

June 20, 2017

# Telluride Regional Wastewater Treatment Plant Master Plan





# Today's Focus

Discuss technical and engineering aspects of the Master Plan.

**1** Background

**2** Immediate Improvements

**3** Near-Term Improvements

**4** Long-Term Modifications

**5** Wrap Up

(While estimated costs will be presented, detailed discussion about costs and financing is for another day.)

# 1 Background

Wastewater Treatment is a dynamic process involving living organisms whose sole purpose is to break down pollutants into components that can be reused in the environment.

# 1 Background ... **WHY DO WE NEED A MASTER PLAN?**

## 1. **AGING INFRASTRUCTURE**

- TRWWTP Phase 1 went on line around 1987
- Phase 2 went online around 1993
- Phase 3, 2001

## 2. **CAPACITY LIMITS**

- Winter and summer visitor peaks bring us close to TRWWTP operating limits
- Basic regional population growth (estimated at 1.5% per year)

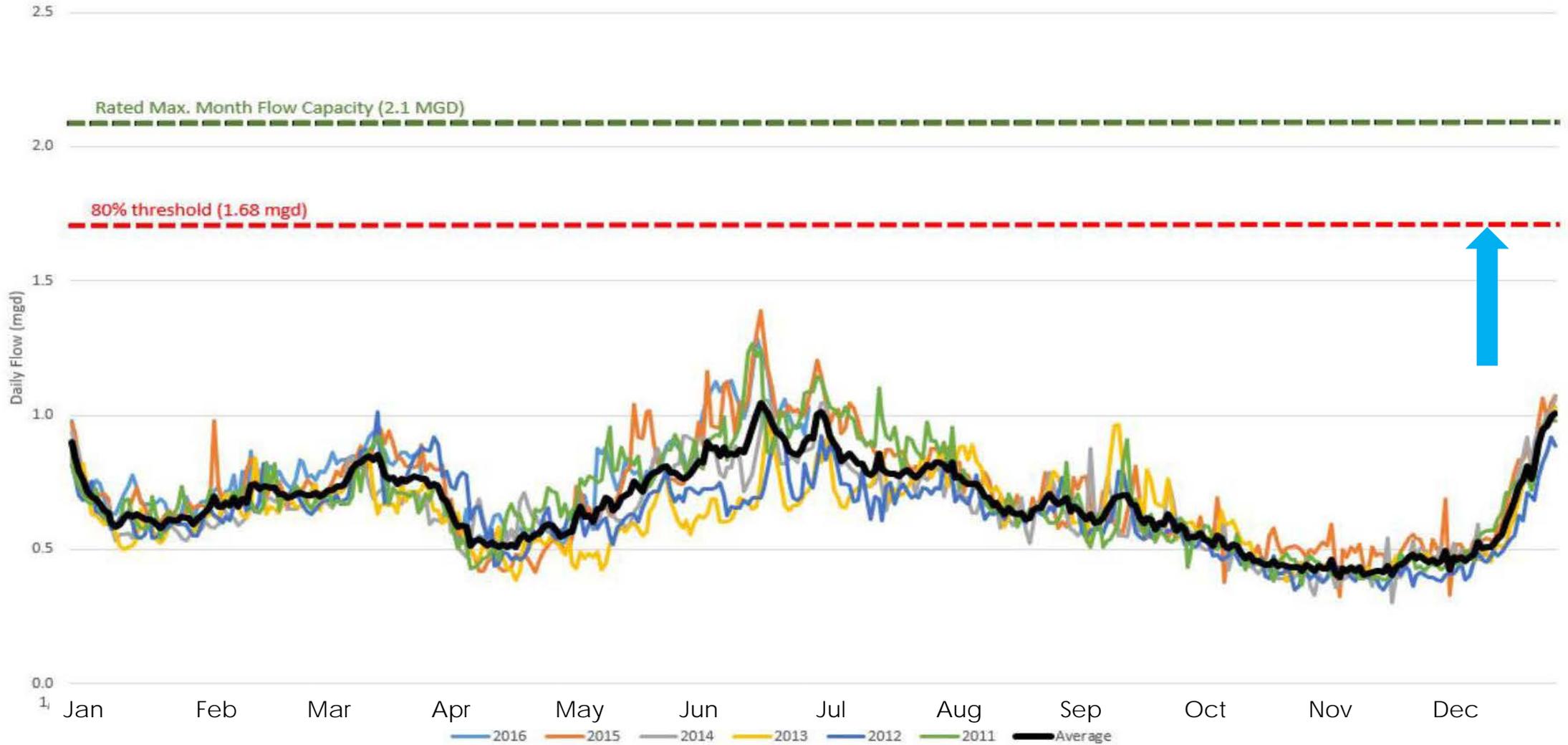
## 3. **STRICTER DISCHARGE PERMIT LIMITS**

- Metals (2017)
- Nutrients (2027)
- Emerging contaminants of concern: temperature, pharmaceuticals, etc. (time uncertain ?)

# Aging Infrastructure

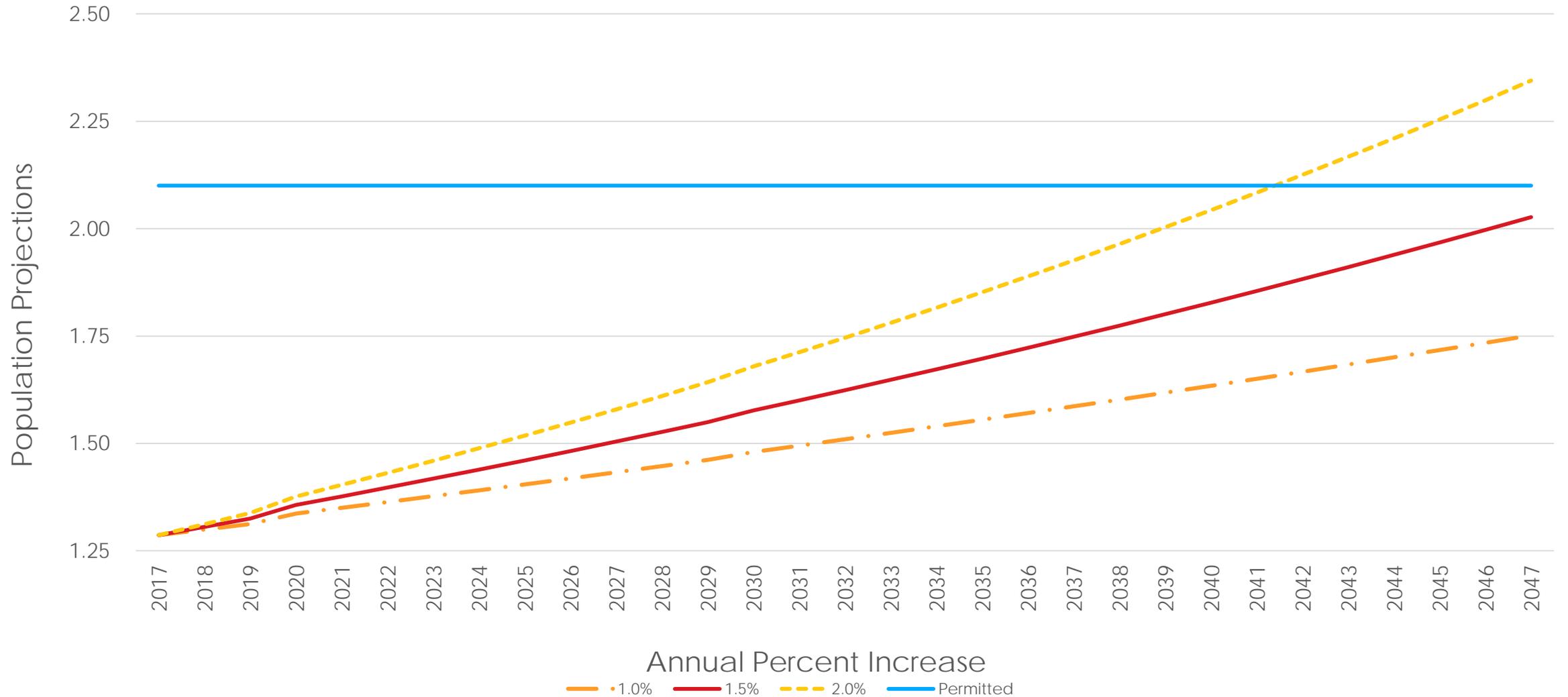


# Capacity Limits, influent daily flow

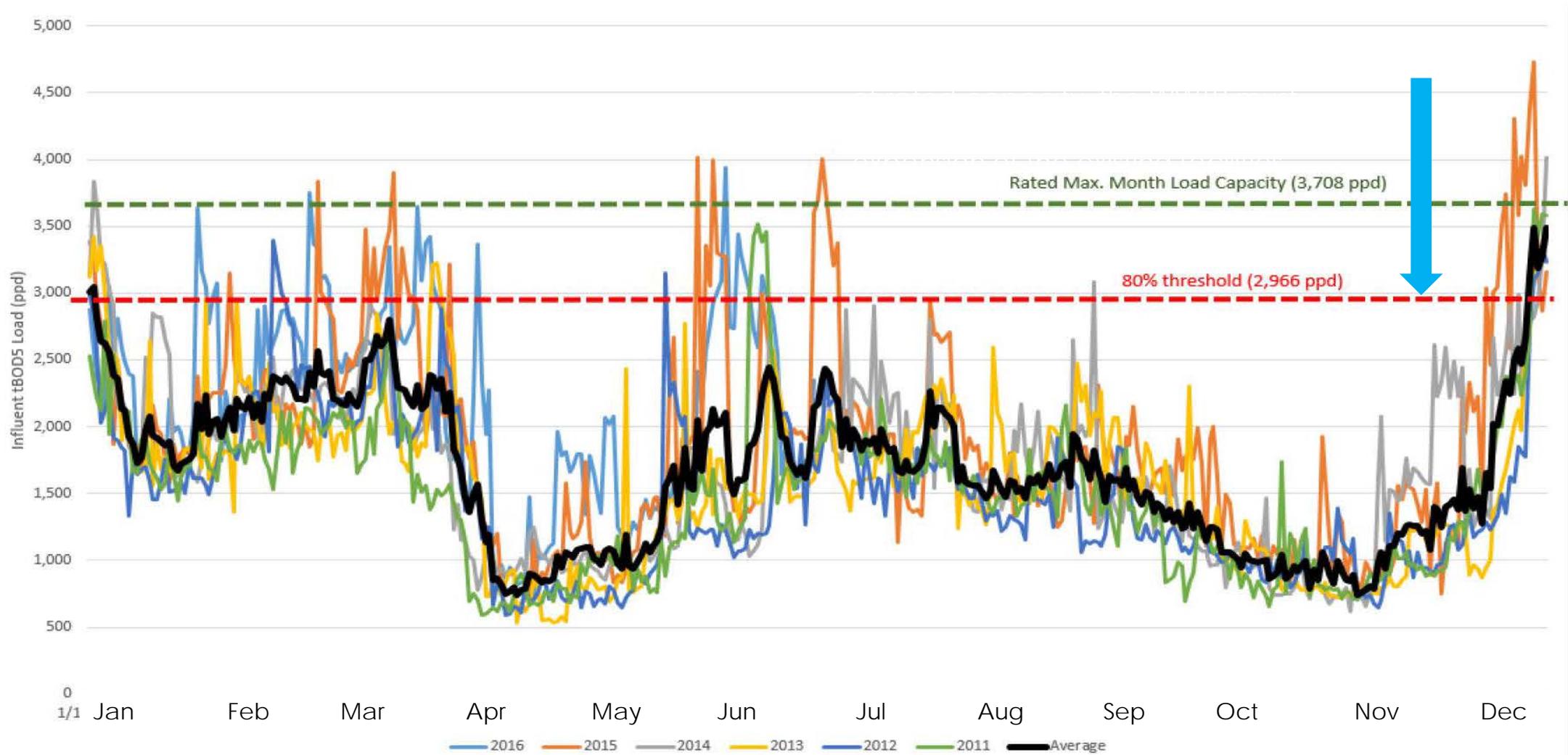


# Projected Wastewater Flow

Maximum 30-day Average Flow Projections for Telluride Regional WWTP

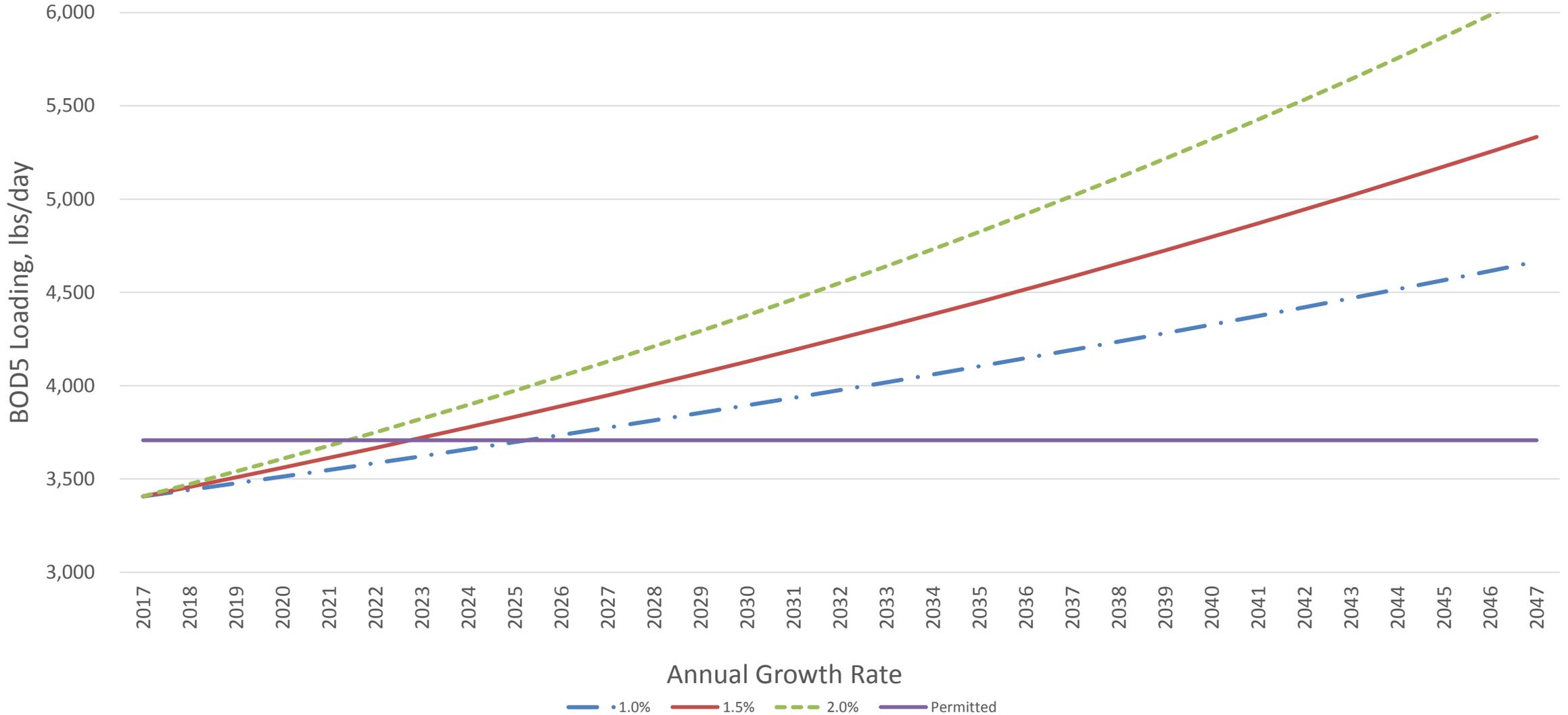


# Capacity Limits, BOD<sub>5</sub>

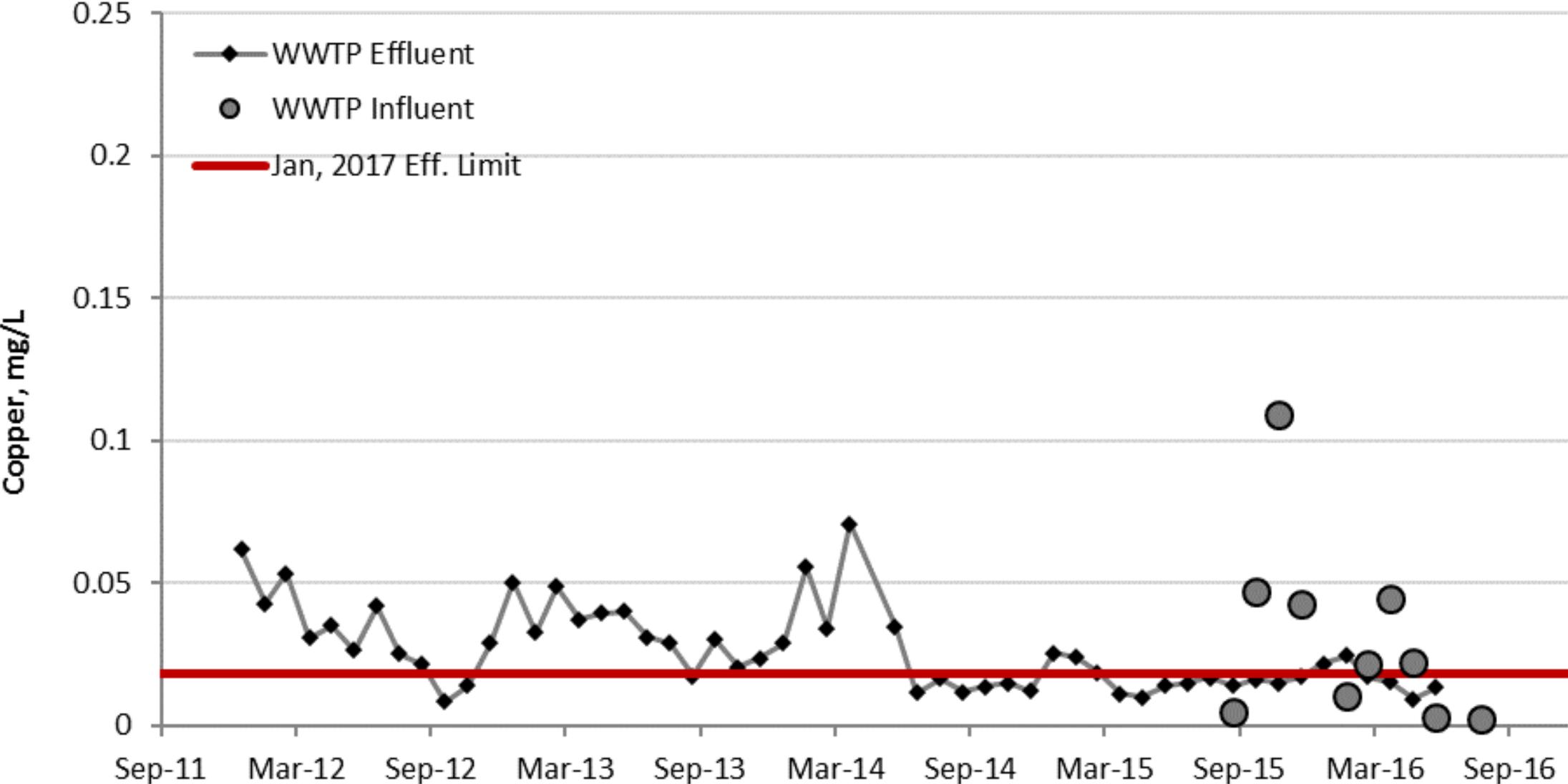


# Projected BOD<sub>5</sub> Loading

Maximum 30-day Average BOD<sub>5</sub> Projections for Telluride Regional WWTP



# New Metals Discharge Limits





# New Regulations

- **REGULATION 85 – EFFLUENT NUTRIENT STANDARDS (2027)**

- TRWWTP subject to technology-based standards in 2027. (The San Miguel River is considered a non-priority stream.)
- Rulemaking on October 10, 2017
  - Adding TIN instream data collection requirements
  - Adopting Chlorophyll-a standards in 2022

- **REGULATION 31– INSTREAM STANDARDS**

- Adopting TP and TN in streams in 2027 (these may be more stringent than technology-based standards.)

- **EMERGING CONTAMINANTS OF CONCERN**

# 1 Background ... **WHAT ARE THE OBJECTIVES?**

**Objective 1:** *Develop a strategy to ensure compliance with discharge permit limits for metals, particularly copper and arsenic.*

**Objective 2:** *Identify factors in the wastewater treatment system that constrain its ability to meet existing and upcoming discharge permit limits for other parameters.*

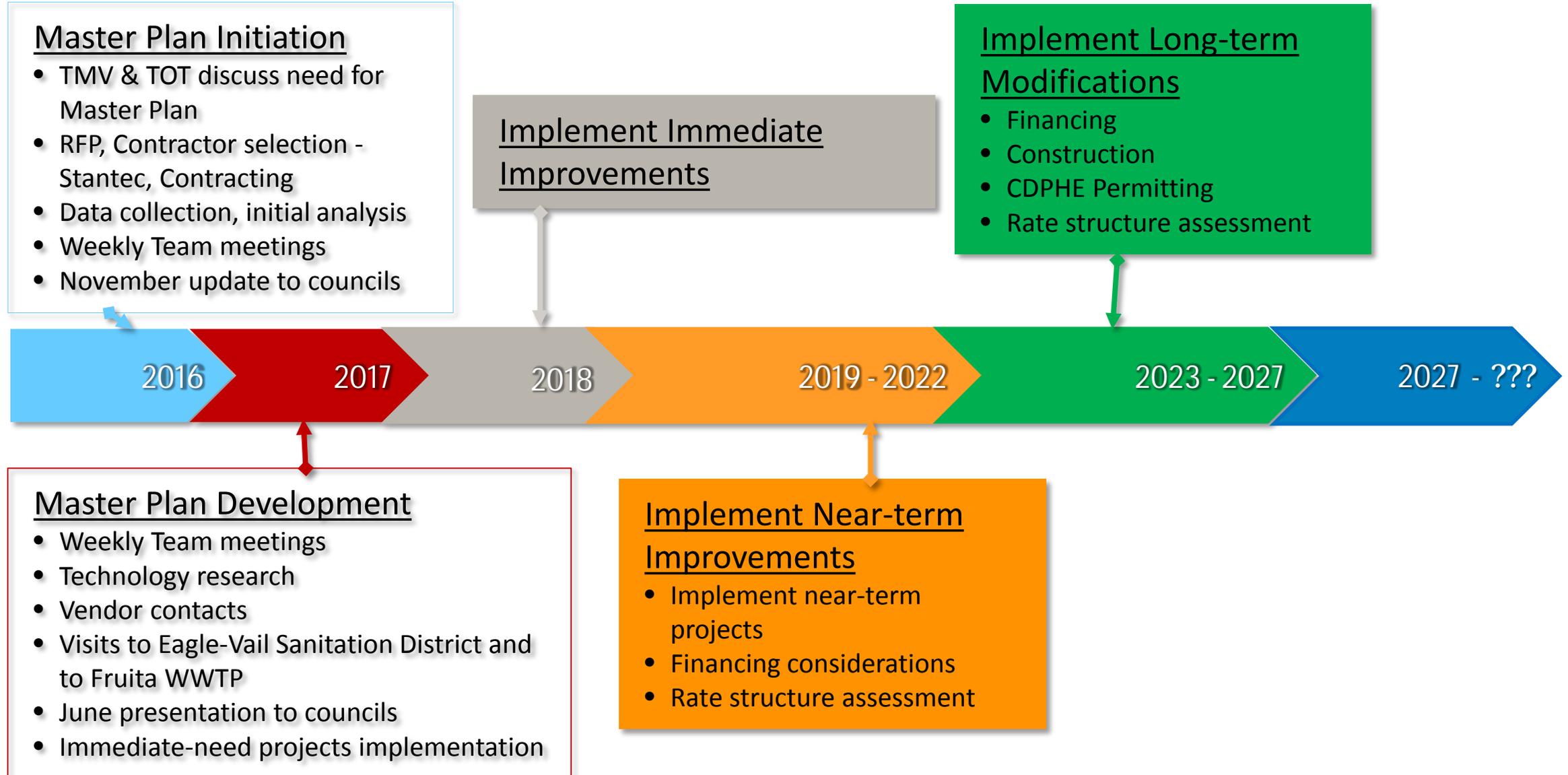
**Objective 3:** *Determine how the wastewater treatment system can meet growth within the service area over the next 30 years?*

**Objective 4:** *Determine how to optimize biosolids generation, treatment, storage, and disposal.*

# 1 Background ... HOW DID WE GET TO TODAY?

1. RFP issued early winter 2016. 5 firms submitted proposals
2. Stantec officially contracted August 2016
3. Stantec, and Telluride & Mountain Village staff gathered data on all relevant components of the water and wastewater systems and system users, reviewed and discussed analyses, toured other wastewater facilities, researched technologies, contacted vendors, and met weekly
4. November/December 2016 “check in” with Telluride and Mountain Village councils and the public about the Master Plan progress
5. Continue with activities from Step 5 until today and this presentation

# 1 Background ... A TIMELINE



# 1 Background ... WASTEWATER 101

1. Treat wastewater, then discharge to river
2. Gather, treat, dewater, haul biosolids (by-product)

Screening & Grit Removal

First take out big stuff. Then take out smaller stuff. Send stuff to landfill.

Oxidation Ditches

Mix "food" with microbes and oxygen. Then wait.

Clarifiers

Encourage microbes to settle out.

Discharge(s)

Disinfect recovered water & send to San Miguel. Treat wasted microbes & dispose (biosolids).

# 1 Background ... WASTEWATER 101

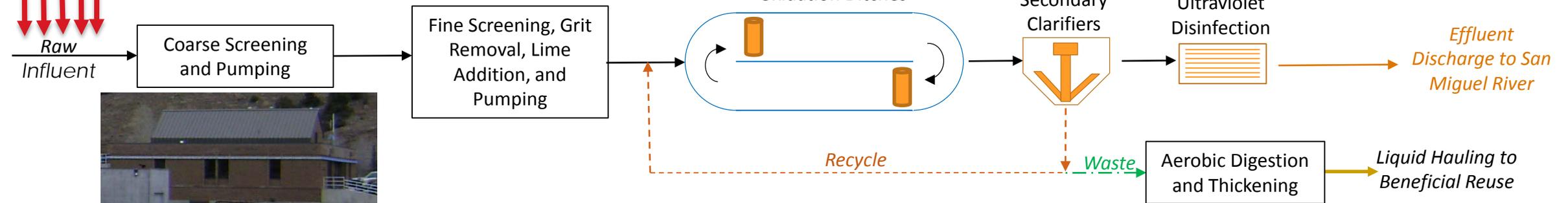
Town of Telluride

Town of Mountain Village

Lawson Hill

Aldasoro

Hillside, Eider Creek, Brown Homestead



# 1 Background ... BIOSOLIDS 101

- Are nutrient-rich organic materials produced from wastewater treatment facilities.
- Can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth.
- Effective management helps ensure this material is used beneficially and harmful materials are not released to water bodies.



# 1 Background ... BIOSOLIDS 101

- Biosolids can be treated to Class A or Class B standards
  - Class A biosolids can be disposed of without restrictions (e.g., soil amendment for ball fields and gardens)
  - Class B biosolids disposal is restricted.
- Processes at the TRWWTP currently treat biosolids to Class B standards in the aerobic digesters. A slurry of biosolids and water is then trucked to apply to agricultural lands in the region.
  - Land application vs composting vs landfilling
  - Hauling mostly water is expensive, but thickening on site with current processes is risky (i.e., odor problems)



Determining a path forward is complex ...

## 2 Immediate Improvements 2017 & 2018

- A. Copper Compliance
- B. Oxidation Ditch Maintenance
- C. Septage Receiving Policy
- D. Biosolids Management

## 2.A Immediate Improvements ... COPPER COMPLIANCE

- TOT currently employing corrosion control for water system. Other water systems in service area may also have to employ corrosion control.
- TOT has modified service pipe specifications to encourage Pure-Core
- TOT & TMV to consider modifying utility ordinances to manage boiler water drainage
- Investigate industrial pre-treatment requirements
- Install enhanced copper removal at TRWWTP

# 2.B Immediate Improvements ... OXIDATION DITCH

## MAINTENANCE

- Clean oxidation ditches to improve capacity, resilience, and reliability.
- A drying bed outside of the ditches would dry sediment more rapidly and decrease down time for maintenance.
  - Sand drying beds\*
  - Containerized filter system
  - Geotextile dewatering tubes



# 2.B Immediate Improvements ... OXIDATION DITCH MAINTENANCE



# 2.B Immediate Needs ... OXIDATION DITCH MAINTENANCE

OPTIONS	ADVANTAGES	DISADVANTAGES	PROBABLE COST ESTIMATE
Sand Drying Beds*	No polymer	<ul style="list-style-type: none"> <li>• Highest capital cost</li> <li>• Requires skid steer and truck for disposal</li> </ul>	<p>Annual O&amp;M = \$2,000</p> <p>Capital = \$200,000</p>
Containerized Filter	Can haul dried solids to landfill in container	<ul style="list-style-type: none"> <li>• Highest O&amp;M cost</li> <li>• Polymer required</li> <li>• Limited space for units</li> <li>• Poor aesthetics</li> </ul>	<p>Annual O&amp;M = \$24,000 (container rental) + \$2,800 (polymer feed unit rental)</p> <p>Purchase of 3 units = \$100,000</p>
Geo-Tubes	Simple to use and clean up	<ul style="list-style-type: none"> <li>• Polymer required</li> <li>• Requires skid steer and truck for disposal</li> </ul>	<p>Annual O&amp;M = \$2,000+\$6,000</p> <p>Capital = \$180,000</p>

## 2.C Immediate Improvements ... SEPTAGE RECEIVING POLICY

- Restrict time of year for receiving septage
- Construct a storage tank to better regulate impacts on TRWWTP systems
- Contemplate policy revisions for septage from within the TRWWTP service area versus outside the TRWWTP service area

## 2.D Immediate Improvements ... BIOSOLIDS MANAGEMENT

### Revamp the Current Biosolids Treatment, Hauling & Re-Use Program

- Ensure flexibility and reliability by securing several options, including
  - A. in-house hauling to re-use
  - B. contracted hauling to re-use
  - C. potential 3<sup>rd</sup> party composting
  - D. hybrid of A through C\*
- Pilot test the CleanB<sup>®</sup> system to increase rate of biosolids treatment?



# 3 Near-Term Improvements 2018 - 2022

- A. Supplemental Oxygen
- B. Structural Repairs
- C. Electrical Code Compliance
- D. Biosolids Management

# 3. A Near-term Improvements ... SUPPLEMENTAL OXYGEN



Expand Existing Aeration System



Supplement with Jets\*



Supplement with Pure O<sub>2</sub>\*

# 3.A Near-term Improvements ... Supplemental Oxygen

	ADVANTAGES	DISADVANTAGES	PROBABLE COST
Mechanical Surface Aeration	<ul style="list-style-type: none"> <li>Simplest upgrade, replaces existing equipment in place</li> <li>Energy costs ~20% less than jet aeration</li> </ul>	<ul style="list-style-type: none"> <li>Inefficient, outdated technology</li> <li>Requires electrical upgrades</li> <li>Only 2 existing locations per ditch</li> </ul>	Capital = \$850,000
Jet Aeration*	<ul style="list-style-type: none"> <li>No in-basin maintenance</li> <li>VFD operation to hit target DO</li> <li>Provides additional mixing</li> </ul>	<ul style="list-style-type: none"> <li>Complex installation (new pumps &amp; blowers)</li> <li>Highest installation cost</li> <li>Inefficient technology at shallow depths</li> <li>Grits wear down jet assemblies</li> </ul>	Capital = \$1,000,000
Liquid Oxygen Saturator*	<ul style="list-style-type: none"> <li>Highly efficient oxygen use</li> <li>Very low electricity use</li> <li>Can turn up, down, or off as needed</li> </ul>	<ul style="list-style-type: none"> <li>New building needed</li> <li>Purchase/store liquid oxygen on site</li> <li>Newer application of established gas-to-water transfer technology</li> </ul>	Capital = \$700,000 - \$900,000

# 3.B Near-term Improvements ... STRUCTURAL REPAIRS



Coating system on roof support beams is delaminating and allowing the structural steel to corrode. If the beam corrodes too much, the capacity of the beam will be compromised. This is occurring on all beams that were coated with an epoxy based system.

Oxidation  
Ditch  
Support  
Beams



HVAC ducting is severely corroded and poses a safety hazard to operators.

Headworks



Wall to composite slab interface is actively leaking. Wall coating has failed and leaks are creating a slip hazard and damaging adjacent room wooden walls.

## Clarifier Wall Interface Leakage

# 3.C Near-term Improvements ... ELECTRICAL CODE COMPLIANCE

- Secondary Power Distribution Capacity
  - Motor Control Centers
  - Panels
- Classification of Hazardous Space
  - NEC article 500
  - NFPA 820

# 3.D Near-term Improvements ... BIOSOLIDS

- Continue to Evolve Biosolids Treatment, Hauling & Re-Use Program
  - Investigate obtaining additional land for disposing of increasing biosolids volumes (lease versus ownership)
  - Investigate potential for composting on our own properties and/or partnering with others for biosolids composting
- Virtues of moving toward Class A biosolids vs continuing with Class B biosolids

# 4 Long-Term Modification 2023 - 2027

- A. Preliminary Treatment (headworks)
- B. Secondary Processes
  - On existing site
  - On adjacent site
- C. Disinfection Systems
- D. Biosolids Treatment

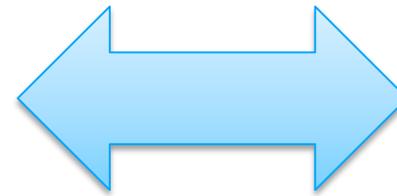
# 4 .A Long-term Modification... PRELIMINARY TREATMENT

- Recommended as the first phase of the long-term plant expansion plan
- Consists of screening, grit removal, and flow measurement within the “headworks”
- Advanced wastewater treatment processes require higher removal capabilities
- A new headworks building (~1200 ft<sup>2</sup>) separate from other process buildings and offices is needed.

# 4 .B Long-term Modification ... SECONDARY TREATMENT PROCESSES

5 process options were investigated & compared

- Conventional Activated Sludge
- Membrane Bioreactor (MBR)
- Oxidation Ditches
- Integrated Fixed-film Activated Sludge (IFAS)
- BioMag<sup>®</sup> enhancements to existing oxidation ditch process



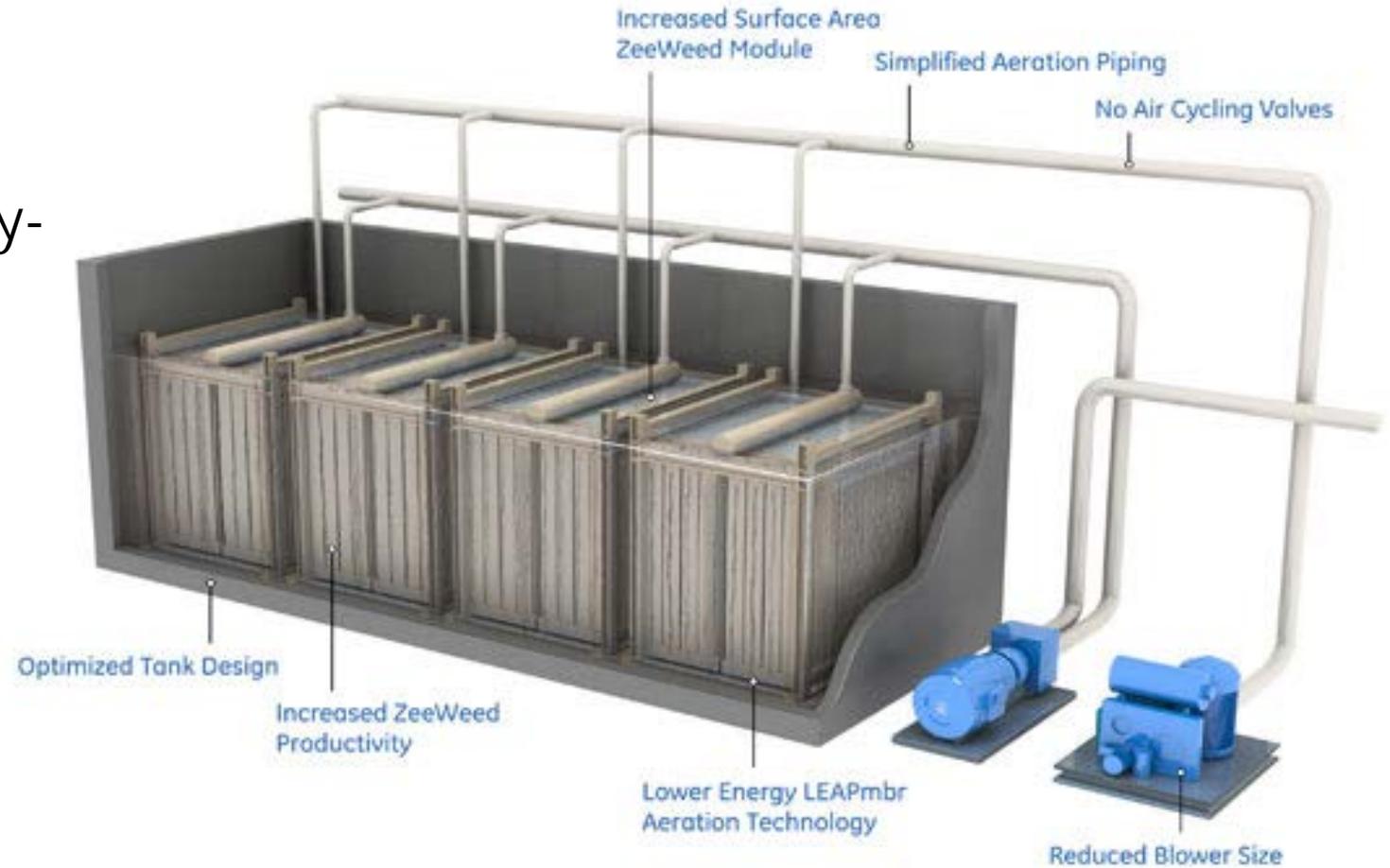
1. Footprint
2. Track Record
3. Flexibility
4. Effluent Quality
5. Expandability
6. Constructability
7. Capital Costs
8. O&M Costs

# The Master Plan Identifies 2 On-Site Secondary Treatment Alternatives

1. MBR Retrofit\*
2. BioMag<sup>®</sup> Enhancements

# Membrane Bio-Reactor (MBR)

- Smaller footprint
- Can meet technology-based nutrient limits
- Provides tertiary filtration

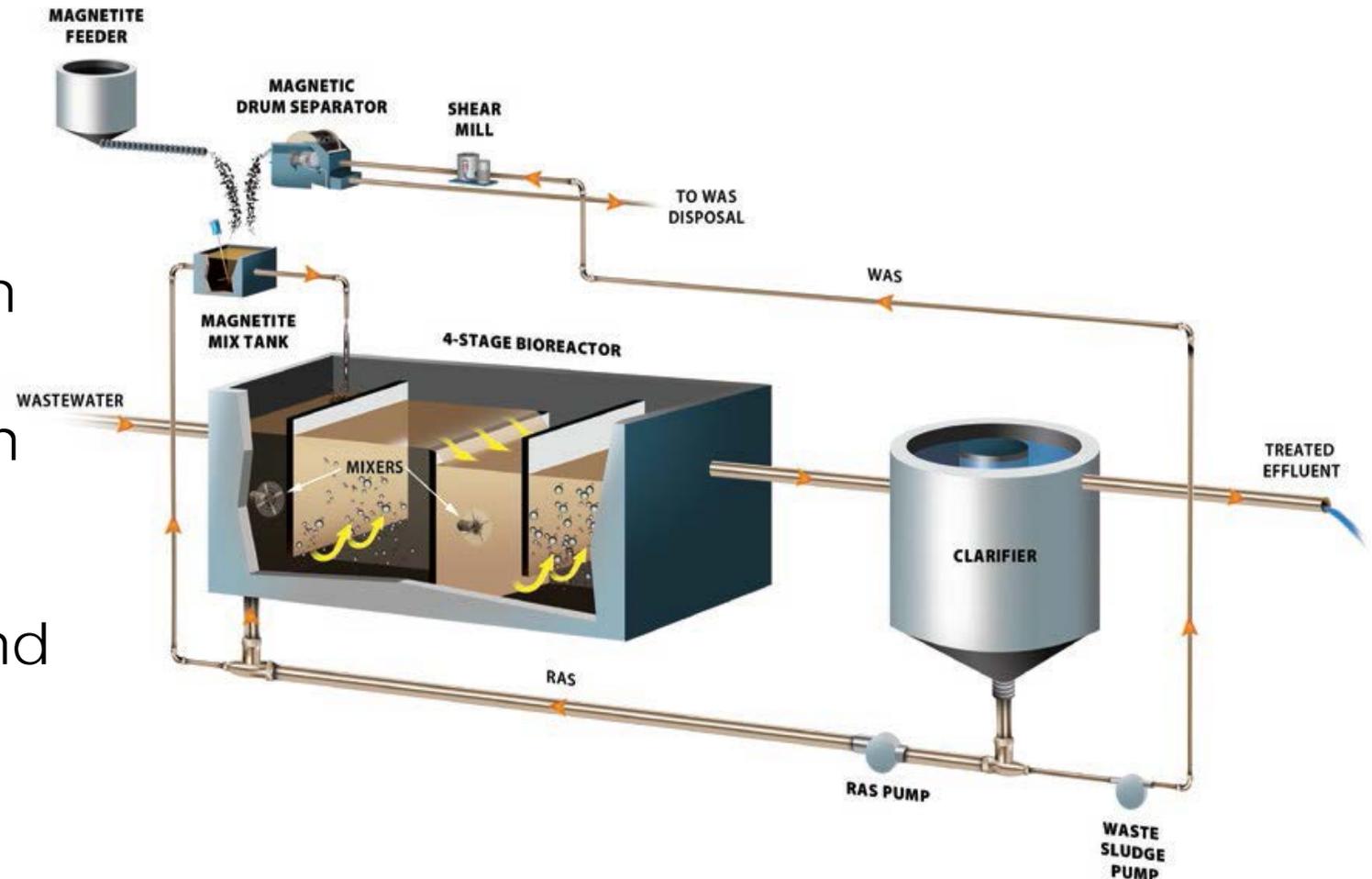


# On-Site MBR Retrofit

	ADVANTAGES	DISADVANTAGES
Capital Cost		\$29.8 M
O&M Cost		\$5.6 M (PV2017)
Maintenance	Self monitoring and initiation of flushing	Chemical cleanings 2x/yr
Operation	Automated, high biomass conc.	
Proprietary		High membrane replacement cost
Performance	Excellent	
Local Support		Venders supported by local reps
History	Widespread Use	
Ops Feedback		

# BioMAG<sup>®</sup> Enhancements

- Smaller footprint
- Can meet technology-based nutrient limits (coagulant addition for low TP)
- Uses existing O-ditch basins and clarifiers
- Requires supplemental O<sub>2</sub> and mixing upgrades

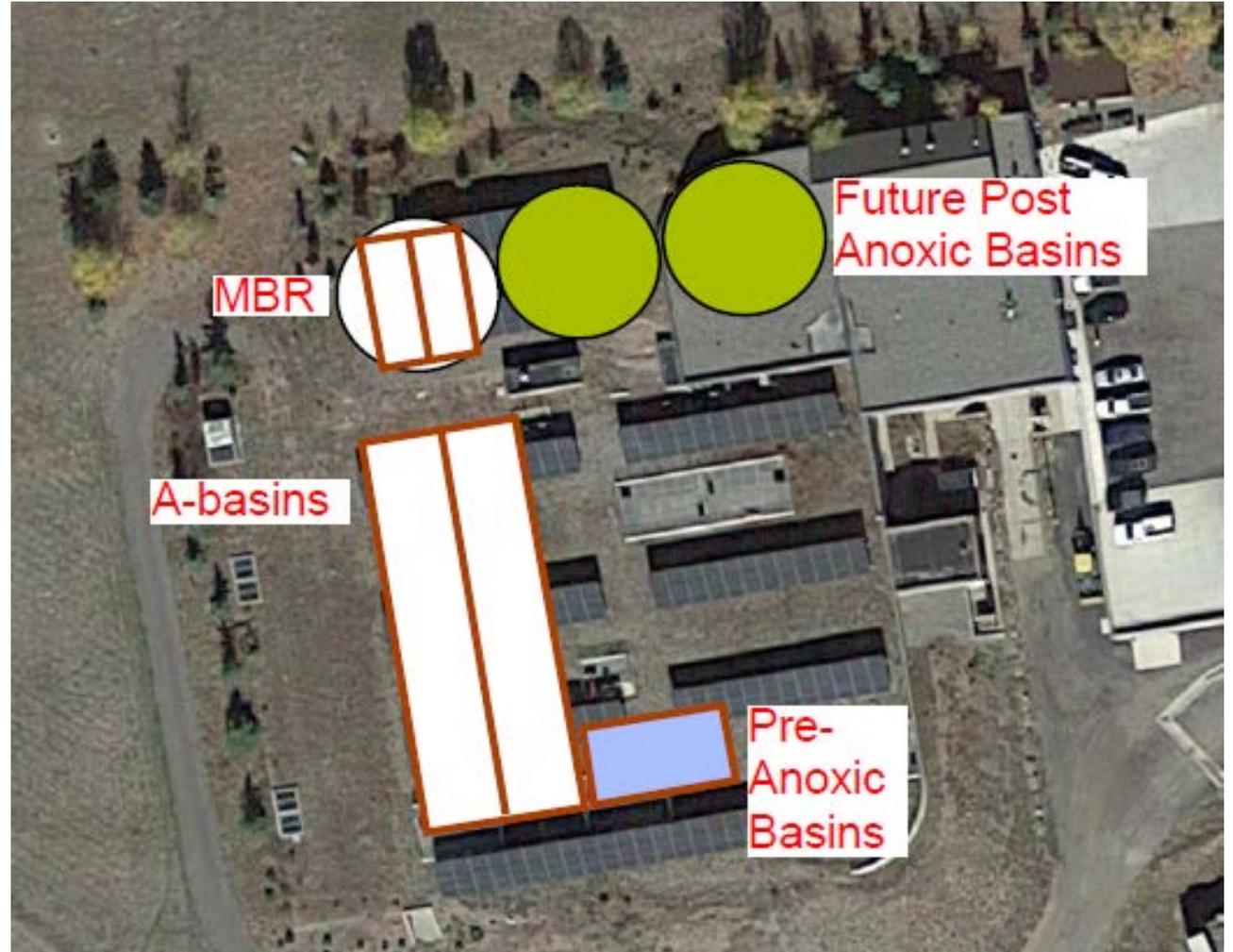


# On-Site BioMag<sup>®</sup> Enhancements

	ADVANTAGES	DISADVANTAGES
Capital Cost	\$19.1 M	
O&M Cost	\$4.5 M (PV2017)	Low effluent TP requires chemical addition
Maintenance		Magnetite likely to settle in O-ditches
Operation	Similar to existing with added mass from ballast	Relies on upgraded aeration & mixing
Proprietary		Only one manufacturer
Performance		Not well documented
Local Support		
History		Very little
Ops Feedback		

# On-Site MBR Retrofit

- Significant demolition and reconstruction
- Access for membrane removal
- Difficult construction
- Fully enclosed
- Stage 1: O-ditch & Clarifier
- Stage 2: Pre-Anoxic Basins
- Future: Post Anoxic Basin in remaining clarifiers
- Would eliminate some solar panels





# The Master Plan Identifies 2 Adjacent-Site Secondary Treatment Expansion Alternatives

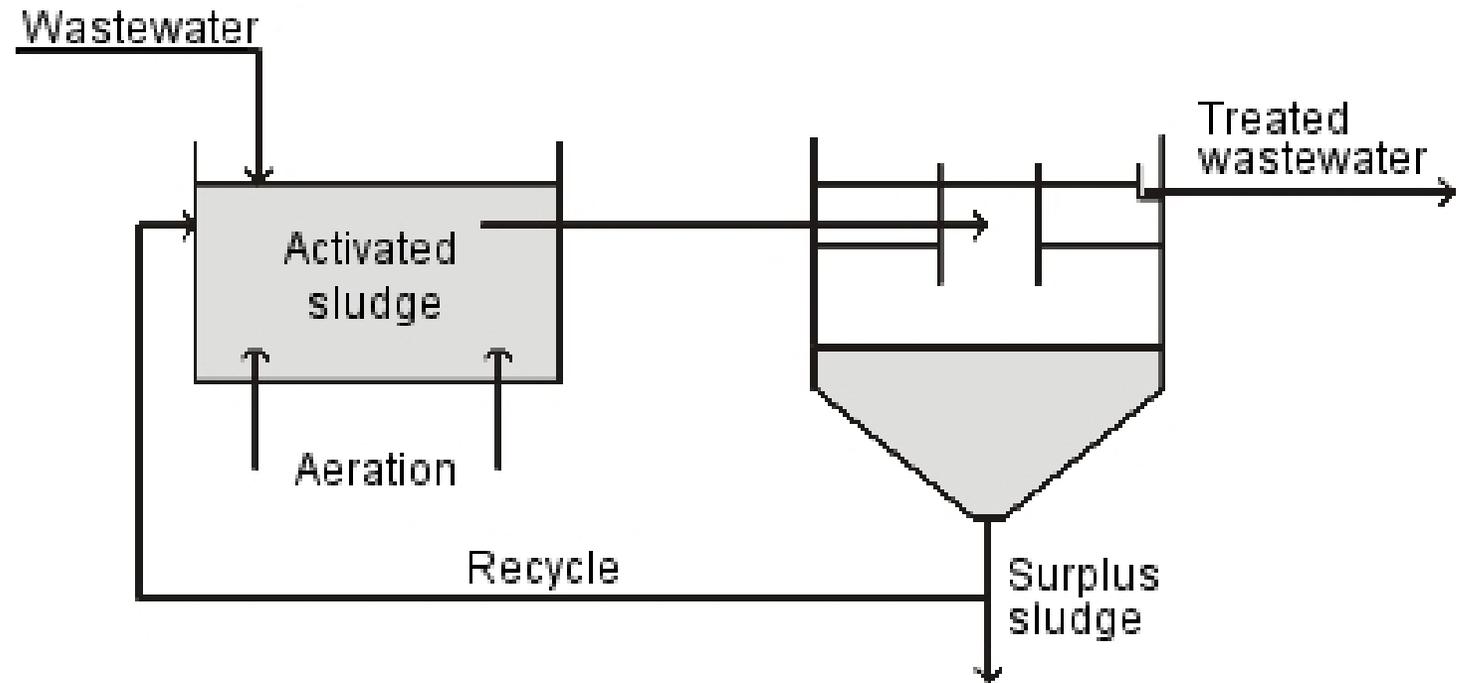
1. MBR (New)\*
2. Conventional Activated Sludge

# New MBR on Adjacent Site

	ADVANTAGES	DISADVANTAGES
Capital Cost		\$28.3 M
O&M Cost		\$5.6 M (PV2017)
Maintenance	Self monitoring and initiation of flushing	Chemical cleanings 2x/yr
Operation	Automated, high biomass conc.	High degree of redundancy required
Proprietary		High membrane replacement cost
Performance	Excellent	
Local Support		None
History	Widespread Use	
Ops Feedback		

# Conventional Activated Sludge

- Larger footprint
- Can meet technology-based nutrient limits (Anaerobic basins & tertiary filters for TP limits < 1 mg/L)
- New anoxic and aerated basins
- Uses existing secondary clarifiers

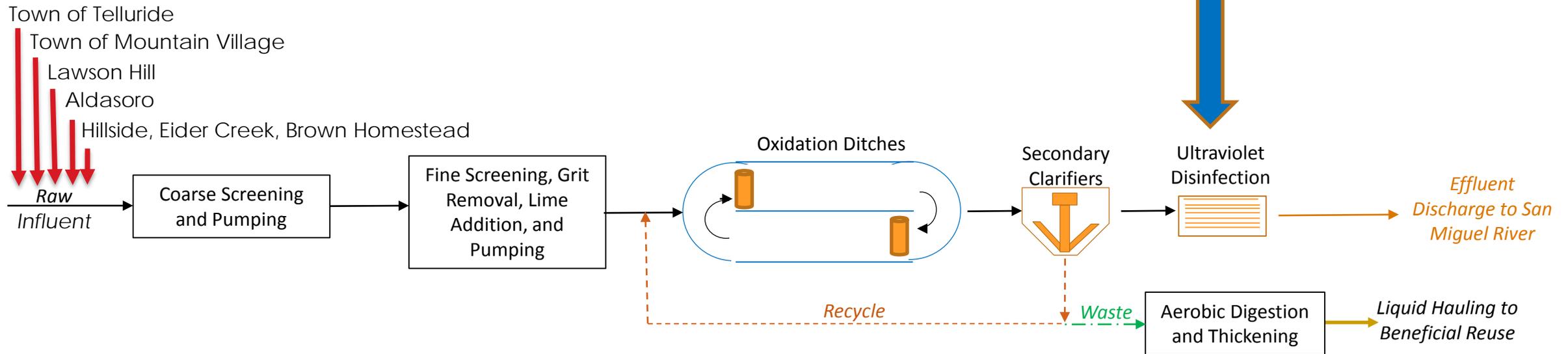


# New CAS on Adjacent Site

	ADVANTAGES	DISADVANTAGES
Capital Cost	\$26.9 M	
O&M Cost	\$3.4 M (PV2017)	
Maintenance	Multiple trains and basins allows for quick draining of tanks for maintenance.	Will not likely meet future nutrient discharge limits.
Operation	Additional tanks provide options for variable loading	Sensitive to variable loading.
Proprietary	Many suppliers for ea. component	
Performance		Limited biomass range
Local Support		Common equipment
History		Substantial
Ops Feedback		

# 4.c Long-term Expansion ... DISINFECTION SYSTEMS

- Existing UV disinfection has a remaining useful life of ~ 10 years
- Replace with plant expansion



# 4.D Long-term Expansion ... CLASS A BIOSOLIDS

1. ATAD (Autothermal Thermophilic Aerobic Digestion)\*
2. CleanB<sup>®</sup>-AC (Accelerated Composting)  
AC facilities use an Accelerated Composting method to produce Class A/EQ (Exceptional Quality compost) in a quarter of the time and using a quarter of the space of traditional composting systems.



# 5 WRAP UP

- A. Summary of Drivers
- B. Summary of Necessary Improvements
- C. The Timeline
- D. Additional Questions & Discussion

# 5 Wrap Up ... SUMMARY OF DRIVERS

## 1. AGING INFRASTRUCTURE

- TRWWTP Phase 1 went on line around 1987
- Phase 2 went online around 1993
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## 2. CAPACITY LIMITS

- Winter and summer visitor peaks bring us close to TRWWTP operating limits
- Basic regional population growth (estimated at 1.5% per year)

## 3. STRICTER DISCHARGE PERMIT LIMITS

- Metals (2017)
- Nutrients (2027)
- Emerging contaminants of concern: temperature, pharmaceuticals, etc. (time uncertain ?)

# 5 Wrap Up ... SUMMARY OF NECESSARY IMPROVEMENTS

## ➤ **IMMEDIATE (2017-2018)**

- Copper compliance
- Oxidation ditch maintenance
- Septage receiving policy changes
- Biosolids management changes to better ensure reliability and redundancy

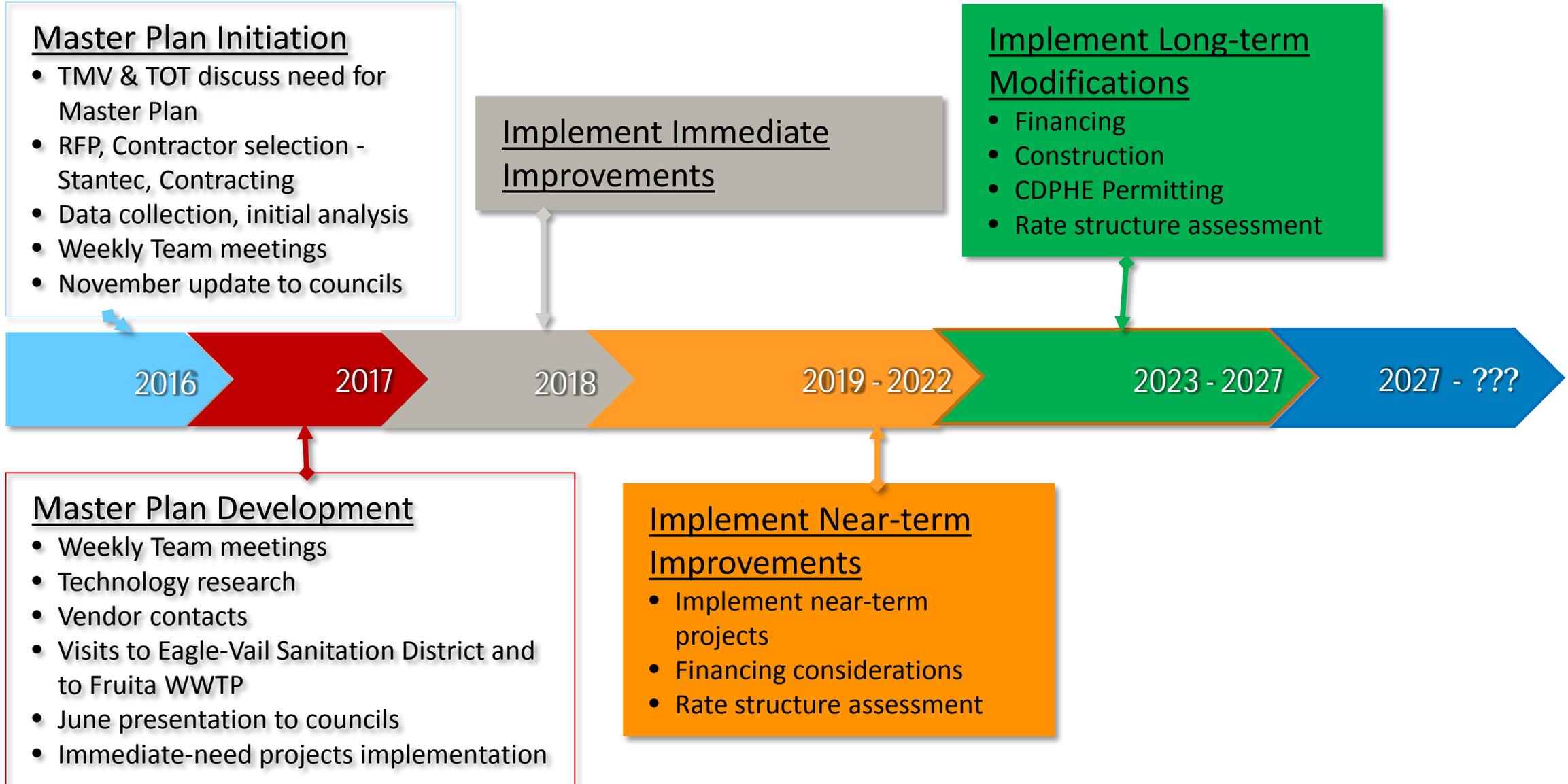
## ➤ **NEAR-TERM (2018-2023)**

- Supplemental oxygen to oxidation ditches
- Structural repairs
- Electrical code compliance
- Continued improvements to biosolids management approach

## ➤ **LONG-TERM (2023-2027)**

- Replace preliminary treatment processes (i.e., new headworks)
- Expand/change secondary treatment processes (to increase capacity and meet discharge limits for new constituents)
- Improve disinfection process (i.e., enlarge and enhanced for more flow)
- Treat biosolids to Class A

# 5 Wrap Up ... The TIMELINE



An aerial photograph of a rural or semi-rural area. In the lower-left quadrant, there is a large, multi-story building with a dark roof, featuring several long, rectangular solar panel arrays on its side. A paved road leads to the building. To the right of the building, a stream flows through a valley, bordered by some trees and a concrete structure. A major road with a roundabout is visible on the right side of the image. The top of the image shows a straight road with a few cars. The overall terrain is dry and hilly.

# 5 Wrap Up ... ADDITIONAL QUESTIONS & DISCUSSION