Transitioning from Permit Compliance to Wastewater Excellence

US EPA sponsored webinar for Wastewater Treatment Plant Operators
April 28, 2022

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President
Grant Tech, Inc.
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Optimizing Nutrient Removal & Wastewater Excellence

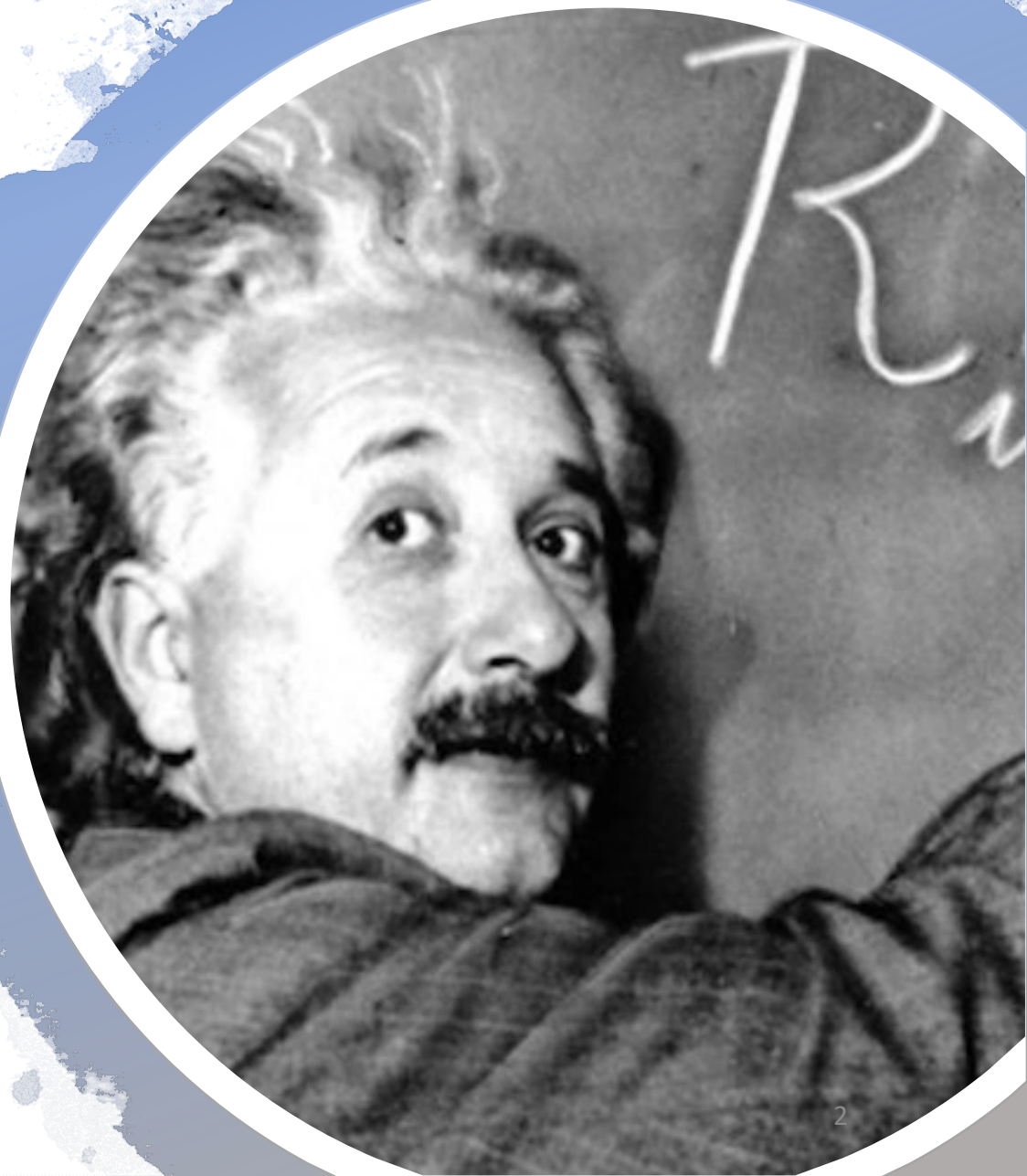
FOR OPERATORS & ADMINISTRATORS

Optimizing Nutrient Removal in:

- **Oxidation Ditches** (January)
- **Sequencing Batch Reactors** (February)
- **Other Activated Sludge WWTPs** (March)

FOR ADMINISTRATORS & OPERATORS

Transitioning from Permit Compliance to Wastewater Excellence (Today)



Review

Nitrogen Removal is a Biological Process

1. Bacteria convert ammonia (NH_3) to nitrate (NO_3) in high DO / low BOD conditions
2. Different bacteria convert nitrate (NO_3) to nitrogen gas (N_2) in low DO / high BOD conditions

Phosphorus can be removed Biologically

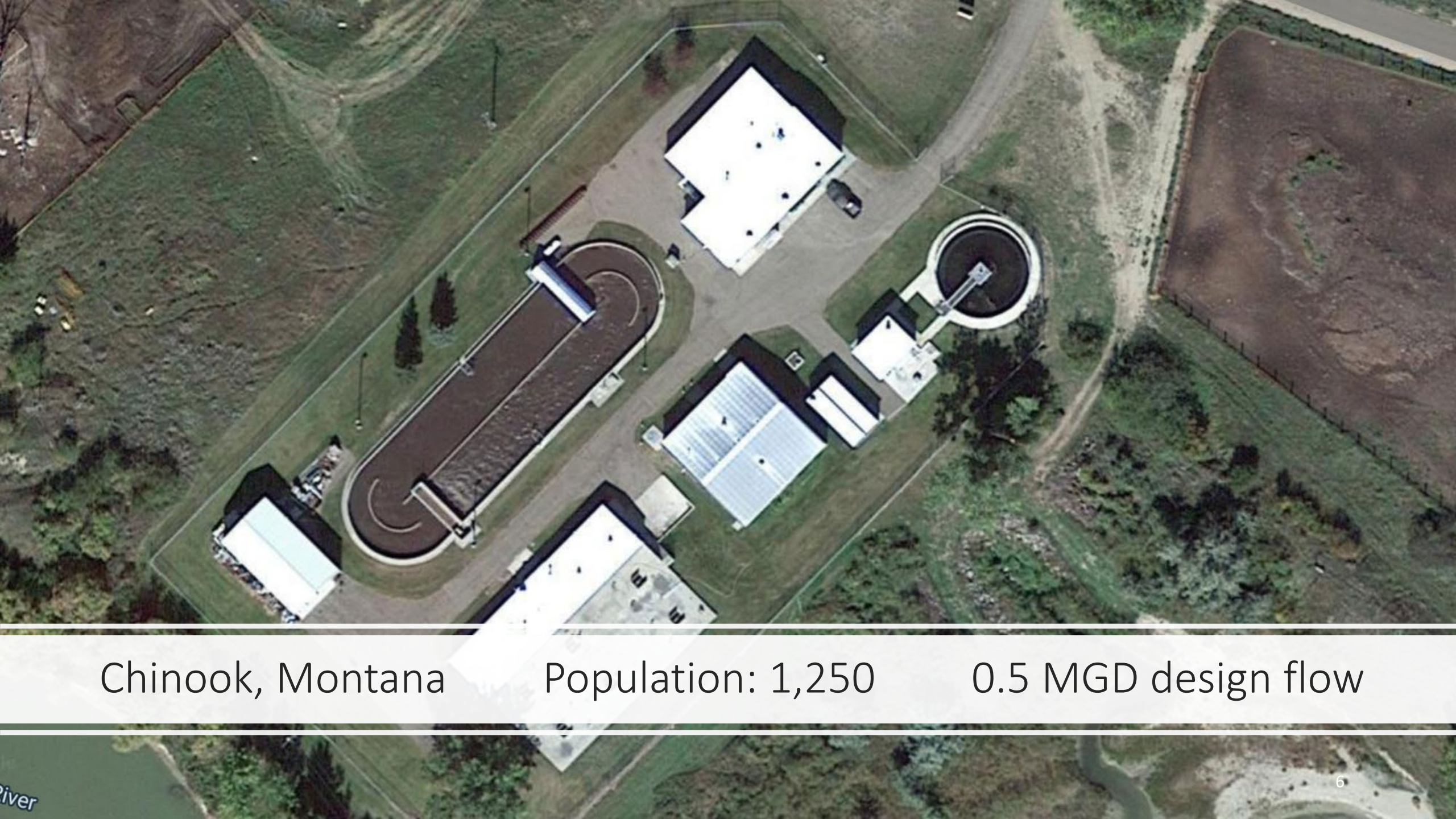
1. In septic conditions, one kind of bacteria break down pollutants to create the food bio-P bugs eat (VFAs, volatile fatty acids)
2. Bio-P bugs (PAOs, phosphate accumulating organisms) “eat” VFAs in septic conditions
3. Bio-P bugs remove phosphorus in aerobic conditions with a pH of at least 6.8
4. Under the “wrong” conditions, bio-P bugs will re-release the phosphorus back into solution

Plants designed to Biologically remove nutrients are built with tanks to create these environments

Review: continued

Wastewater Treatment Plants NOT DESIGNED to remove Nitrogen can often be operated to do so Biologically

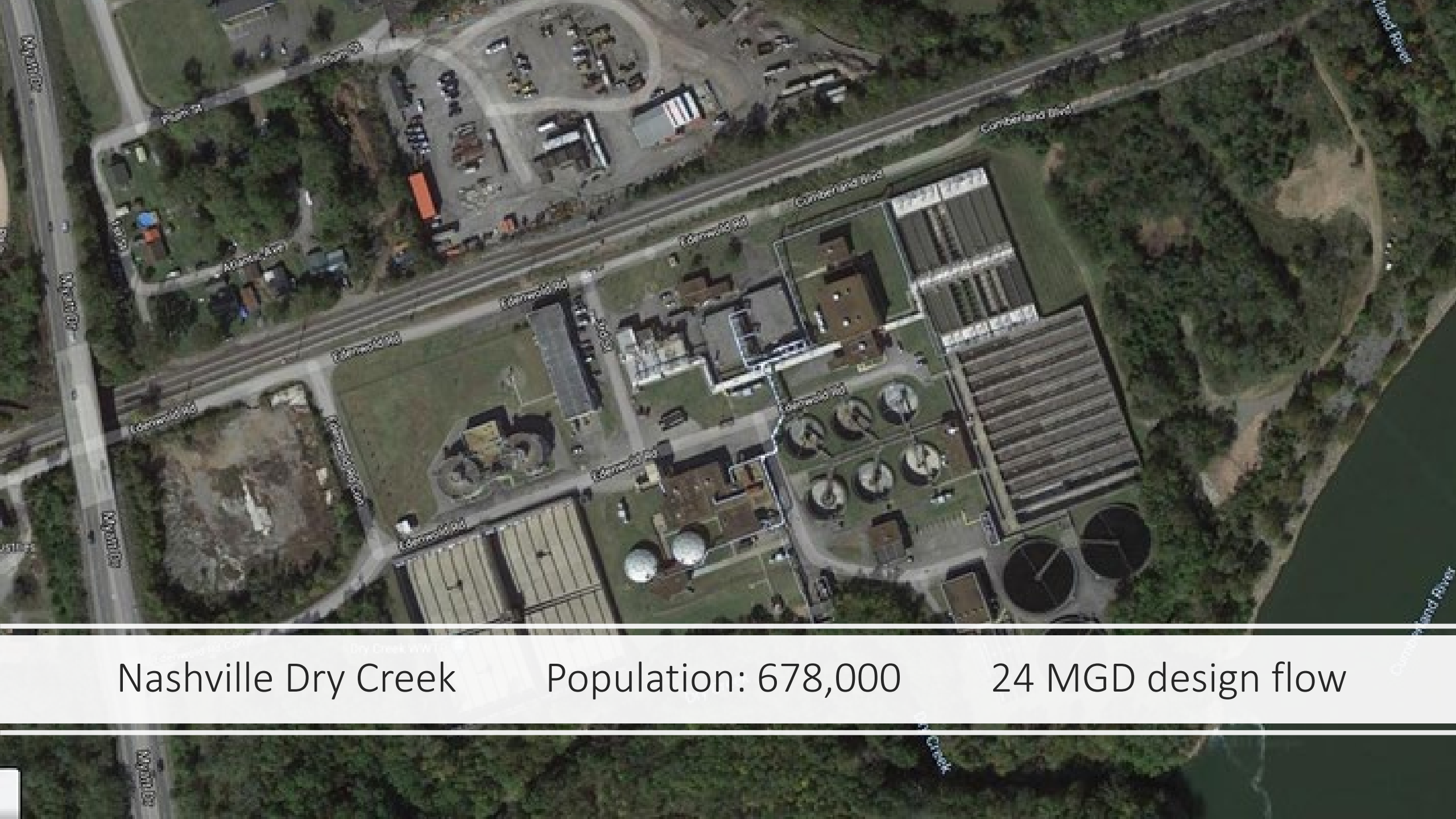

7
N
Nitrogen



Chinook, Montana Population: 1,250 0.5 MGD design flow

Sunderland, Massachusetts Population: 3,700 0.5 MGD design flow

Norris, Tennessee Population: 1,450 0.2 MGD design flow



Nashville Dry Creek Population: 678,000 24 MGD design flow

Review: continued

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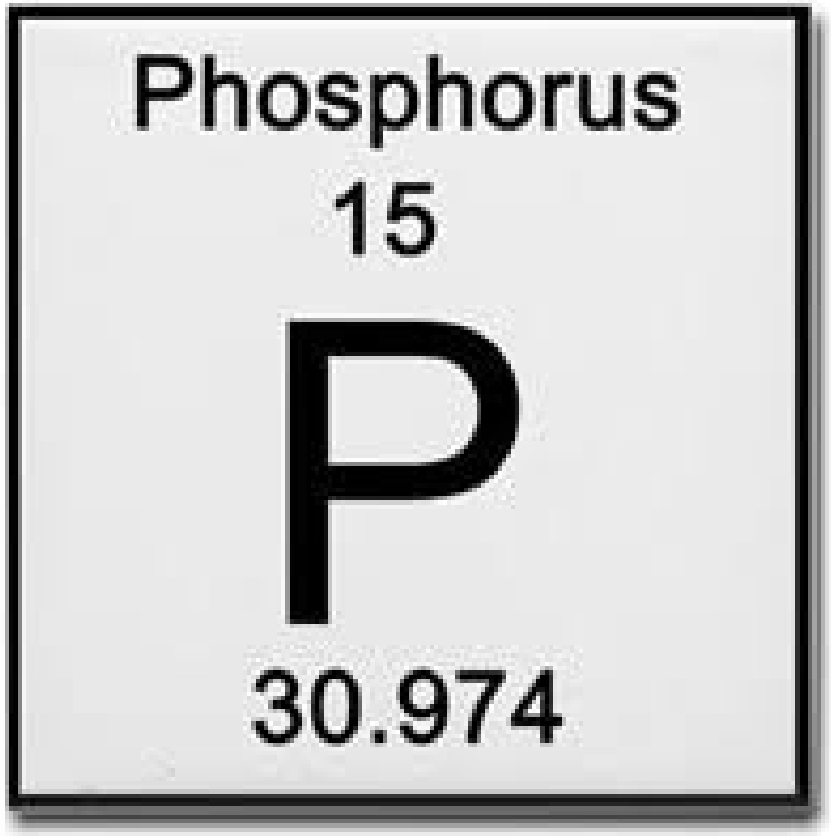
Wastewater Treatment Plants NOT DESIGNED to remove Phosphorus can often be operated to do so Biologically


Phosphorus
15
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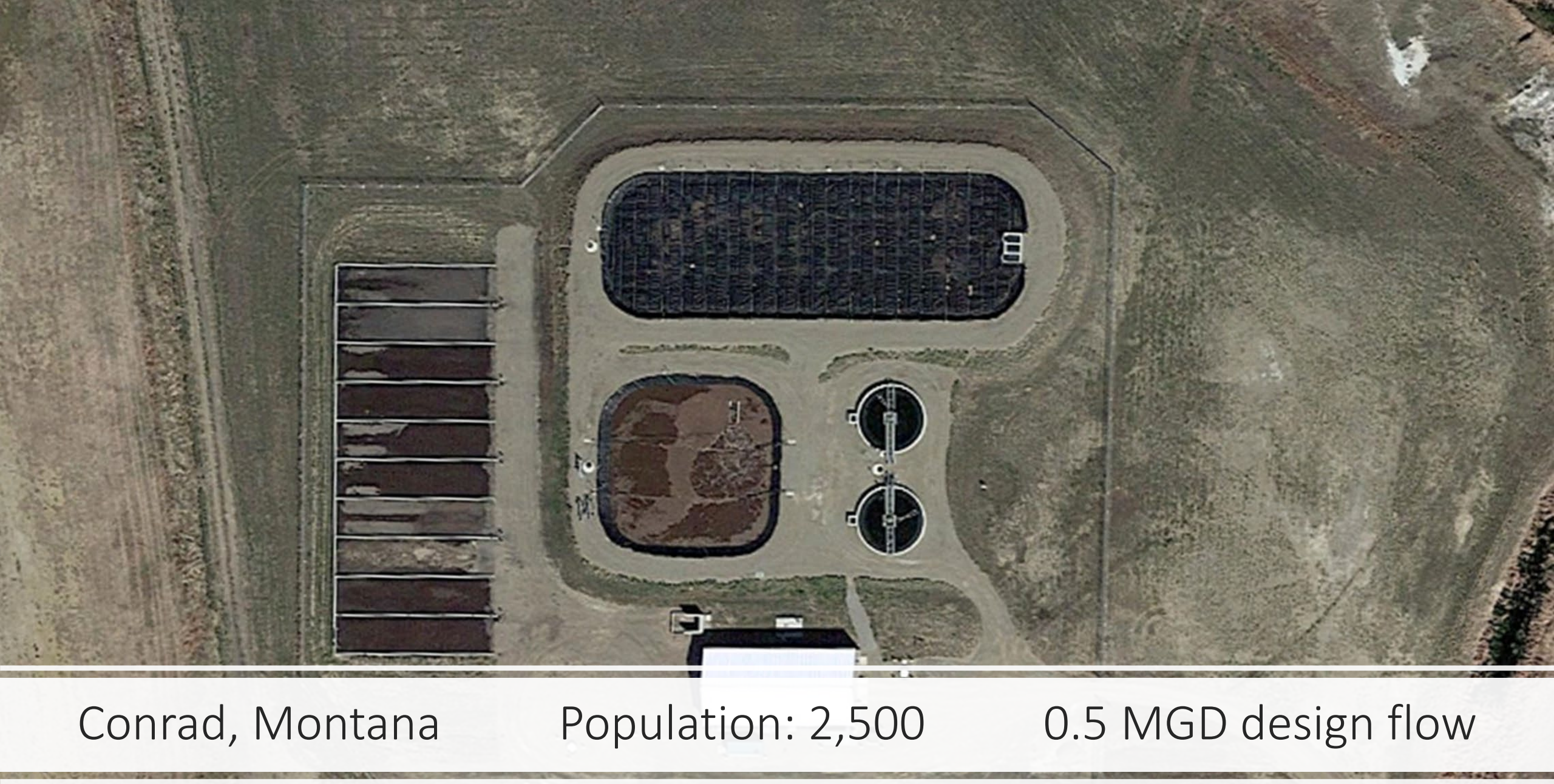
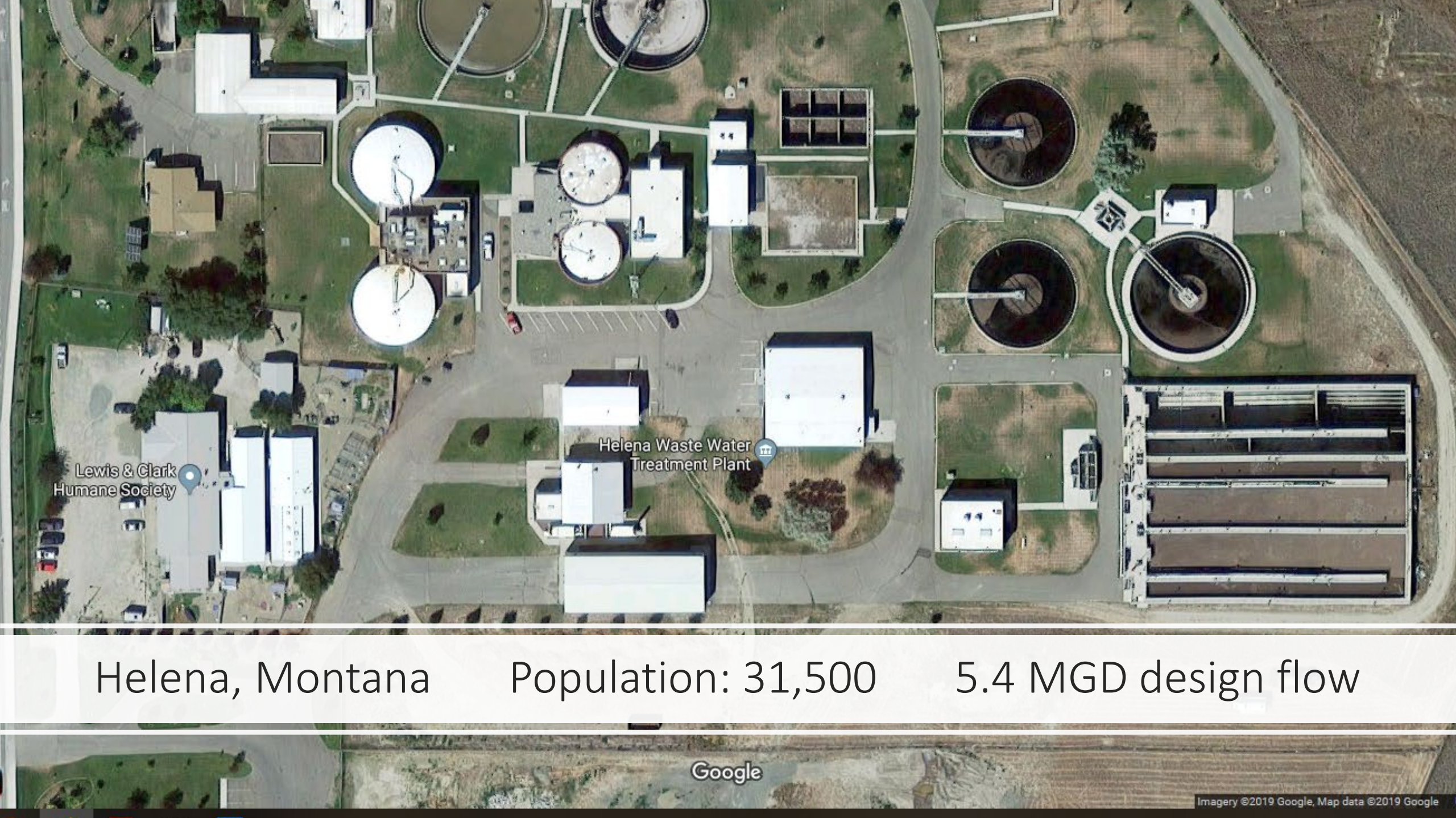
Great Bend, Kansas Population: 13,400 3.6 MGD design flow

Abilene, Kansas Population: 6,400 1.5 MGD design flow



Conrad, Montana Population: 2,500 0.5 MGD design flow

Parsons, Kansas Population: 9,700 2.5 MGD design flow



Helena, Montana Population: 31,500 5.4 MGD design flow

Review: continued

Wastewater Treatment Plants NOT DESIGNED to remove Nitrogen can often be operated to do so Biologically

Wastewater Treatment Plants NOT DESIGNED to remove Phosphorus can often be operated to do so Biologically

Operating Wastewater Treatment Plants DIFFERENTLY THAN DESIGNED can SIGNIFICANTLY IMPROVE Biological Phosphorus and Nitrogen Removal … often at a cost savings

Cookeville, Tennessee Population: 33,500 15 MGD design flow

Conclusion: Lesson Learned

To Remove Nitrogen and Phosphorus at a Wastewater Treatment Plant NOT DESIGNED to remove Nitrogen or Phosphorus …

may require:

NOT “using all equipment as designed”

NOT “following the O&M Manual”

Warning to Operators & Utility Administrators

Check with regulator first:

- **Some states require pre-approval**
- **Many states don't**

Warning to Regulators

It is unrealistic to expect every wwtp to perform as well as my case studies


What do you
think?

THIS IS MY STORY


KEEP
CALM
AND
BLAME
ME FOR EVERYTHING

Connecticut
Colchester-East Hampton
East Haddam
Groton
New Canaan
New Hartford
Plainfield North
Plainfield Village
Suffield
Windham

Kansas
Abilene
Andover
Arkansas City
Baldwin City
Basehor
Beloit
Bonner Springs
Buhler
Caney
Chanute
Chisholm Creek
Coffeyville
Derby
De Soto
Ellinwood
Eudora
Garden Plain
Gardner
Garnett
Goddard
Great Bend
Halstead
Haysville
Herington
Hiawatha
Holton
Independence
Kansas City #14 & 20
Kingman
Lansing
Lakewood Hills
Lyons
Medicine Lodge
Miami CO - Bucyrus
Miami CO - Walnut Creek
Norton
Osawatomie
Parsons
Phillipsburg
Pratt
Riley CO - University Park
Rose Hill
Shawnee CO - Sherwood
St. Marys
Spring Hill
Tonganoxie
Topeka North
Wamego
Wellington
Wellsville
Wichita Plants 1&2
Winfield
Yates Center

Kentucky
Hopkinsville

Massachusetts
Amherst
Barnstable
Easthampton
Greenfield
Montague
Newburyport
Northfield
Palmer
South Deerfield
South Hadley
Sunderland
Upton
Westfield

Montana
Bigfork
Big Sky
Billings
Boulder
Bozeman
Butte
Chinook
Choteau
Colstrip
Columbia Falls
Conrad
Craig
Dillon
East Helena
Forsyth
Gallatin Gateway
Glendive
Great Falls
Hamilton
Hardin
Havre
Helena
Kalispell
Laurel
Lewistown
Libby
Lolo
Manhattan
Miles City
Missoula
Stevensville
Wolf Creek

New Hampshire
Keene

North Carolina
Asheboro
Eden - Mebane Bridge
Newton
Reidsville

South Carolina
Greeneville

Tennessee
Athens
Baileyton
Bartlett
Chattanooga
Collierville
Cookeville
Cowan
Crossville
Dickson – White Bluff
Harpeth Valley
Harriman
Humboldt
Lafayette
LaFollette
Livingston
McMinnville
Millington
Nashville Dry Creek
Norris
Oak Ridge
Oneida

Virginia
Strasburg

Washington
Alderwood
Everett
King CO Brightwater
Lake Stevens
Marysville
Mukilteo
Port Orchard
Puyallup
Sultan
Sumner

Wyoming
Laramie

Low-Cost Nutrient Removal in Montana

2022 Final Report

Data exist for **34 Montana mechanical municipal wastewater treatment facilities**

- **14 facilities** underwent nutrient removal facility upgrades
- **20 facilities were optimized only, NOT upgraded**

The 20 facilities optimized but not upgraded realized a significant reduction in discharge of nitrogen and/or phosphorus:

- ***127 tons less per year of nitrogen***
- ***19 tons less per year of phosphorus.***

"The results clearly demonstrate that optimization produces significant nutrient reduction."

DEQ Montana Department of Environmental Quality

Table 2 – Montana Summary Nutrient Reduction Data – Non-Upgraded Facilities

	Metric	Total-N	Total-P
Conventional	Avg. Concentration Before (mg/L)	16.5	2.5
	Avg. Concentration After (mg/L)	9.9	1.9
	Overall Additional Concentration Reduction	**40%**	**25%**
	Overall Additional Mass Reduction (ton/yr)	**57**	**6**
BNR/AWT	Avg. Concentration Before (mg/L)	10.3	0.9
	Avg. Concentration After (mg/L)	7.0	0.7
	Overall Additional Concentration Reduction	**32%**	**17%**
	Overall Additional Mass Reduction (ton/yr)	**70**	**13**
Combined	Avg. Concentration Before (mg/L)	14.3	1.9
	Avg. Concentration After (mg/L)	8.9	1.5
	Overall Additional Concentration Reduction	**38%**	**23%**
	Overall Additional Mass Reduction (ton/yr)	**127**	**19**

Montana wwtps NOT DESIGNED to remove Nitrogen or Phosphorus:

40% total-Nitrogen reduction

25% total-Phosphorus reduction

less than $25,000 per wwtp

… … … …

To achieve similar results through conventional improvements, ***the cost to each community would typically be in the millions of dollars.***

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	Overall Additional Concentration Reduction	**38%**	**23%**
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AND

Significant improvements were seen in wwtps designed to remove Nitrogen and Phosphorus:

32% more total-Nitrogen

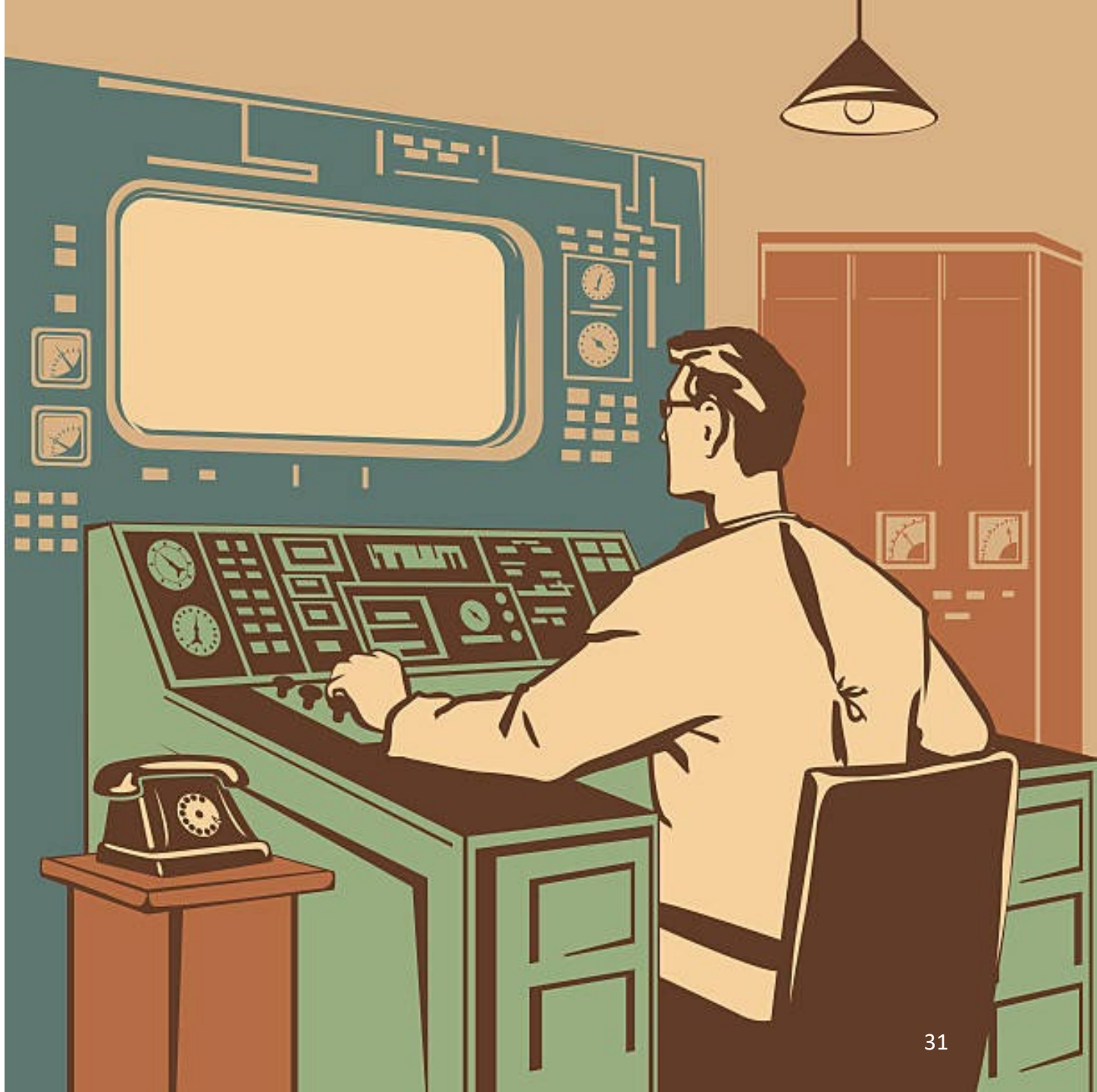
17% more total-Phosphorus

"Montana's experience demonstrates that there is little to lose and much to gain in implementing widespread municipal wastewater treatment plant nutrient optimization."

Promoting excellence


Share your thoughts

Empowering Operators



the Generic Wastewater Operator

Job 1: compliance

meet permit & adhere to rules and regulations

Under the radar:

a good day is one when nobody complains

Risk adverse

Deferential:

regulators are feared, engineers are respected

Operators are generally more mechanically skilled than scientifically (process) knowledgeable

Empowering Wastewater Operators

Plant Manager Skillset

Training

Licensing

epa.gov/compliance/technical-assistance-webinar-series-improving-cwa-npdes-permit-compliance

- or search –

"EPA Technical Assistance Webinar Series"

EPA United States Environmental Protection Agency

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Compliance

CONTACT US

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- How We Monitor Compliance
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  - CERCLA
  - CWA
  - FIFRA
  - RCRA
  - SDWA
  - TSCA
  - Good Laboratory Practices (GLP)
- State Review Framework
- NPDES Electronic Reporting
- Compliance Assistance Centers
- National Enforcement Training Institute (NETI)
- Resources and Guidance Documents
  - Compliance Assistance
  - Compliance Monitoring
  - State Oversight

Technical Assistance Webinar Series: Improving CWA-NPDES Permit Compliance

On this page:

- Upcoming Webinars
- Recorded Webinars

This technical assistance webinar series supports the joint EPA and Authorized State Significant Noncompliance (SNC) Rate Reduction National Compliance Initiative (NCI). The SNC NCI is aimed at improving surface water quality and reducing potential impacts on drinking water by assuring that all Clean Water Act (CWA) – National Pollutant Discharge Elimination System (NDPES) permittees are complying with their wastewater discharge permits.

This page includes registration information for upcoming webinars as well as recordings and supplemental materials for past webinars.

Intended Audience: The webinars are intended for plant operators, municipal leaders, technical assistance providers, and compliance inspection staff from federal, state, tribal and local governments. Every plant is unique and plant operators should discuss any major operational change with their NDPES permiting authority.

For attending live webinars: All registered attendees receive a follow-up email from GoToWebinar 24 hours after the conclusion of the webinar which includes a link to download a certificate of attendance. Acceptance of certificates for CEUs is contingent on state and/or organization requirements—EPA cannot guarantee acceptance. Discuss eligibility of continuing education credits with your state's specific certification authority.

For viewing recorded webinars: We are *unable* to provide certificates of attendance for viewing our previously recorded webinars.

For additional information, contact: Laura Paradise (paradise.laura@epa.gov) or Peter Bahor (bahor.peter@epa.gov)

Upcoming Webinars

- Thursday March 31, 2022 (1:00 – 2:30pm Eastern)
  Optimizing Nutrient Removal in Activated Sludge WWTPs EXIT
  Presenter: Grant Weaver, PE, President Grant Tech, Inc
- Thursday April 28, 2022 (1:00 – 2:30pm Eastern)
  Transitioning from Permit Compliance to Wastewater Excellence EXIT
  Presenter: Grant Weaver, PE, President Grant Tech, Inc

Recorded Webinars

Recorded Webinars

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Show 10 entries Search:

Webinar	Date
Alkalinity Testing for Better Process Control in Small Wastewater Treatment Plants	2020-01-29
Asset Management 101 – Finding Financial Assistance for Infrastructure Upgrades	2020-04-15
Best Management Practices for POTW Compliance Part 1	2020-08-18
Best Management Practices for POTW Compliance Part 2	2020-09-15
Biosolids Part 1: Overview of Wastewater Treatment Sludge and Clean Water Act Regulatory Structure	2021-04-29
Biosolids Part 2: Wastewater Treatment Sludge Disposal Methods	2021-05-27
Build Resilience & Adapt to Climate Change Impacts for Drinking Water & Wastewater Utilities Part 2	2021-07-29
CWA – NPDES Compliance Assistance for Public Drinking Water Systems	2020-05-13
Discharge Monitoring Reports - Avoiding Common Mistakes	2020-07-15
Do's and Don'ts in Operating an NPDES Laboratory: Common Mistakes and Ways to Improve Results	2021-02-24

Showing 1 to 10 of 26 entries Previous 1 2 3 Next

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- or search –

"EPA Technical Assistance Webinar Series"

epa.gov/eg/national-study-nutrient-removal-and-secondary-technologies

- or search –

"EPA Nutrients National Study"

National Study of Nutrient Removal and Secondary Technologies

EPA is examining efficient and cost-effective approaches for nutrient removal at publicly owned treatment works (POTW). As part of the national study, the agency conducted a survey of POTWs during 2019 to 2021.

On this page:

Photo credit: Jane Thomas, Integration & Application Network, University of Maryland Center for Environmental Science EXIT

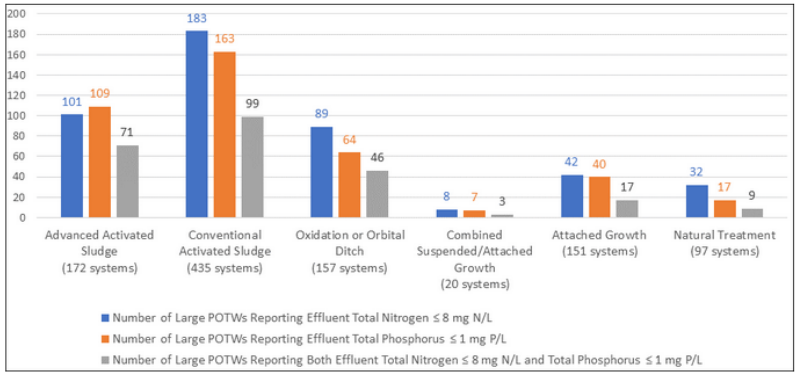
Study Goals

Some POTWs have added new treatment processes to remove nutrients, but these upgrades may not be affordable or necessary for all facilities. This study is helping EPA learn about other ways that POTWs are reducing their nutrient discharges, while optimizing operation and maintenance practices, and without incurring large capital expenses. The study has three main goals:

1. Obtain nationwide data on nutrient removal.
2. Encourage improved POTW performance with less expense

Nutrient Removal Accomplished Nationwide

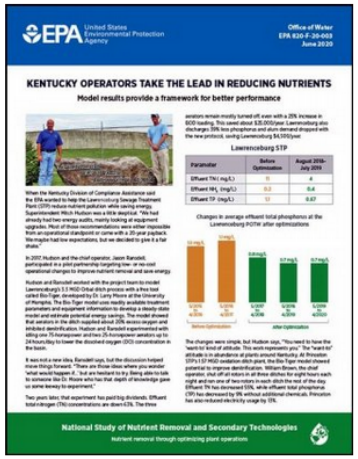
Initial results of the screener questionnaire help demonstrate an important aspect of the National Study: improved nutrient removal is attainable by all types of POTWs. Survey results to date show more than 1,000 POTWs with different biological treatment types (including both conventional and advanced treatment technologies) can achieve effluent total nitrogen of 8 mg/L and total phosphorus of 1 mg/L. The figure below includes those POTWs with a population served of at least 750 individuals and a design capacity flow of at least 1 million gallons per day.



Note: Survey respondents could select multiple biological treatment types.

Fact Sheets

Descriptions of low-cost adjustments to reduce nutrient pollutant discharges at sewage treatment plants.



- No Plant is Too Small to Optimize: Wisconsin Operator Ingenuity (May 2021)
- Optimizing Biological Phosphorus Removal in Minnesota (March 2021)
- Tennessee: Quest for Energy Efficiency Inspires Operators' Pursuit of Nutrient Removal (January 2021)
- Kansas: High-Quality Water From Small POTWs (June 2020)
- Kentucky Operators Take The Lead in Reducing Nutrients (June 2020)
- Optimizing for Results in Montana (June 2020)

epa.gov/eg/national-study-nutrient-removal-and-secondary-technologies

- or search –

"EPA Nutrients National Study"

Empowering Wastewater Operators

Plant Manager Skillset

Training

Licensing

Control / Decision making authority

Raise job status

Decision making powers

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Remote Support

Rural America, especially

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Raise Expectations!

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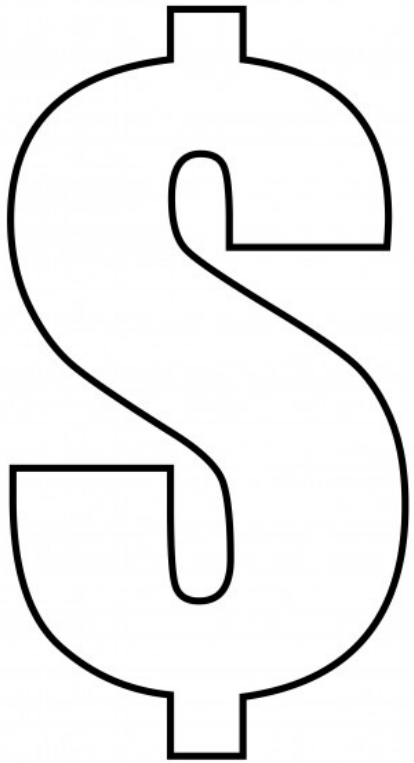


Questions?
Comments?


What do you
think?

Acknowledgements

ABILENE, KANSAS G.D. Hite, Kevin Clark & Lon Schrader

CHINOOK, MONTANA Eric Miller & Cory Fox

CONRAD, MONTANA Keith Thaut

COOKEVILLE, TENNESSEE Ronnie Kelly, Tom Graham & John Buford

GREAT BEND, KANSAS Jason Cauley, Reuben Martin, April Batts & James Gaunt

HELENA, MONTANA Jeff Brown, Mark Fitzwater (retired), Fred Irving & staff

PARSONS, KANSAS Derek Clevenger

PLAINFIELD, CONNECTICUT Jeff Young (deceased), Jay Young (retired) & Stephanie Baldino

NASHVILLE, TENNESSEE David Tucker & Johnnie McDonald (retired)

NORRIS, TENNESSEE Tony Wilkerson & Doug Snelson

SUNDERLAND, MASSACHUSETTS Bob Gabry

EPA Peter Bahor, Laura Paradise, Jake Nguyen, Paul Shriner & Tony Tripp (**HQ**), Brendon Held & Craig Hesterlee (**R4**), Andrea Schaller & Sydney Weiss (**R5**), Tina Laidlaw (**R8**),

TENNESSEE Karina Bynum, Tim Hill & Mark Valencia (**TDEC**), Brett Ward (**UT-MTAS**), Dewayne Culpepper (**TAUD**)

KANSAS Tom Stiles, Shelly Shores-Miller, Ryan Eldredge & Rod Geisler (retired), (**KDHE**)

MONTANA Paul LaVigne (retired), Pete Boettcher, Josh Viall, Darryl Barton, Bill Bahr (retired) & Dave Frickey (retired) (**DEQ**)


Questions?
Comments?

Utility Administrator's Path to Wastewater Excellence

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Plant Manager's Skillset

Everything a municipal manager needs to know

Plus "Process Control" skills and/or provide remote support

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Information necessary to responsibly oversee operations

Lab Reports

Monthly Electric Bills

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Inclusion

Involve operators in decision-making

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Monthly Electric Bills

Inclusion

Involve operators in decision-making

Raise expectations

Expect permit compliance

Establish metrics (e.g., KWH per MGD or BOD … lbs chemical per MGD or # influent alkalinity)

Utility Administrator's Path to Wastewater Excellence

Plant Manager's Skillset

Everything a municipal manager needs to know

Plus "Process Control" skills and/or provide remote support

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Monthly Electric Bills

Inclusion

Involve operators in decision-making

Raise expectations

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Establish metrics (e.g., KWH per MGD or BOD … lbs chemical per MGD or # influent alkalinity)

Support failure / Reward success


Questions?
Comments?

Grant's approach to Wastewater Excellence

Operator training

Nitrogen & Phosphorus removal fundamentals

Case studies

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Nitrogen & Phosphorus removal fundamentals

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In-plant support

Brainstorm optimization strategies with plant staff

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Site-specific optimization strategy with process control targets

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Ongoing technical support
Remote and in-plant

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Case studies

In-plant support
Brainstorm optimization strategies with plant staff

Written plan
Site-specific optimization strategy with process control targets

Ongoing technical support
Remote and in-plant

Regulatory support
Critical to success


What do you
think?


Questions?
Comments?

Optimizing Nutrient Removal & Wastewater Excellence

That's it.

Thanks for Participating!

Grant Weaver
Grant@GrantTechSolutions.com