footprint Summit this week in Miami.

The major topic of the conference is "Making the Business Case for Measuring and Reducing Corporate Water Footprints."

Feb. 24: Minnesota draining its supplies of water

Nature can't keep up with demand, prompting disputes in some cities.

By Josephine Marcotty (<http://www.startribune.com/josephine-marcotty/10645336/>) Star Tribune

AUGUST 30, 2013 — 9:55PM

DNR eyes water supply in Central Minnesota

 Kirsi Marohn, kmrohna@stcloudtimes.com 10:40 a.m. CDT April 7, 2014

The Department of Natural Resources has launched a project to study whether groundwater use in the Bonanza Valley and two other areas in Minnesota is sustainable in the future.

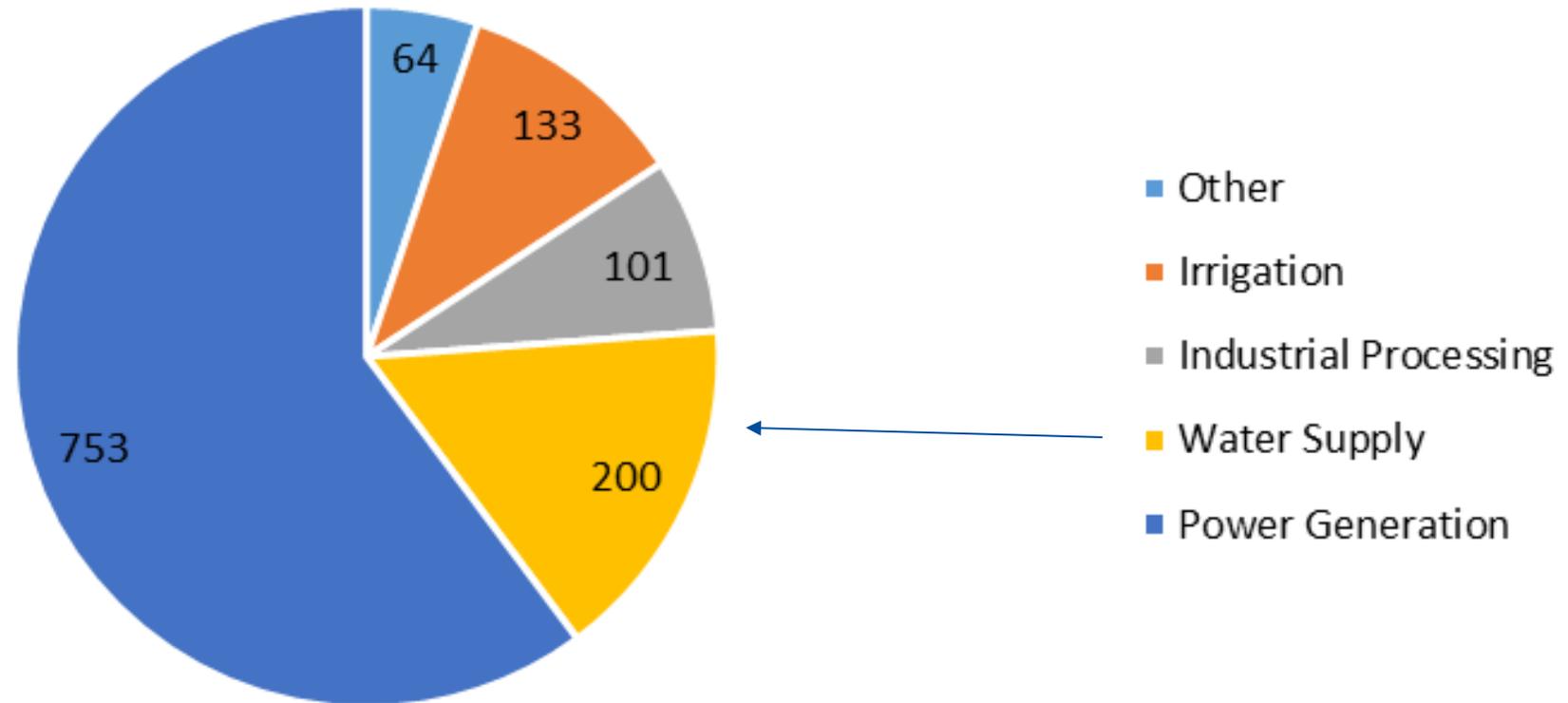
What is water reuse?

- Conservation, reclamation, and repurposing of water to best manage the challenges of water supply, use, treatment, and disposal
- Matching alternative water sources to potential end uses with a need for water
- Wastewater, stormwater, grey water, process water, rainwater



Why should cities be involved? Cities are a major appropriator

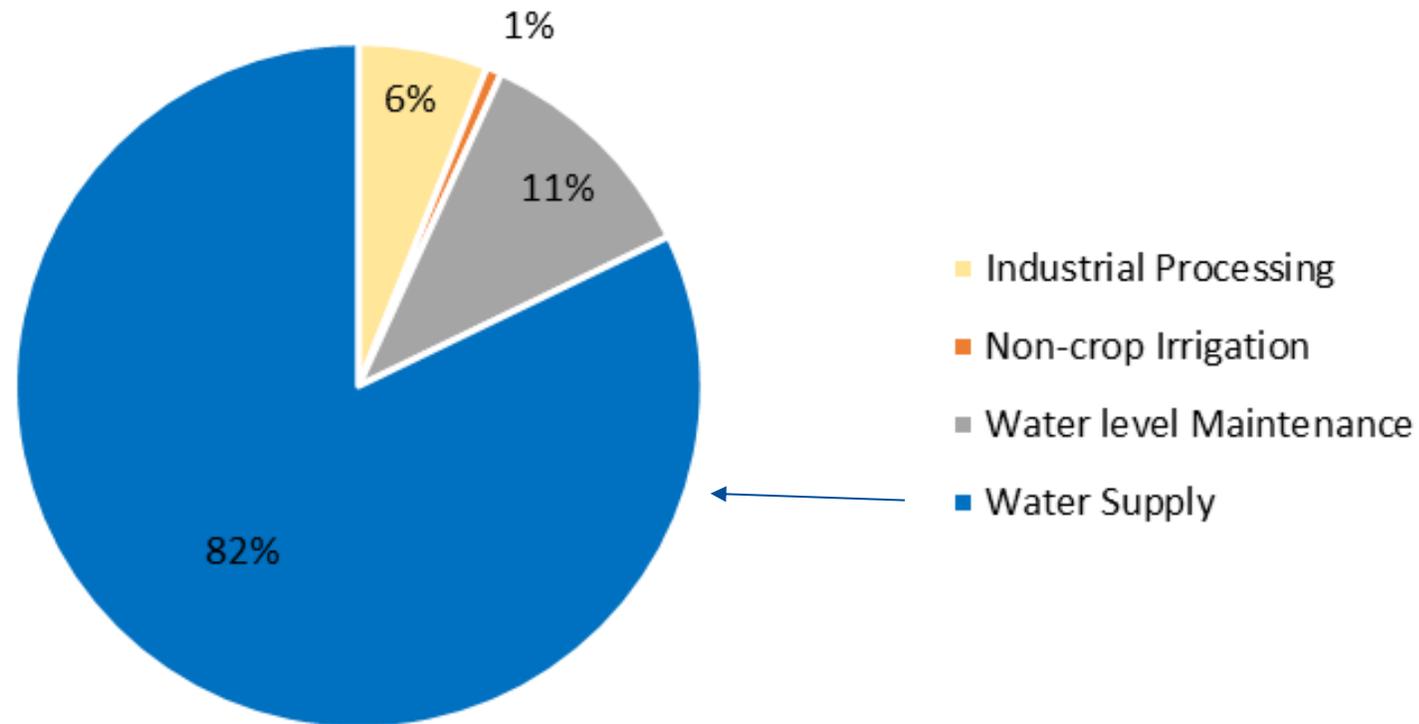
2014 Minnesota water use (BGY)



*2014 data from DNR SWUDS

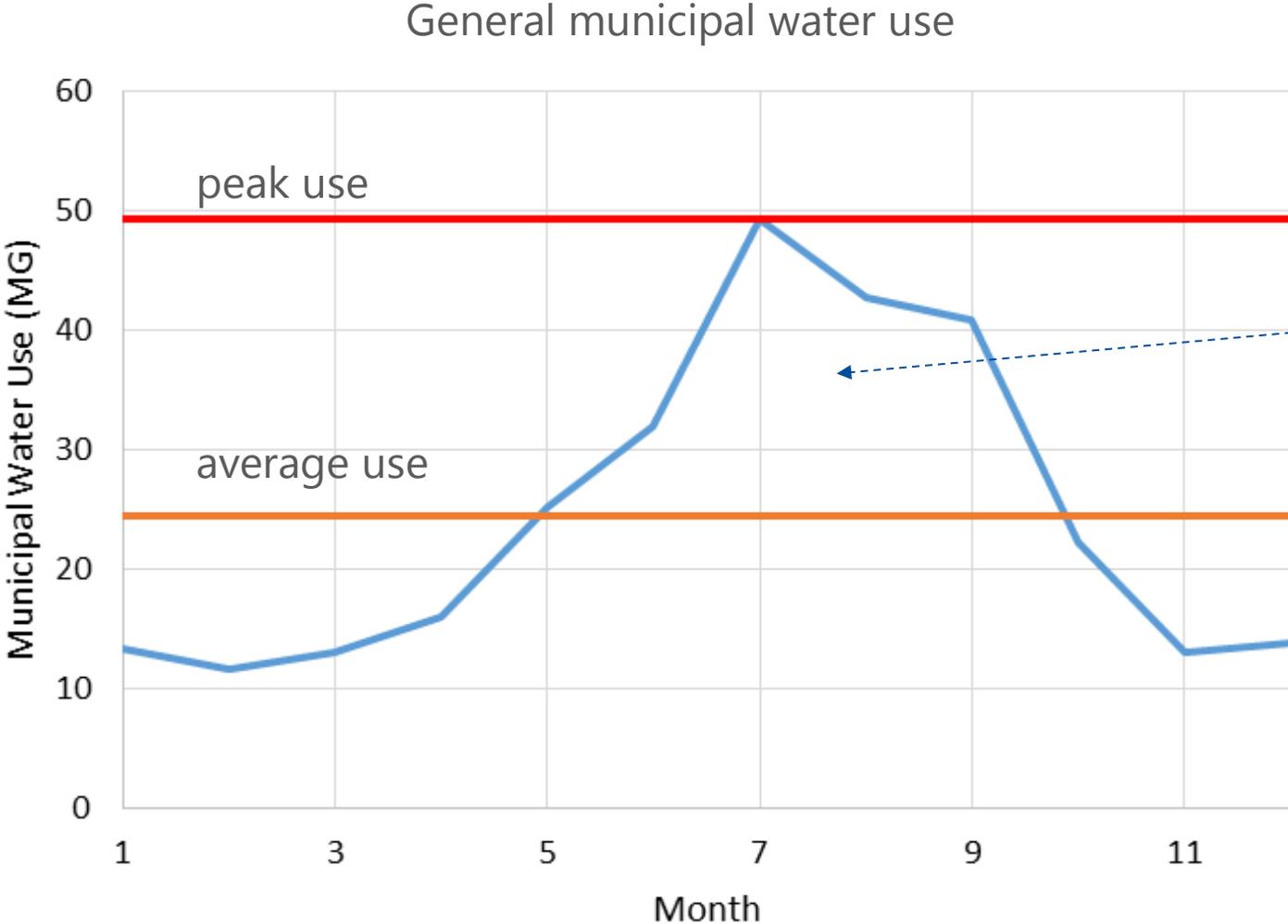
Why should cities be involved? Cities are a major appropriator

2014 Water Use Within City of Eagan



*2014 data from DNR SWUDS

Why should cities be involved? Reduce peak infrastructure

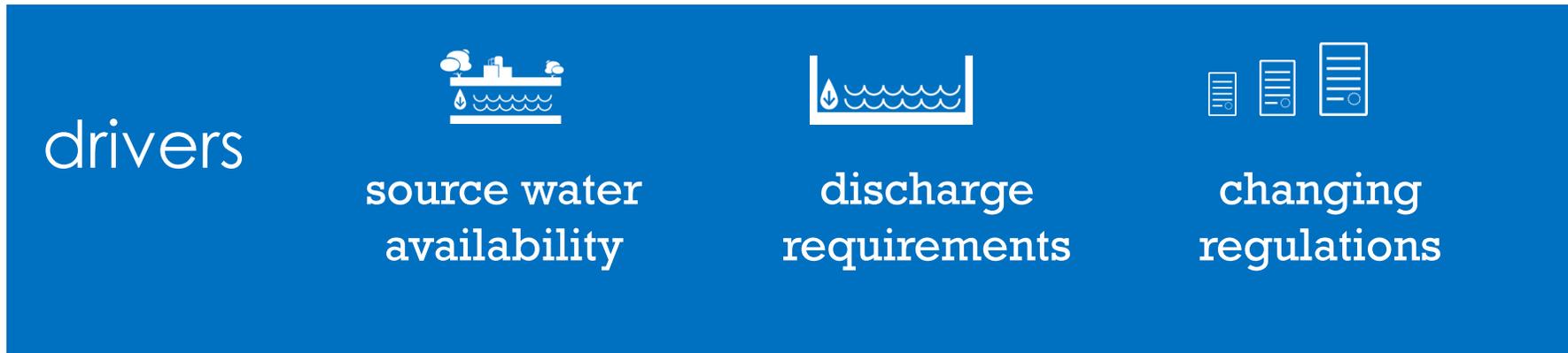


Summer irrigation does not require potable water

Presentation outline

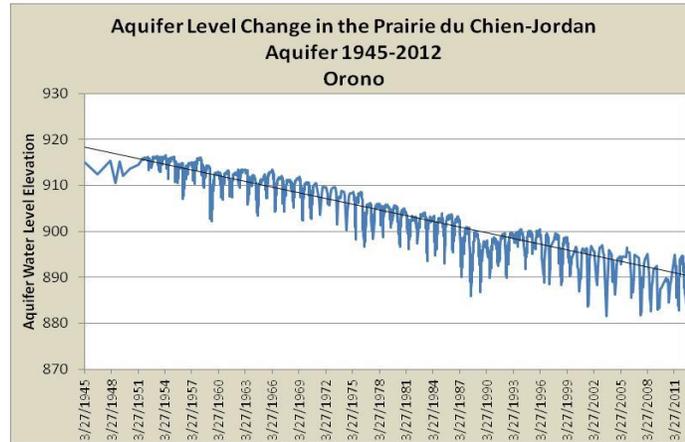
- Water reuse background
- **Drivers for reuse projects**
- How to identify opportunities
- Why you need partners
- Case studies

Common water reuse project drivers



- Secondary drivers
 - Cost of securing potable water from traditional sources
 - Corporate sustainability principles
 - Public education
 - Public safety

Example of a well-known driver: groundwater sustainability



Groundwater observation well



Photo Source: Minnesota Public Radio

White Bear Lake

- in some areas, current approach to water-supply management and development is unsustainable.
- in some areas, aquifer levels are declining.
- in some areas, lakes, streams, and wetlands are impacted.



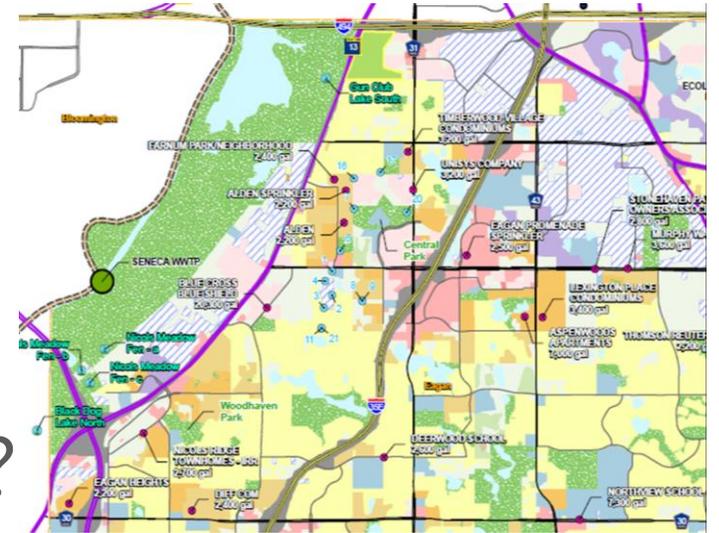
Presentation outline

- Water reuse background
- Drivers for reuse projects
- **How to identify opportunities**
- Why you need partners
- Case studies

Identify opportunities by matching sources to end uses

Look around; connect the dots:

- Who uses water?
- Where is there abundant water?
- What is the quality of that water source?
- What is the water quality that is needed for the end use?



Presentation outline

- Water reuse background
- Drivers for reuse projects
- How to identify opportunities
- **Why you need partners**
- Case studies

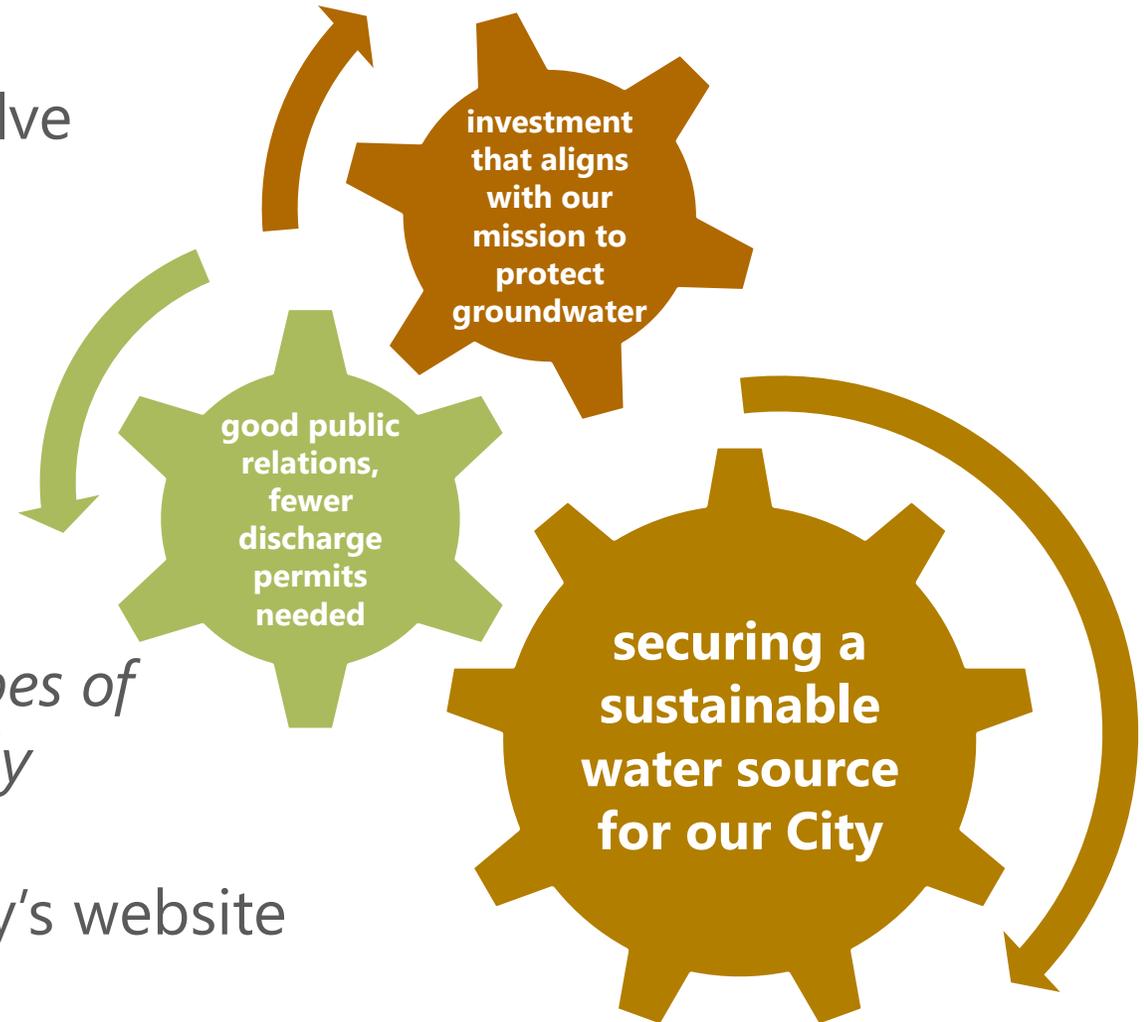
Do I really have to partner with someone?

“The issues we face are so big and the targets are so challenging that we cannot do it alone. When you look at any issue, such as food or water scarcity, it is very clear that no individual institution, government or company can provide the solution alone.”

- Paul Polmen, CEO of Unilever (also Chairman of the World Business Council for Sustainable Development)

Different motivations are fine if the “machine” moves together to support the project

Sometimes these partnerships involve organizations that would—on the surface—appear to be at odds.



“Collaboration between different types of organizations can produce previously unimagined solutions.”

-Network for Business Sustainability’s website

General process for water reuse projects

- Step 1: Identify project and possible partners
- Step 2: Do your homework
- Step 3: Engage possible partners and build the project team
- Step 4: Assess project feasibility
- Step 5: Define project
- Step 6: Execute, construct
- Step 7: Operate
- Step 8: Monitoring results
- Step 9: Tell the story of your success!

Presentation outline

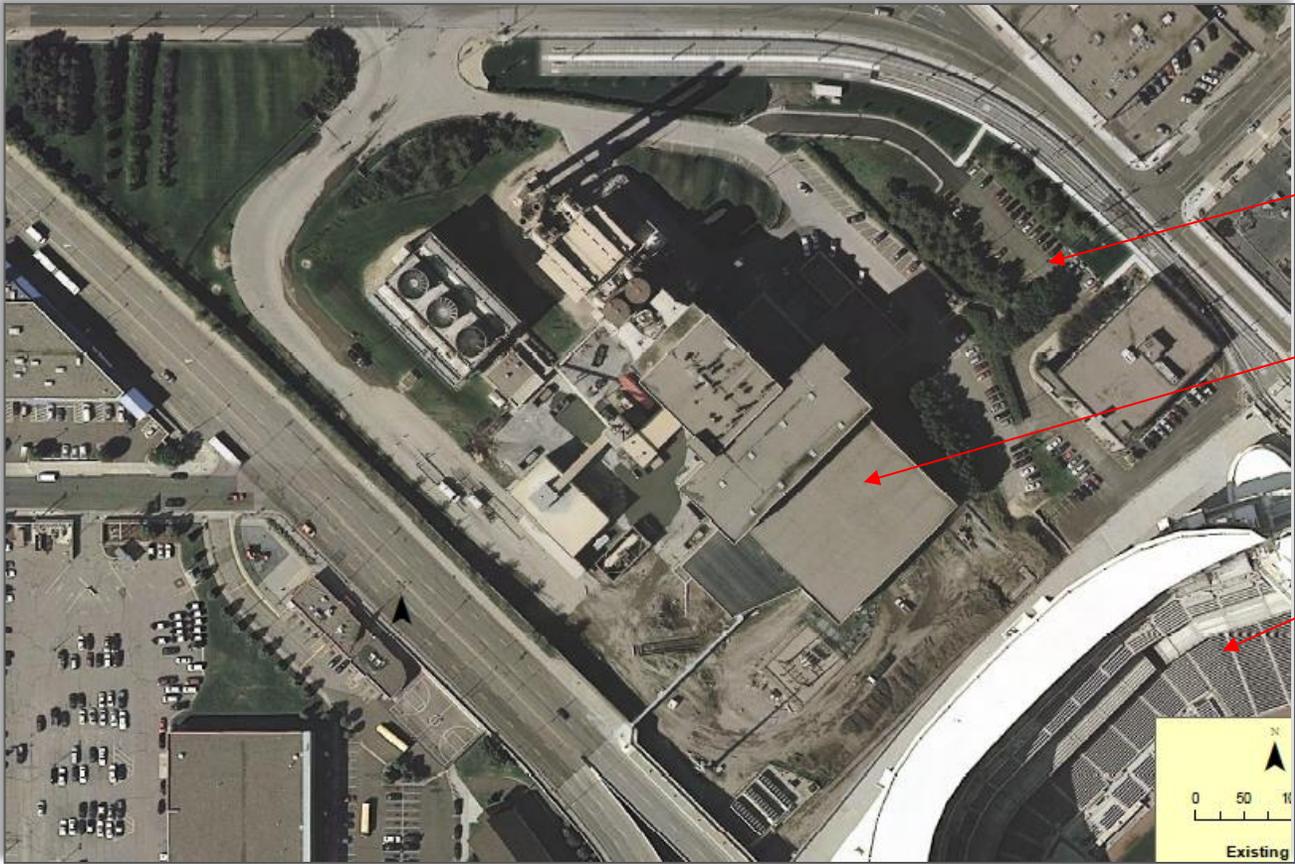
- Water reuse background
- Drivers for reuse projects
- How to identify opportunities
- Why you need partners
- **Case studies**

Case study: Target Field Station (The Interchange)

“Your problem is my solution.”



Source: urban site with competing demands and stormwater requirements



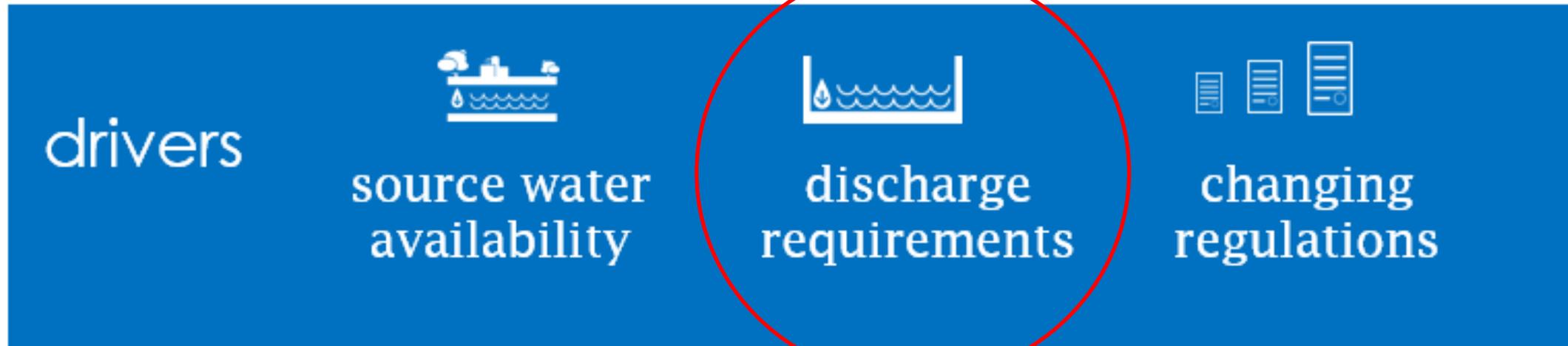
Target
Field
Station
Site

HERC

Stadium

Project drivers

- poor infiltration and contaminated soils
- stormwater requirements
- strict limitations on stormwater discharge



User: industrial end user

Hennepin Energy Recovery Center (HERC)

- Burns nearly 365,000 tons of municipal solid waste generating enough electricity for 25,000 homes and steam for the downtown district energy system
- Significant water user for cooling and other various processes in the facility
- 24/7 operation



Partnerships



- project owner (Hennepin County) already owned the HERC facility, though a private company manages it (Covanta).
- Covanta had already identified processes that could utilize lower quality water.
- Minneapolis was the permitting authority, involved in conceptual design review, and supportive of a water reuse project
- MWMO was a granting authority, supportive of water reuse projects, and consulted on green features for the project

Infrastructure: stormwater use at the HERC facility

Above-ground cisterns:

- 40,000 gallon capacity
- 90th percentile storm event
- Year-round function (snowmelt system) used for a variety of processes, including steam cooling and ash dust control.
- Over 1 million gallons/year of stormwater runoff used



Source: http://www.ballparkauthority.com/Target_Field_Station_Cisterns.html

Lessons learned: Target Field Station

- If partners are interested enough, fast-track reuse projects are possible.
- Involving permitting and granting agencies in the design and review of the project (early in the process!) can be helpful.
- Be sure to talk to the folks who will have to operate your project.
- A good stewardship story is valuable.

Case study: Dakota Prairie Refinery (wastewater reuse)

“It rains every day at a wastewater treatment plant.”

Case study: Dakota Prairie Refinery (wastewater reuse)

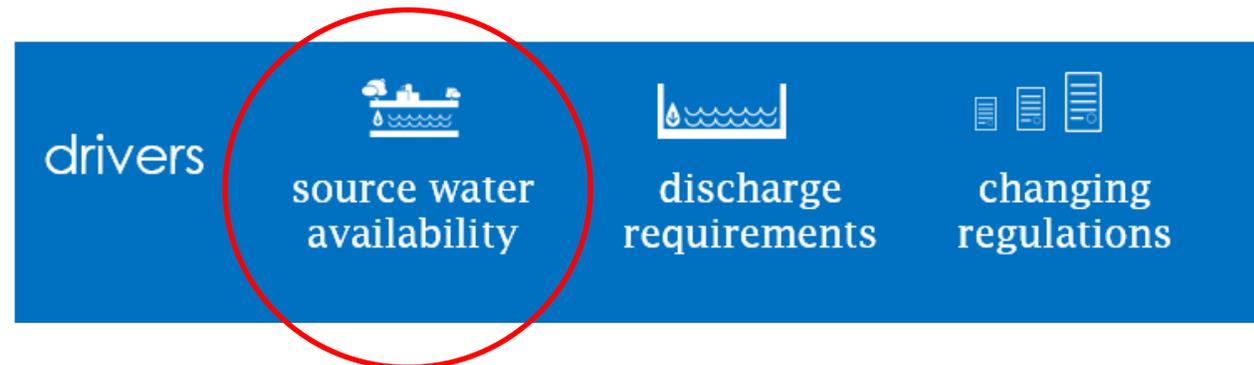
- 20,000 barrels/day diesel refinery
- First greenfield refinery constructed in the US since the 1970s
- Near Dickinson, ND
- Start-up in spring 2015



Project drivers

Water supply options:

- Groundwater: only available for back-up per state
- Surface water: poor and variable water quality
- Potable water: limited availability
- Wastewater: effluent from City of Dickinson, needed to create a partnership



Selected water source

City of Dickinson wastewater effluent was selected as the source for industrial water. Water will be used for:

- Cooling
- Boiler feed
- Fire fighting (backup)
- Washdown
- General, non-potable uses



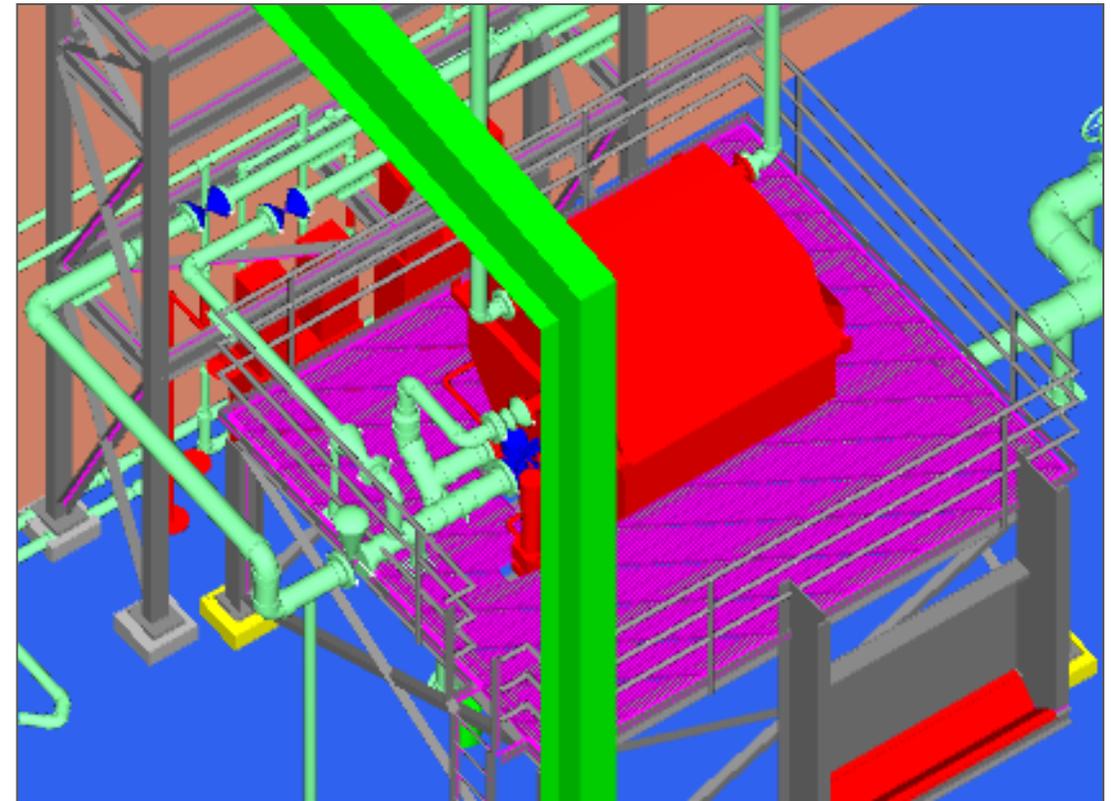
How was the partnership created?

- The City of Dickinson was in the process of upgrading their wastewater treatment plant.
- DPR and Dickinson had a conversation at a regional water meeting and came to an understanding.
- DPR purchases treated wastewater from Dickinson.



Project infrastructure

- Forcemain from WWTP to the refinery, with extra capacity for future users
- Treatment plant for microbial control
- Treated water storage
- Level of treatment based on end use and public health risks



3D model of the disc filter ahead of UV

Lessons learned: DPR and City of Dickinson Partnership

- The partnership details took a long time to finalize.
- There were lots of changes: which organizations were involved, timelines, and project constraints.
- A good working relationship is necessary.



Case study: City of Eagan (water reuse)

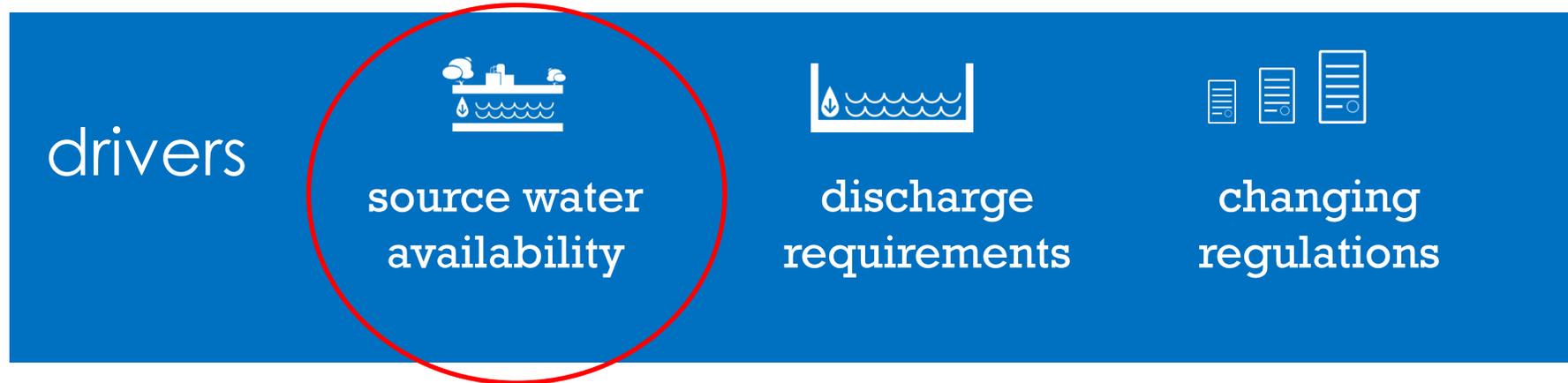
“If you build it, they will use it.”

Case study: City of Eagan (water reuse)

- Step 1: Identify project and possible partners
- Step 2: Do your homework
- Step 3: Engage possible partners and build the project team
- Step 4: Assess project feasibility **<now>**
- Step 5: Define project
- Step 6: Execute, construct
- Step 7: Operate
- Step 8: Monitoring results
- Step 9: Tell the story of your success!

Project drivers

- Long-term availability of the water:



Project drivers

- Groundwater is the sole source for the City of Eagan potable water supply
- Average potable water use is expected to increase 10% from 2010 to 2040
- Potential for groundwater aquifer drawdown concerns by 2040
- Potential impacts to natural resources

Eagan model projection of aquifer drawdown

Potential drawdown impacts from City of Eagan

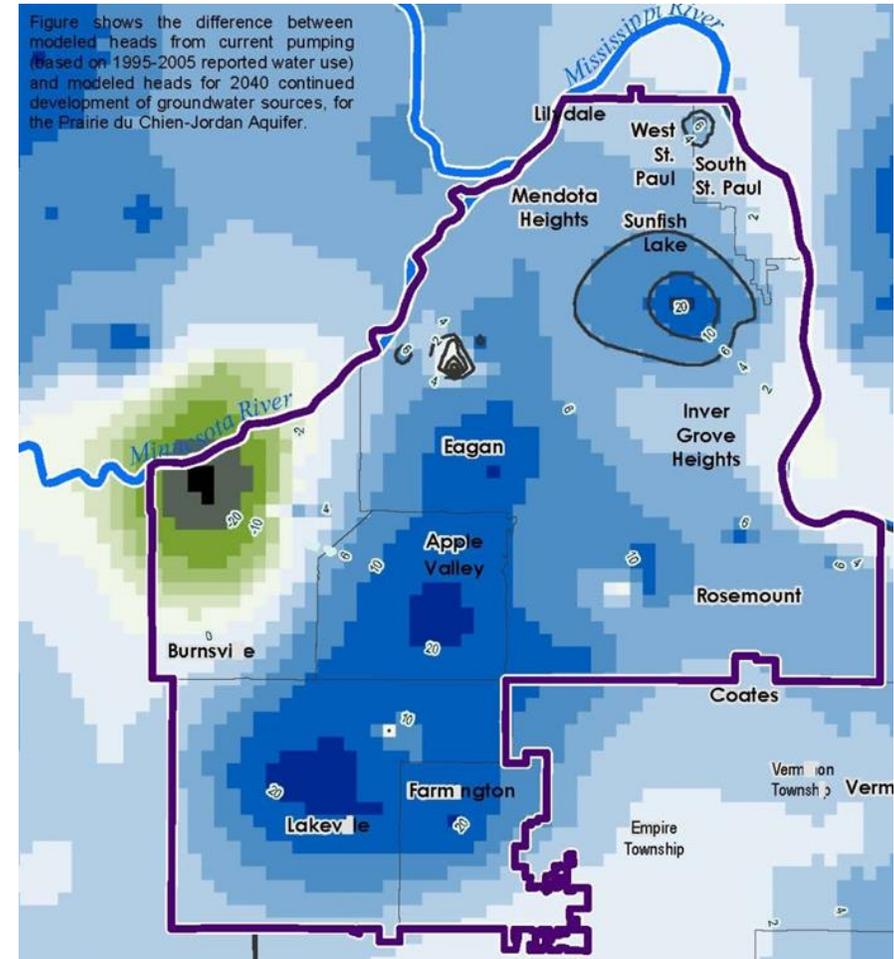
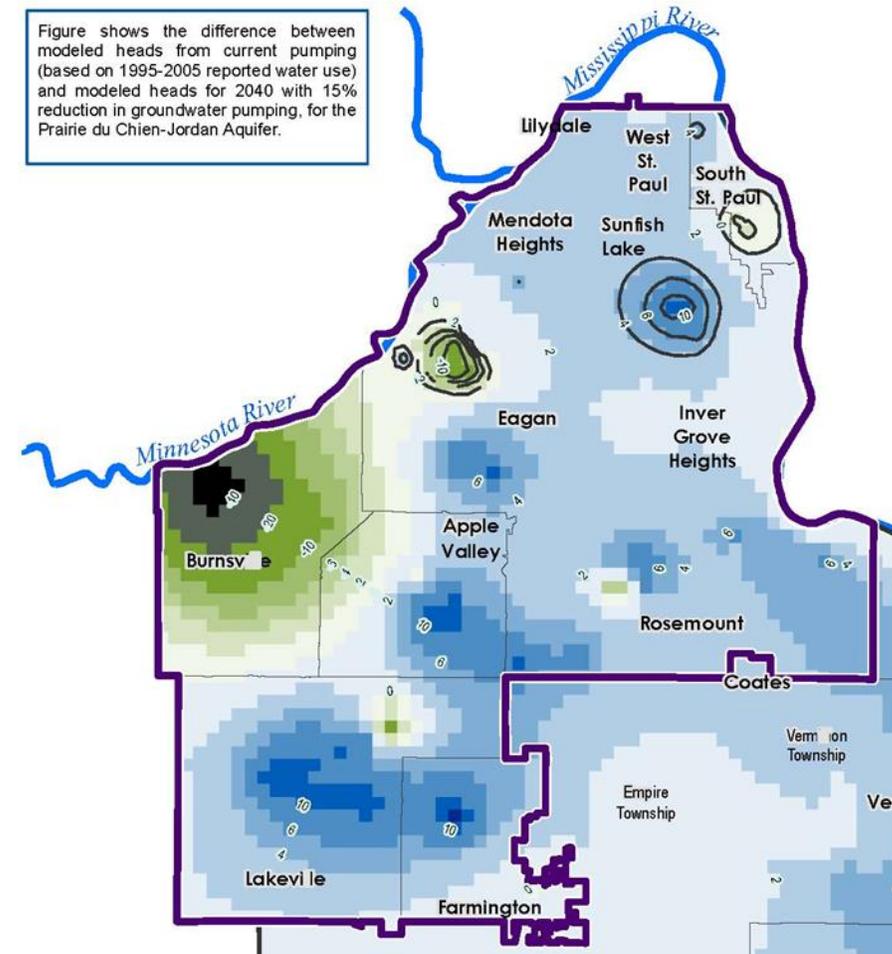
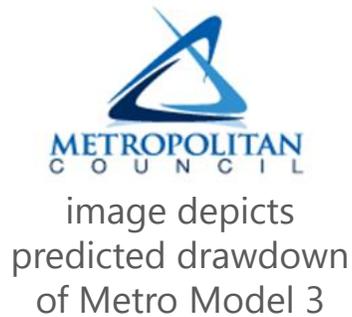


image depicts predicted drawdown of Metro Model 3

Revised Eagan model projection of aquifer drawdown

Potential drawdown impacts from City of Eagan with 15% reduction



Brainstorm of possible reuse system water users

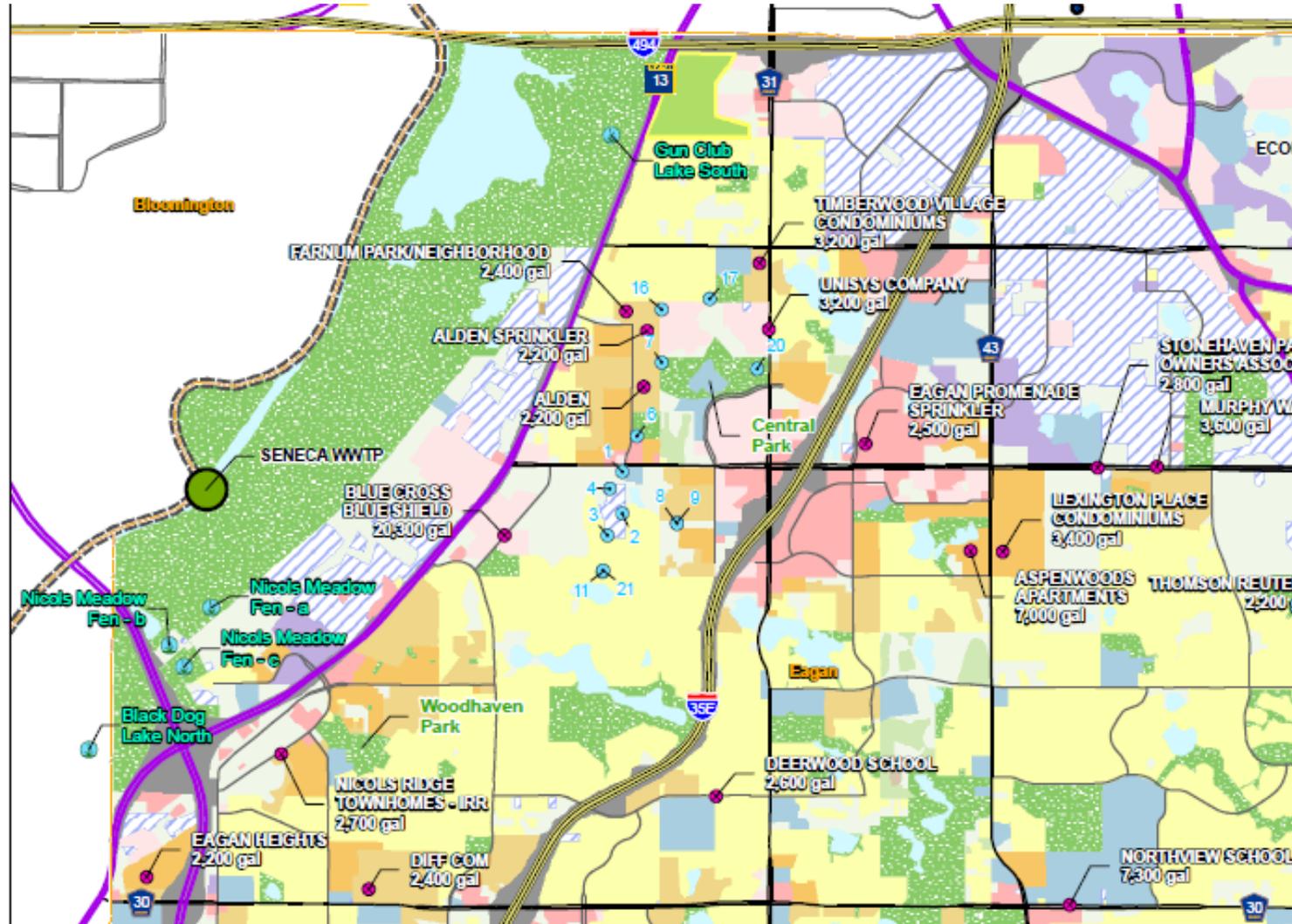
- Irrigation
- Process water
- Fire fighting
- Vehicle washing
- Aquifer recharge
- Fen recharge

Identify the user

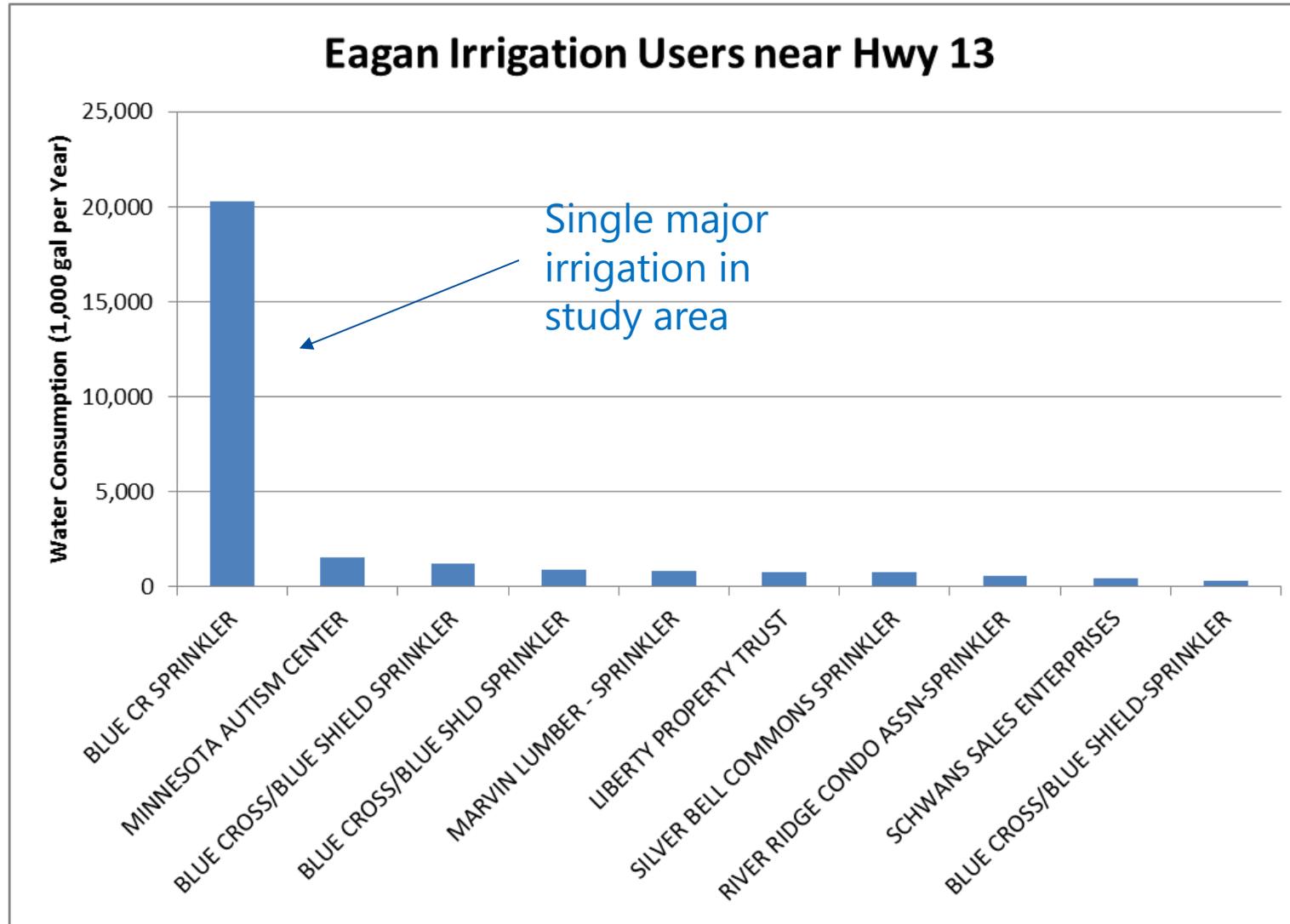
Look around...

- **Who uses water?** 
- Where is there abundant water?
- What is the quality of that water source?
- What is the water quality that is needed for the end use?

GIS evaluation of users and source



Irrigation use of city potable water



Identify the source

Look around...

- Who uses water?
- **Where is there abundant water?** 
- What is the quality of that water source?
- What is the water quality that is needed for the end use?

Identification of a source

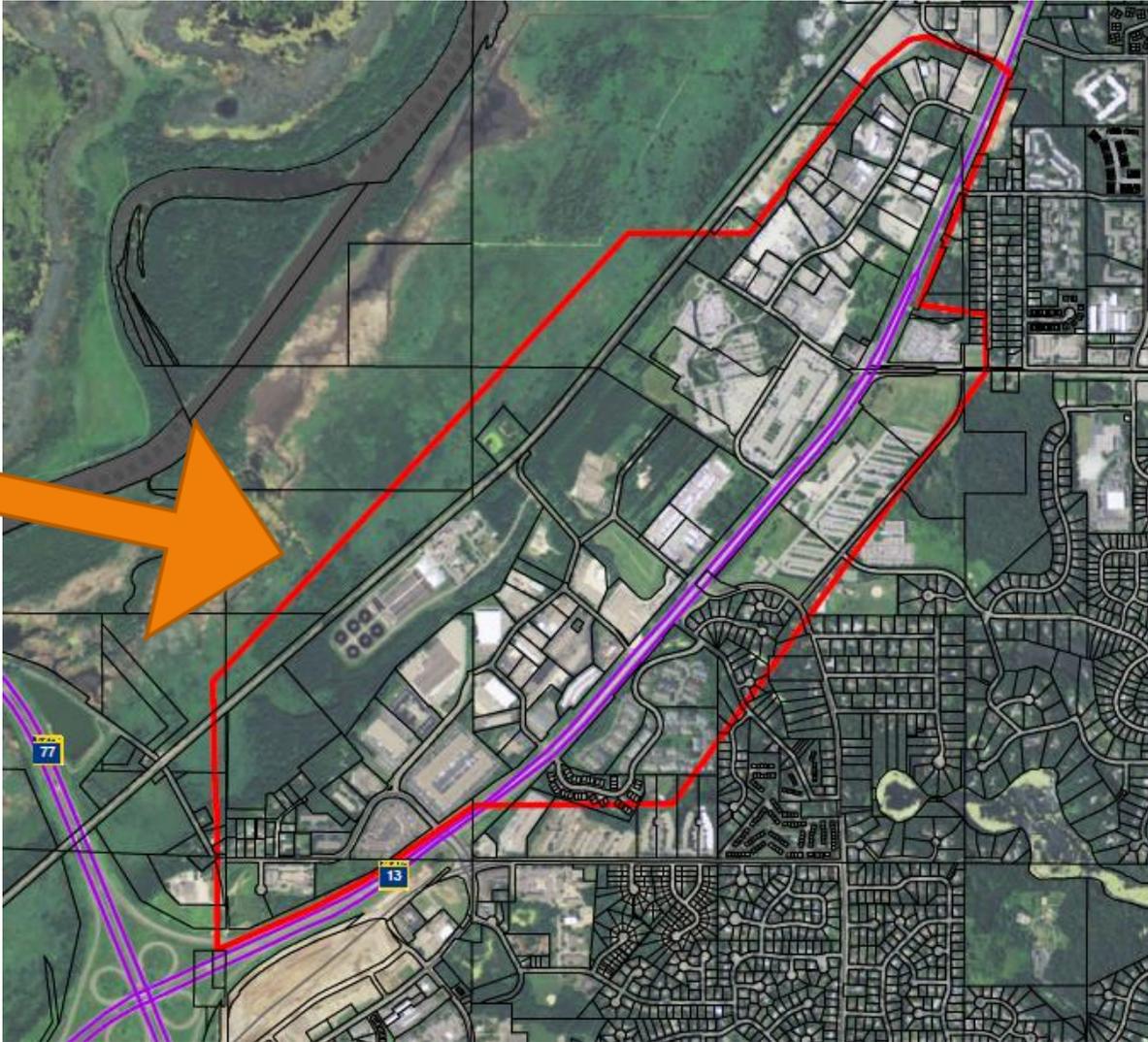
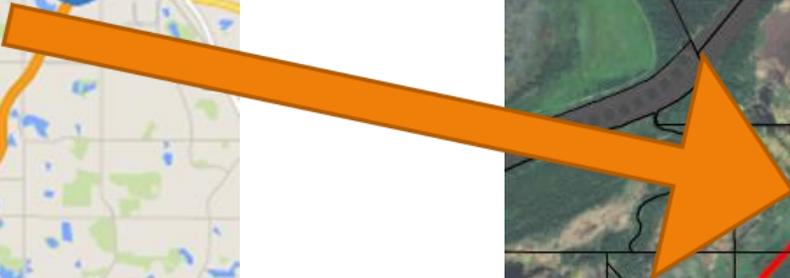
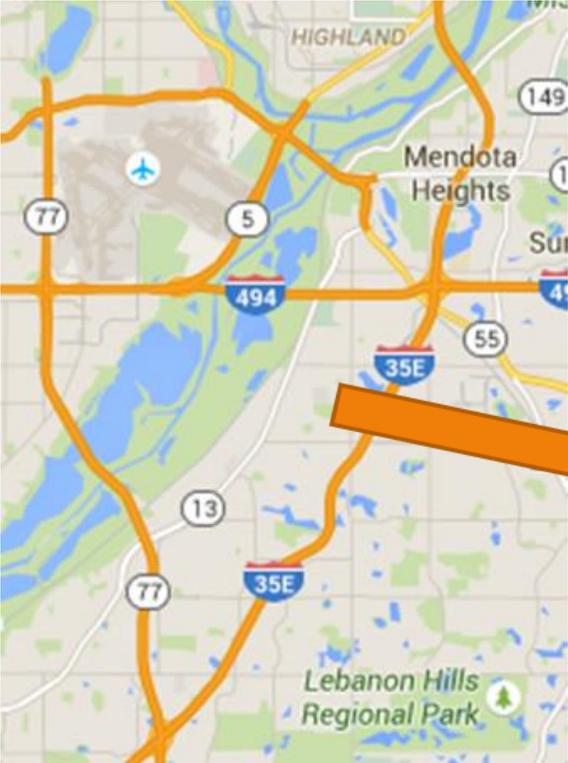
- MCES Seneca Wastewater Treatment Facility
 - Located in the City of Eagan
 - Treats and discharges ~20 MGD to the Minnesota River
 - Basin underdrains discharge ~1 MGD to the river



Identification of a source

- Look around...
- Who uses water?
- Where is there abundant water?
- **What is the quality of that water source?** ←
- **What is the water quality that is needed for the end use?** ←

Conceptual project area



How was the partnership formed?

- The City of Eagan is looking to promote a sustainable water supply.
- The City cannot do water reuse projects alone and is looking for partners.
- Conservation has reduced the peak flows but more needs to be done.
- Non-potable water use for irrigation and commercial/industrial processes is a simple solution.

Partnership benefit

How would water reuse benefit both private companies and the City of Eagan?

- Reduces Eagan's peak summer demand
- Reduces the need to expand current infrastructure
- Matches the private company corporate sustainability policy
- Reduces operational cost for both parties

current partnerships



- Eagan is the lead party working with Barr on the reuse system users and infrastructure.
- Metropolitan Council is supportive of a water reuse project, sharing feasibility funding. CH2M is working on reuse treatment.
- University of Minnesota is an education partner using the project in the Capstone Project Program.

project partners and stakeholders

- Owners:
 - City of Eagan, working with Barr
 - Metropolitan Council, working with CH2M
- Users:
 - Preliminary discussions with private users
- Regulatory
 - DNR
 - MPCA
 - MDH
 - Dakota County

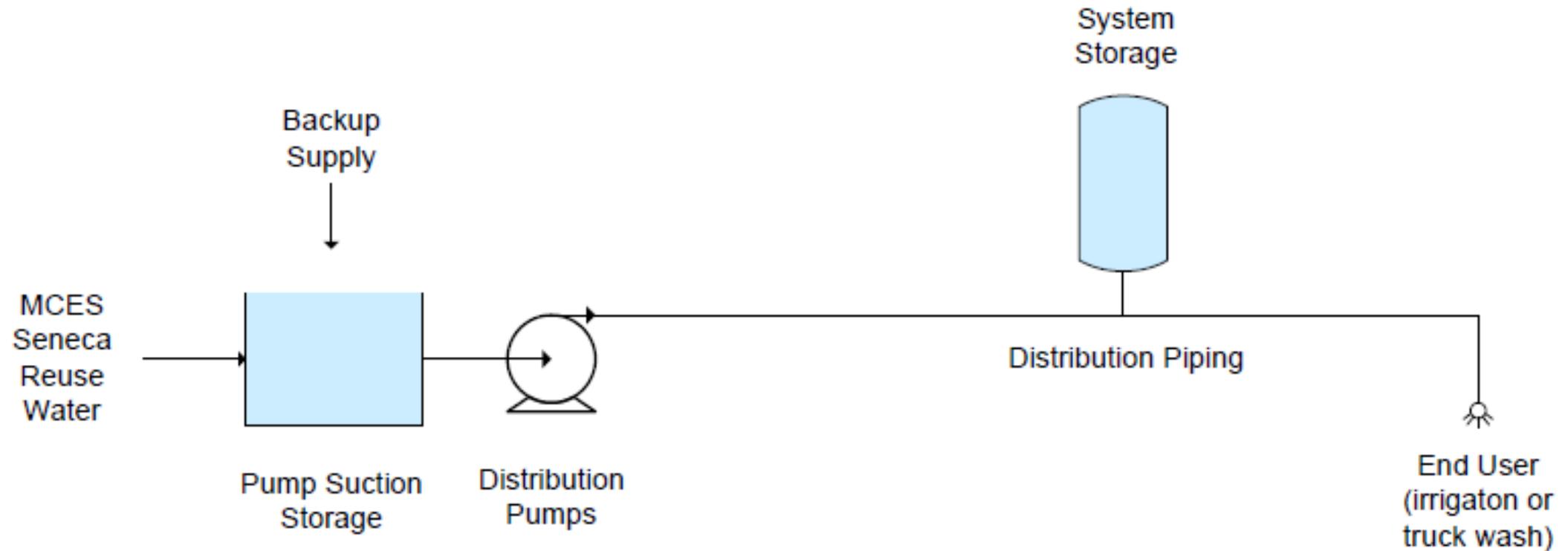
Current project status

Current: project feasibility study stage

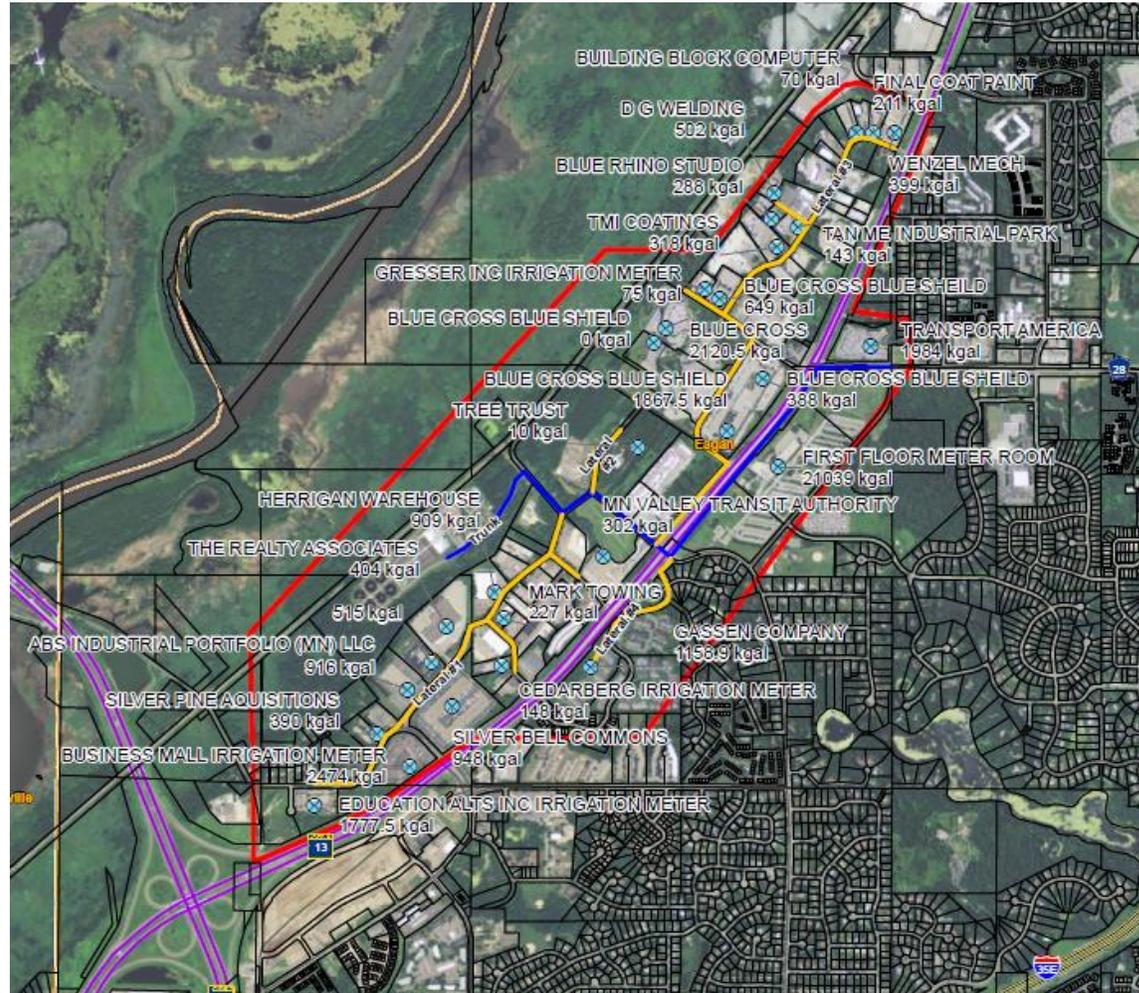
- Identify users and treatment needs
- Identify infrastructure needs and costs
- Confirm partnerships
- Regulatory and permitting issues
- Identify deal breakers

future: design and bidding

Conceptual reuse distribution system schematic



Conceptual reuse distribution system piping



In conclusion

- Reuse projects are happening in Minnesota.
- Partnering is essential for many reuse projects.
- Reuse projects can help conserve water, achieve stormwater management, and sustain water supply goals.



Resources

- WaterReuse Association
- MIDS calculator: harvest and reuse
- Met Council Stormwater Reuse Guide
- MPCA Municipal Wastewater Reuse
- Envision Rating System™

The screenshot shows a software window titled "MP Properties" with a sub-tab "MP Properties: 1 - Harvest and re-use/Cistern". The window has three tabs: "Watershed", "BMP Parameters", and "BMP Summary". The "BMP Summary" tab is active, displaying a list of parameters for a "Harvest and re-use/Cistern" BMP. On the left, there is a photograph of a black rain barrel. The parameters are as follows:

Parameter	Value	Unit
Required treatment volume	1996	ft ³
Reuse storage volume	1996	ft ³
Irrigation application area	0.5	acres
Irrigation application rate	1	in/week
Irrigation season start month	May	
Irrigation season end month	September	
Does the system go offline during off season	Yes	
Volume reduction capacity of BMP [V]	778	ft ³
Volume of retention provided by BMP	778	ft ³

At the bottom right of the window are "OK" and "HELP" buttons.



Discussion and questions?

Any questions or comments?

Thank you!

