**City of Ketchum**

June 13, 2022

Mayor Bradshaw and City Councilors
City of Ketchum
Ketchum, Idaho

Mayor Bradshaw and City Councilors:

**Receive Briefing on Wastewater Facility Plan & Provide Feedback**

Recommendation and Summary

The city retained HDR Engineering to update the previous Wastewater Facility Plan to inform future capital investments at the treatment plant to meet the needs of the town and comply with regulations set forth by the Idaho Department of Environmental Quality. HDR will present the key findings from the plan and answer any questions/concerns from the Council.

Should the Council feel comfortable with the plan, staff will place on a future Council meeting for formal adoption. Staff will conduct public outreach prior to Council adoption of the plan. Should the Council affirm the Capital Improvement Plan schedule, it will require a rate increase and engaging voters to approve a revenue bond (50% approval) to fund the plan.

Sustainability Impact

The treatment plant discharges into the Big Wood River. One of the major focuses of the capital improvements is to meet current and future water quality standards. The city already utilized a water reuse approach to service irrigation needs. The plan also reviewed any opportunities to reduce the consumption of electricity.

Financial Impact

The city is in the process of retaining a financial advisor to further refine the expense and revenue model to inform what level of debt should be pursued and whether it would be one or multiple issuances during the life of the Capital Improvement Plan. Staff anticipates placing that contract on the June 27th Council meeting.

Attachments

PowerPoint Presentation
Facility Plan

HDR

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# KETCHUM / SVWSD FACILITY PLAN

- Objectives of Plan
  - Identify areas in need of upgrades
    - Meet current and future permit limitations
    - Aging equipment
    - Additional capacity for growth
  - Provide improvement construction cost opinions
  - Identify implementation schedule
  - Estimate the user rate changes

# UPGRADE APPROACH


Upgrade processes to meet current (and future) permit limitations.


Upgrade equipment reaching the end of lifespan during the planning period.


Increase treatment capacity to serve future growth.


Ketchum / SVWSD WRF Site Plan
1 Headworks Building (not pictured)
2 Grit Building
3 Aeration Basin 1
4 Aeration Basin 2
5 Aeration Basin 3
6 Aeration Basin 4
7 Clarifier #1
8 Clarifier #2
9 Alum Building
10 Aeration Blower Building
11 Filter Building
12 Reuse Building
13 UV Building
14 Aerobic Digester
15 Digester Blower Building
16 Transfer Building
17 Gravity Thickener
18 Sludge Loading Building
19 Garage
20 Operations Building
21 Water Operations Building
22 Admin Building
N
80 40 0 80
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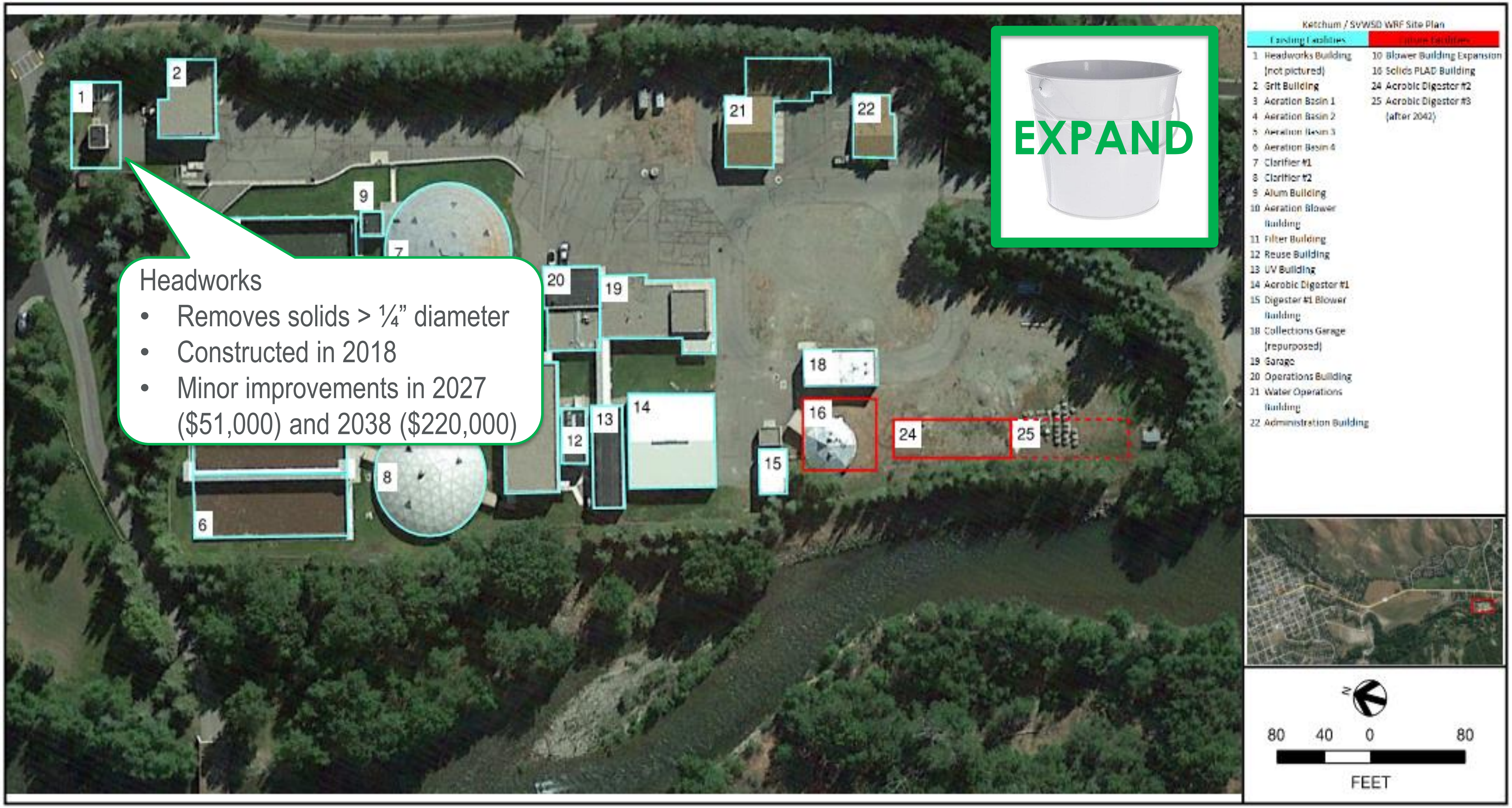


EXPAND

Headworks
- Removes solids > ¼" diameter
- Constructed in 2018
- Minor improvements in 2027 ($51,000) and 2038 ($220,000)

| '22-'27: $51,000 | '28-'32: $0 | '33-'37: $0 | '38-'42: $220,000 | Total: $271,000 |
|---|---|---|---|---|

2022 2027 2032 2037 2042

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Grit

- Removes heavy particles like sand and coffee grounds
- Installed in early 1990's
- Improvements in 2031 ($1,015,000)

| 2022 | '22-'27: $51,000 | 2027 | '28-'32: $1,015,000 | 2032 | '33-'37: $0 | 2037 | '38-'42: $220,000 | 2042 | Total: **$1,220,000** |
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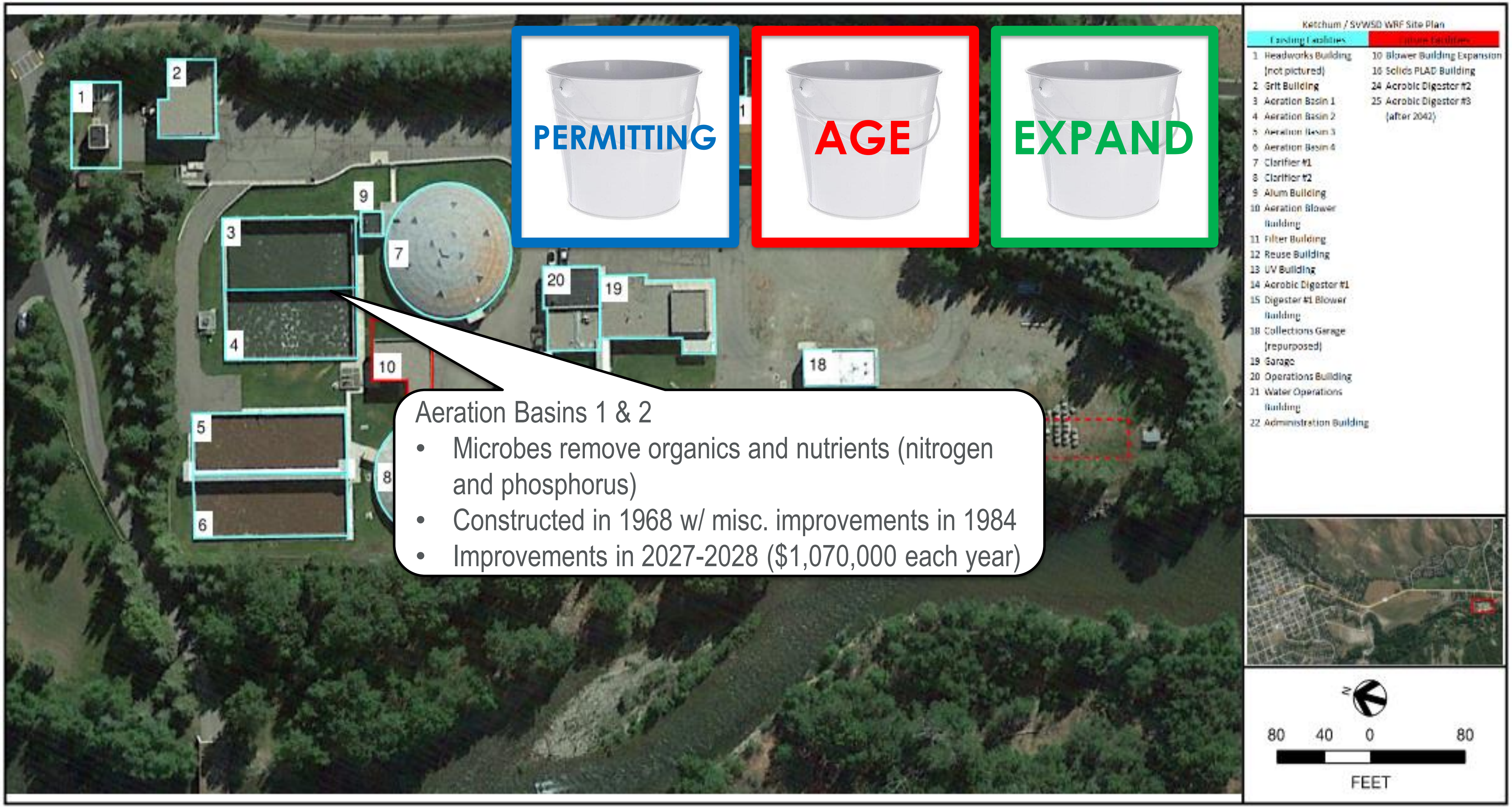


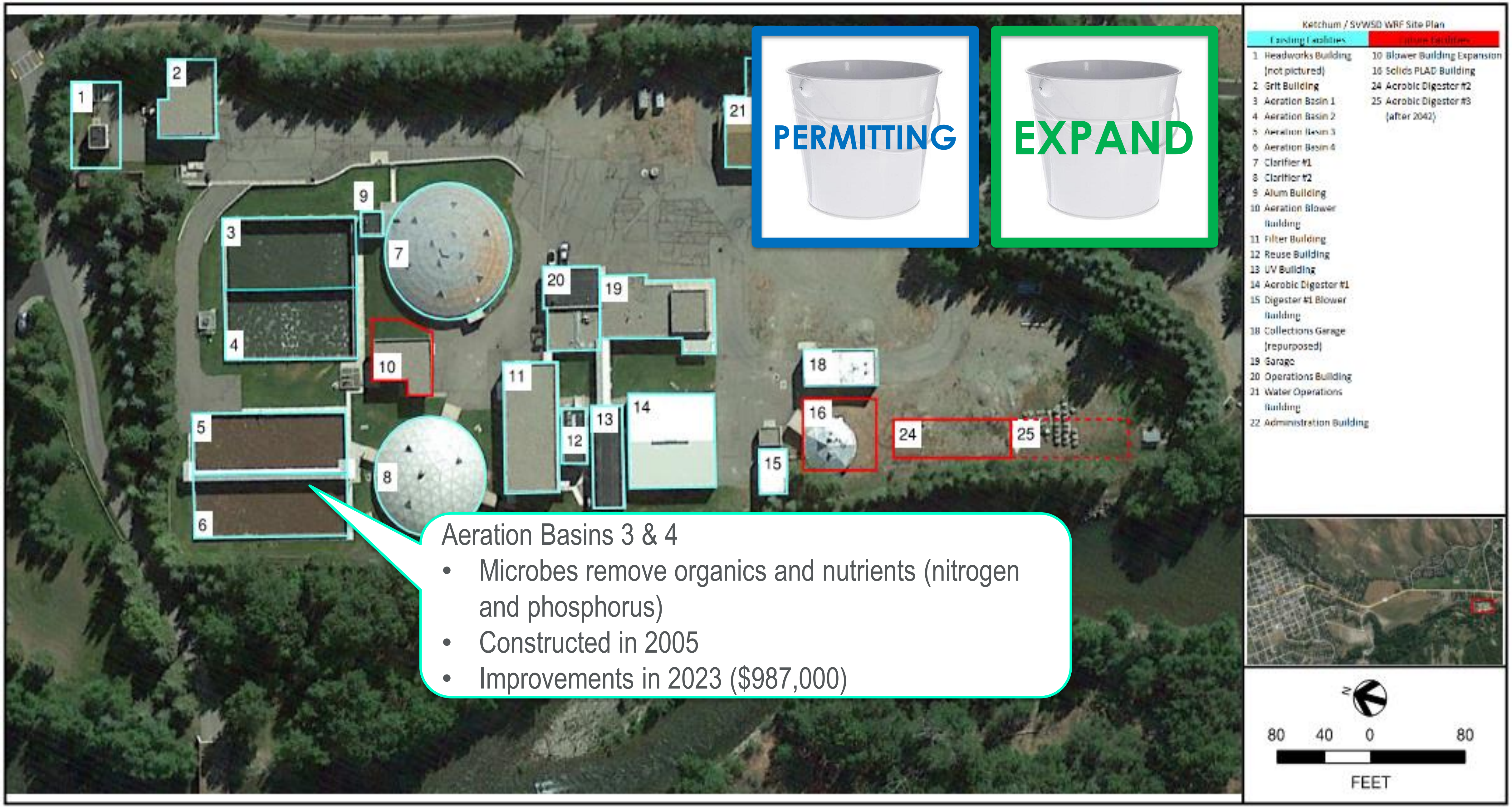

Aeration Basins 1 & 2

- Microbes remove organics and nutrients (nitrogen and phosphorus)
- Constructed in 1968 w/ misc. improvements in 1984
- Improvements in 2027-2028 ($1,070,000 each year)

'22-'27: $1,121,000 | '28-'32: $2,085,000 | '33-'37: $0 | '38-'42: $220,000

2022 | 2027 | 2032 | 2037 | 2042

Total: **$3,426,000**




Aeration Basins 3 & 4

- Microbes remove organics and nutrients (nitrogen and phosphorus)
- Constructed in 2005
- Improvements in 2023 ($987,000)

| 2022 | '22-'27: $2,108,000 | 2027 | '28-'32: $2,085,000 | 2032 | '33-'37: $0 | 2037 | '38-'42: $220,000 | 2042 |
|---|---|---|---|---|---|---|---|---|

Total:
**$4,413,000**

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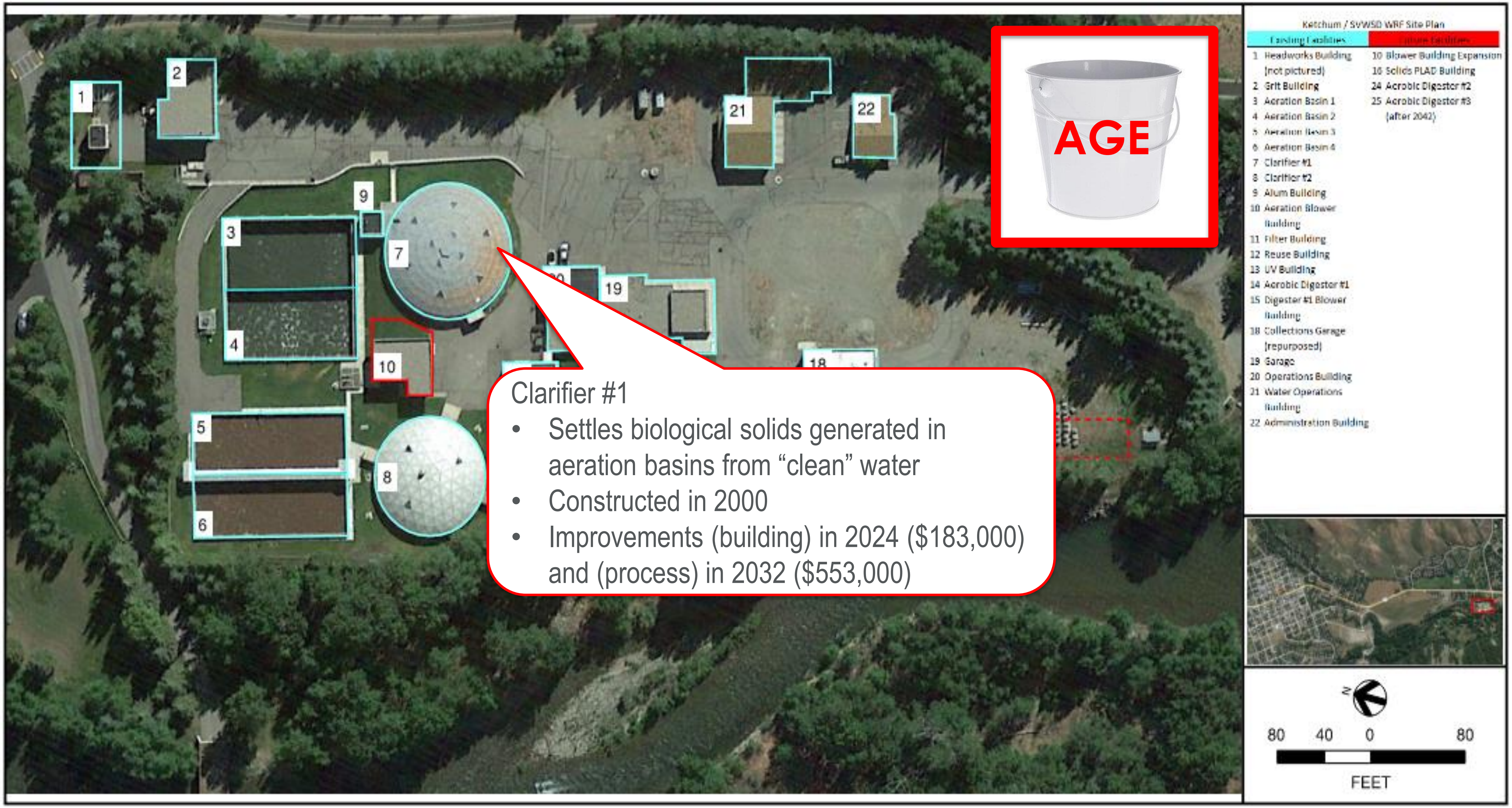
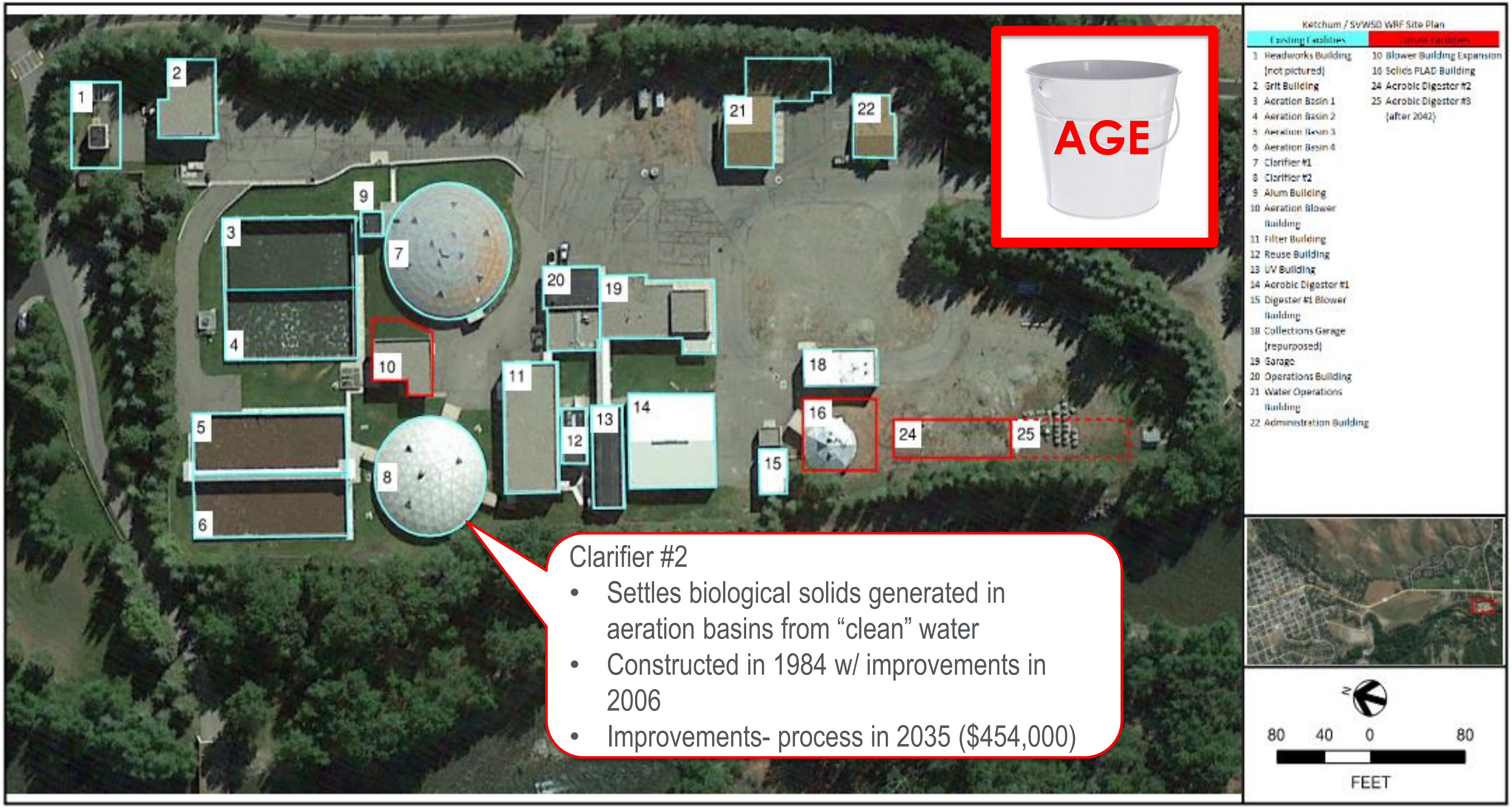



Clarifier #1

- Settles biological solids generated in aeration basins from "clean" water
- Constructed in 2000
- Improvements (building) in 2024 ($183,000) and (process) in 2032 ($553,000)

| '22-'27: $2,291,000 | '28-'32: $2,638,000 | '33-'37: $0 | '38-'42: $220,000 | Total: $5,149,000 |
|---|---|---|---|---|
| 2022–2027 | 2027–2032 | 2032–2037 | 2037–2042 | |

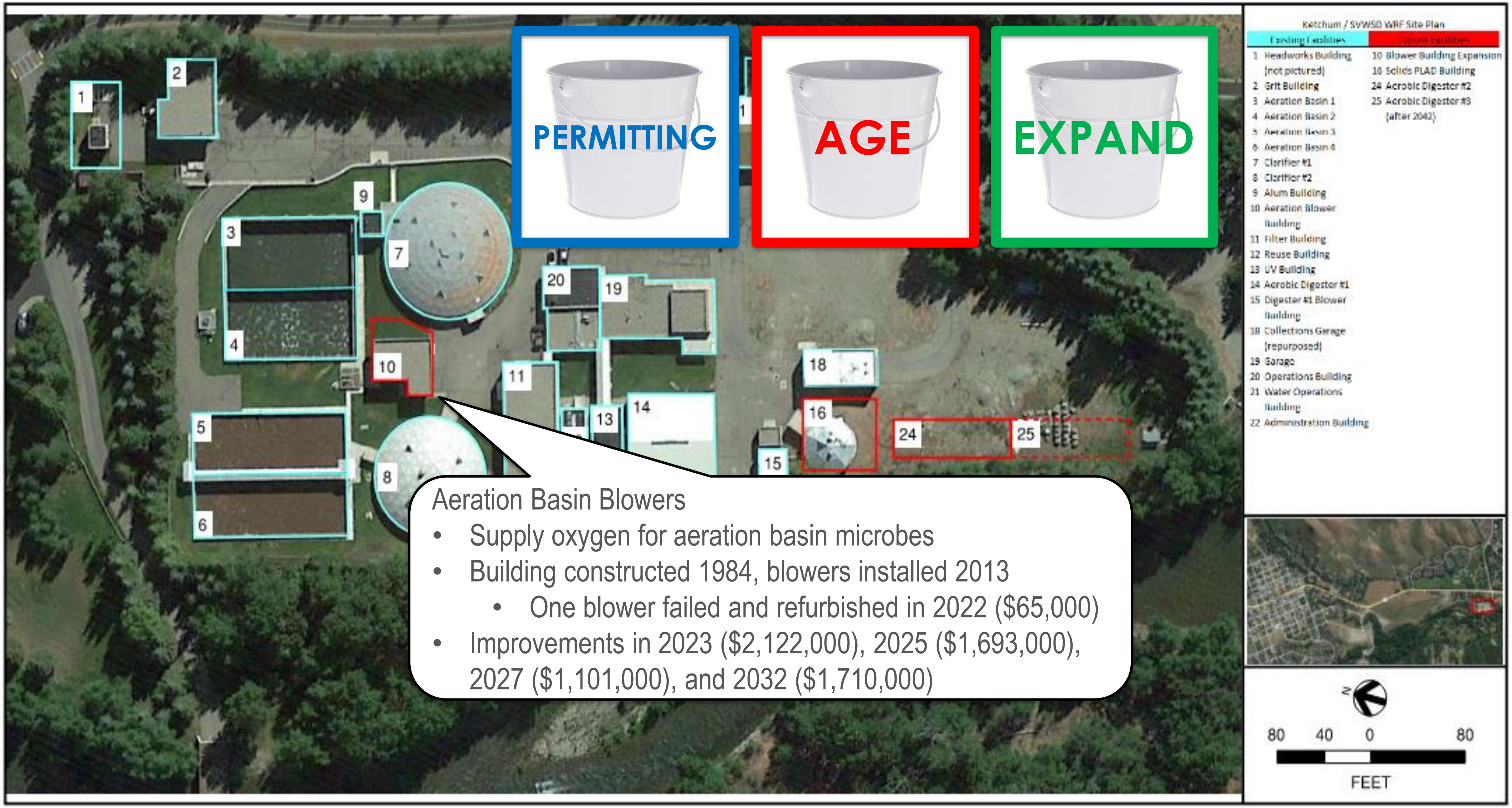



Clarifier #2

- Settles biological solids generated in aeration basins from "clean" water
- Constructed in 1984 w/ improvements in 2006
- Improvements- process in 2035 ($454,000)

| 2022 | '22-'27: $2,291,000 | 2027 | '28-'32: $2,638,000 | 2032 | '33-'37: $454,000 | 2037 | '38-'42: $220,000 | 2042 |
|---|---|---|---|---|---|---|---|---|

Total: **$5,603,000**



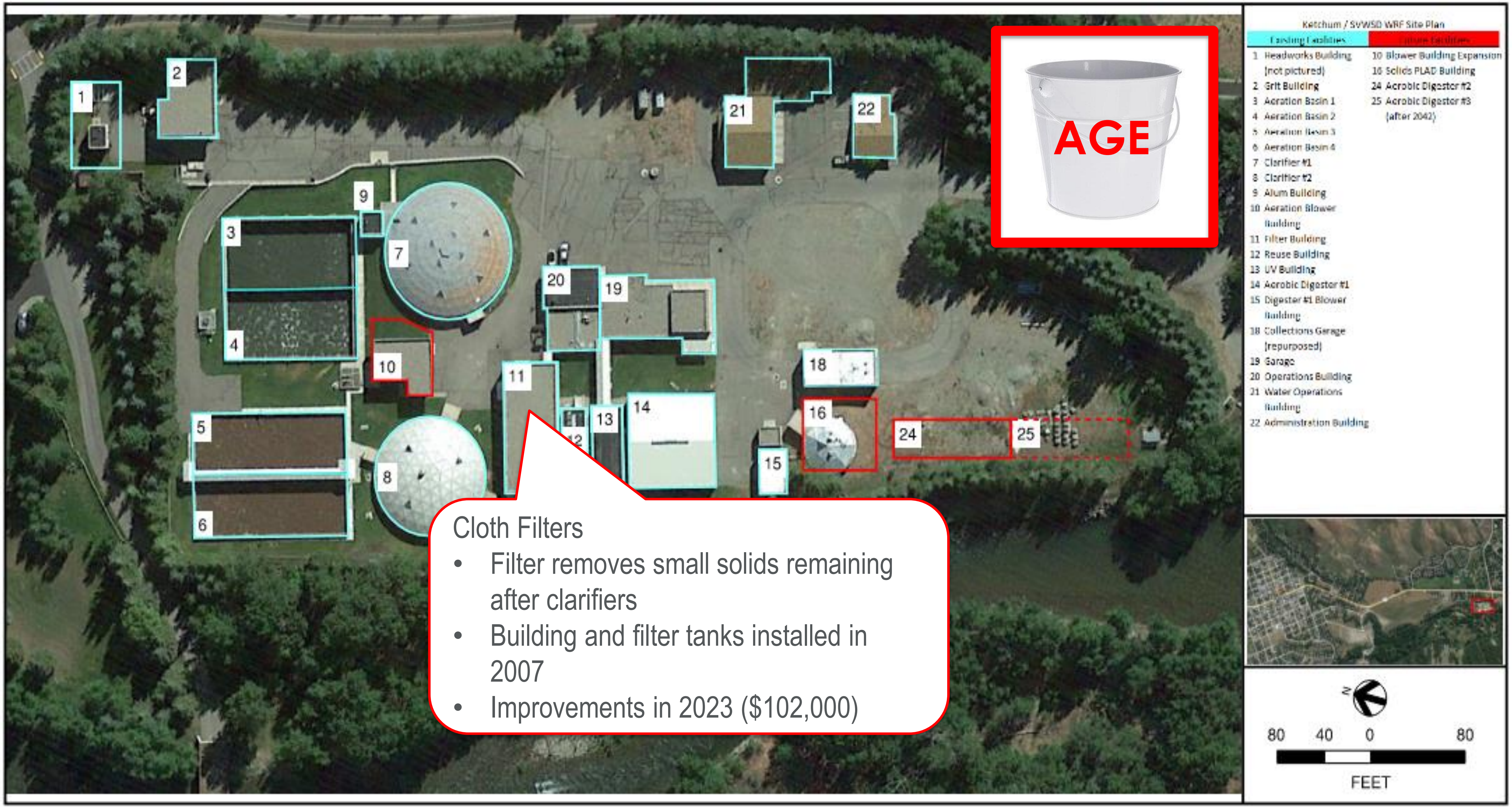

Aeration Basin Blowers

- Supply oxygen for aeration basin microbes
- Building constructed 1984, blowers installed 2013
  - One blower failed and refurbished in 2022 ($65,000)
- Improvements in 2023 ($2,122,000), 2025 ($1,693,000), 2027 ($1,101,000), and 2032 ($1,710,000)

‘22-’27: $7,272,000 | ‘28-’32: $4,348,000 | ‘33-’37: $454,000 | ‘38-’42: $220,000

2022 | 2027 | 2032 | 2037 | 2042

Total: **$12,294,000**




Cloth Filters

- Filter removes small solids remaining after clarifiers
- Building and filter tanks installed in 2007
- Improvements in 2023 ($102,000)

‘22-’27: $7,374,000 | ‘28-’32: $4,348,000 | ‘33-’37: $454,000 | ‘38-’42: $220,000

2022 2027 2032 2037 2042

Total: **$12,396,000**

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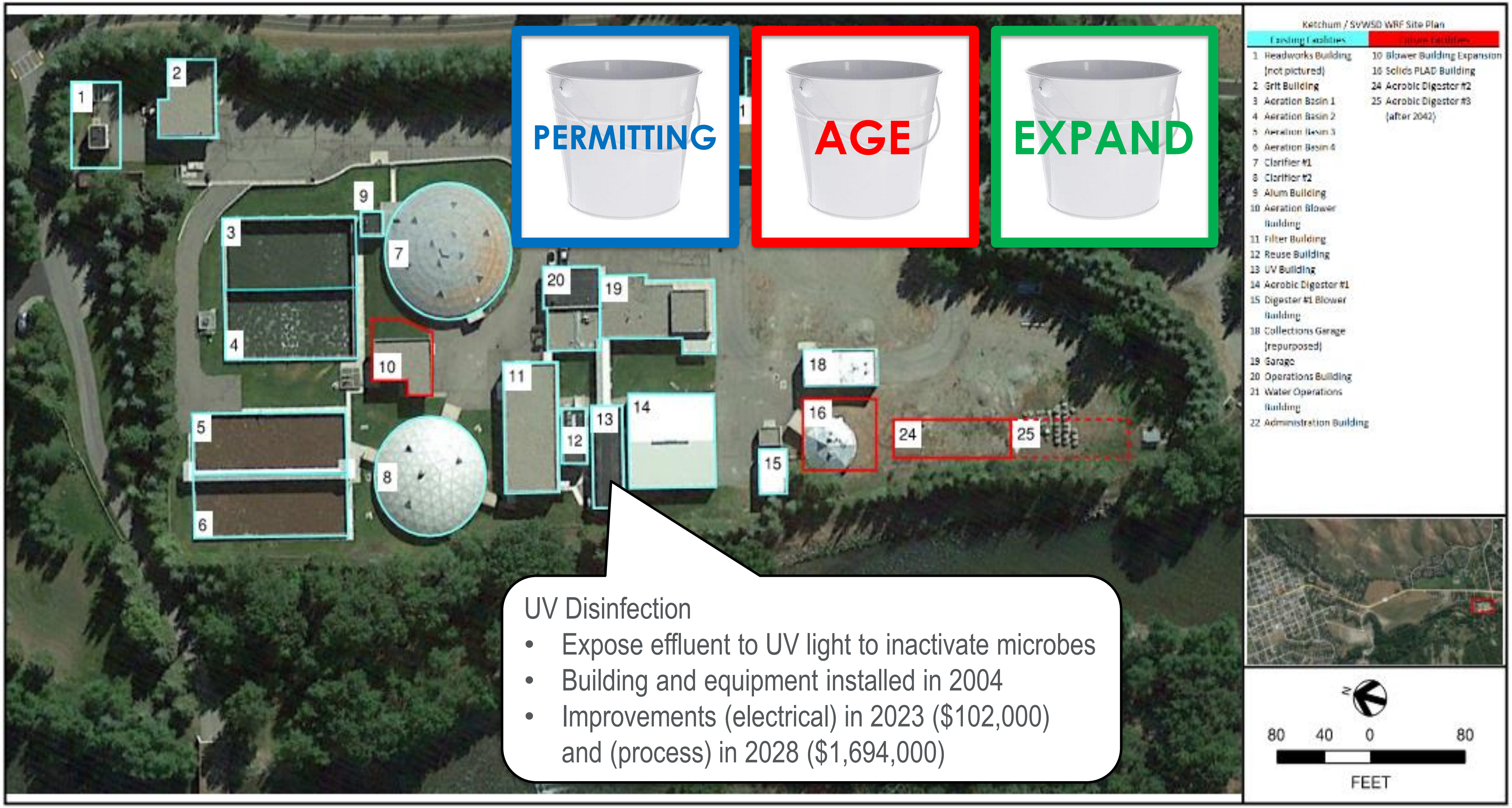
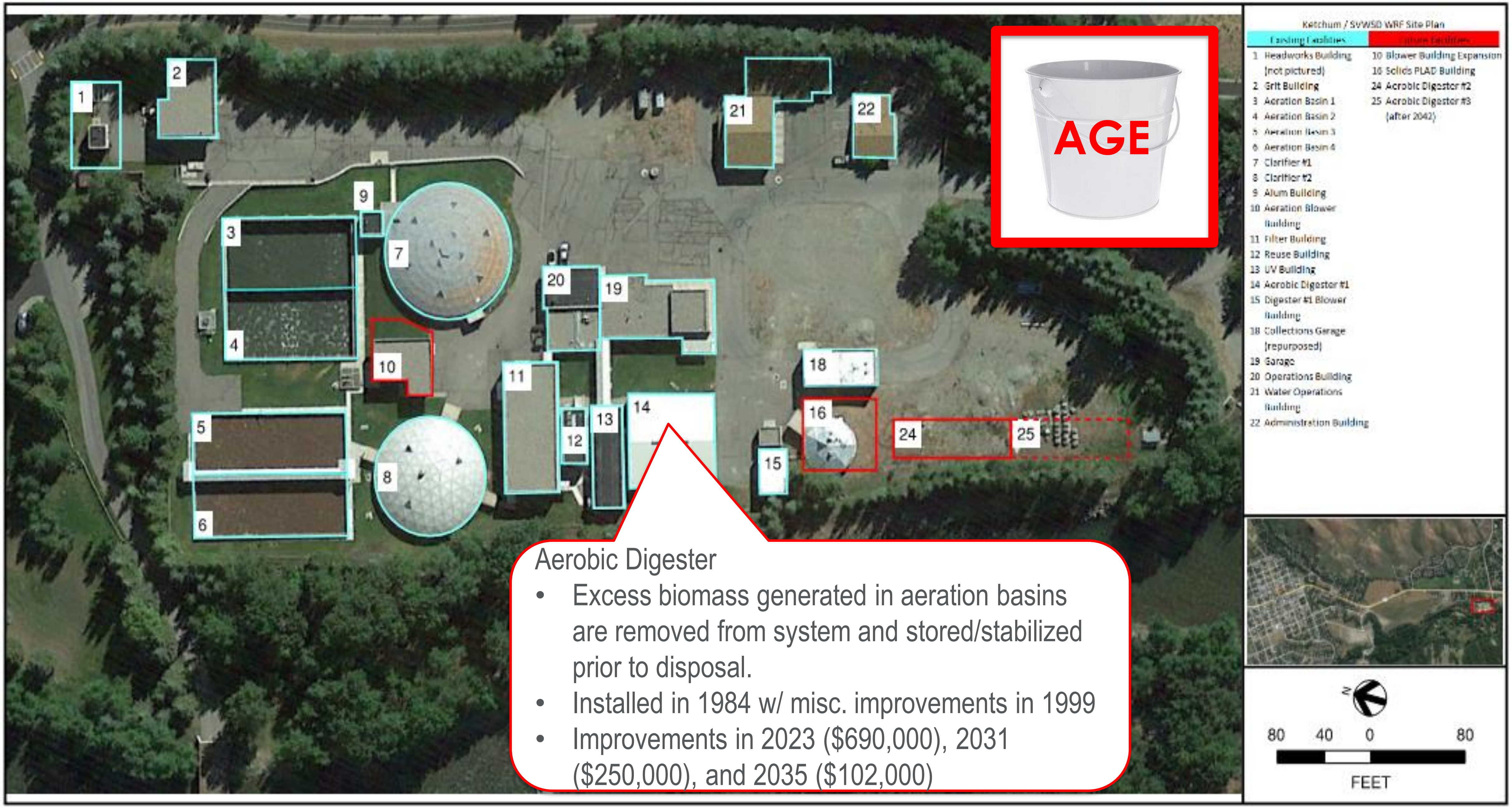



UV Disinfection

- Expose effluent to UV light to inactivate microbes
- Building and equipment installed in 2004
- Improvements (electrical) in 2023 ($102,000) and (process) in 2028 ($1,694,000)

| 2022 | '22-'27: $7,476,000 | 2027 | '28-'32: $6,042,000 | 2032 | '33-'37: $454,000 | 2037 | '38-'42: $220,000 | 2042 |
|---|---|---|---|---|---|---|---|---|

Total: **$14,192,000**




Aerobic Digester

- Excess biomass generated in aeration basins are removed from system and stored/stabilized prior to disposal.
- Installed in 1984 w/ misc. improvements in 1999
- Improvements in 2023 ($690,000), 2031 ($250,000), and 2035 ($102,000)

| 2022 | '22-'27: $8,166,000 | 2027 | '28-'32: $6,292,000 | 2032 | '33-'37: $556,000 | 2037 | '38-'42: $220,000 | 2042 |
|---|---|---|---|---|---|---|---|---|

Total: **$15,234,000**

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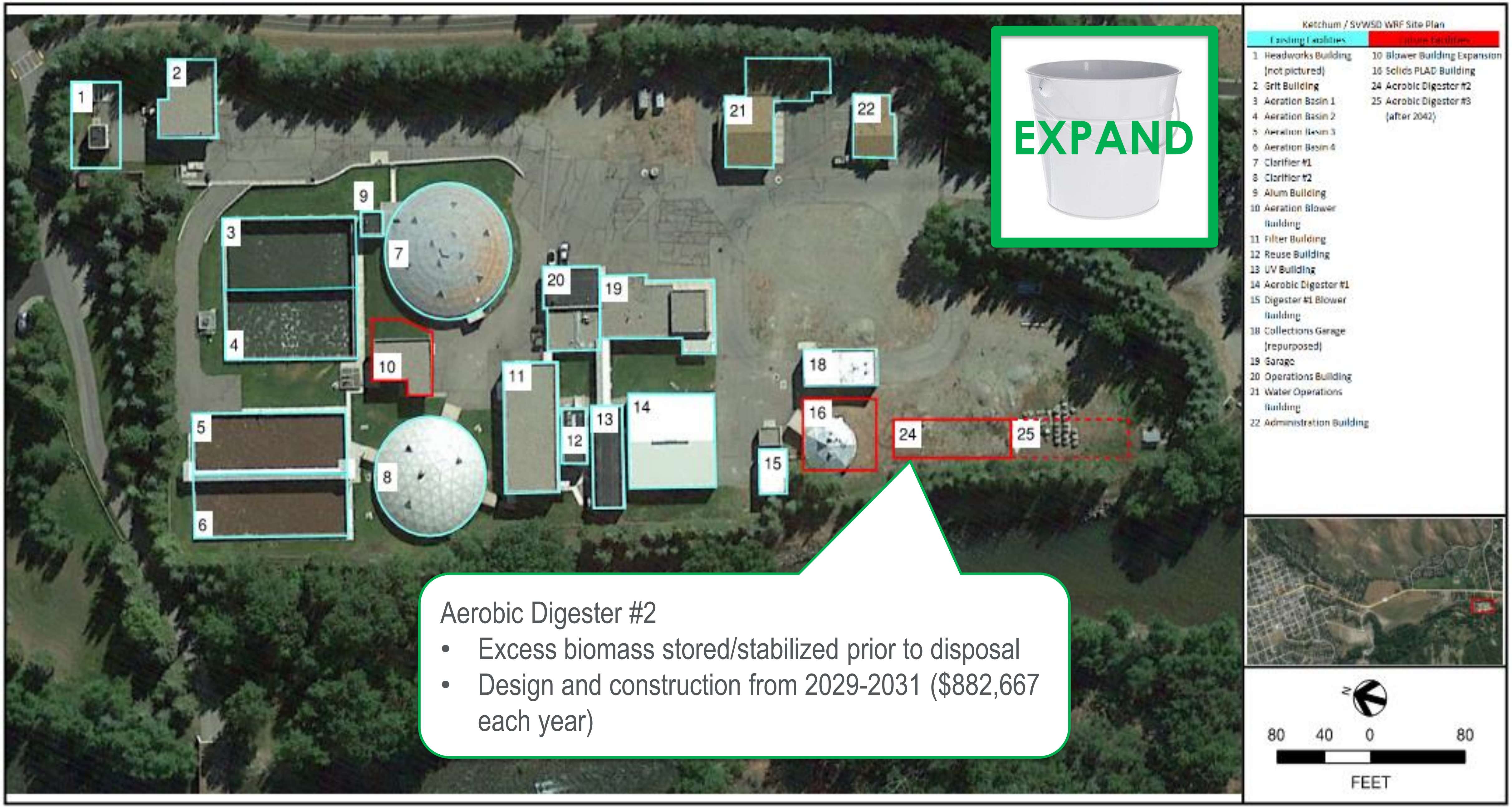


Aerobic Digester #2

- Excess biomass stored/stabilized prior to disposal
- Design and construction from 2029-2031 ($882,667 each year)

| 2022 | '22-'27: $8,166,000 | 2027 | '28-'32: $8,940,000 | 2032 | '33-'37: $556,000 | 2037 | '38-'42: $220,000 | 2042 |
|---|---|---|---|---|---|---|---|---|

Total: **$17,882,000**

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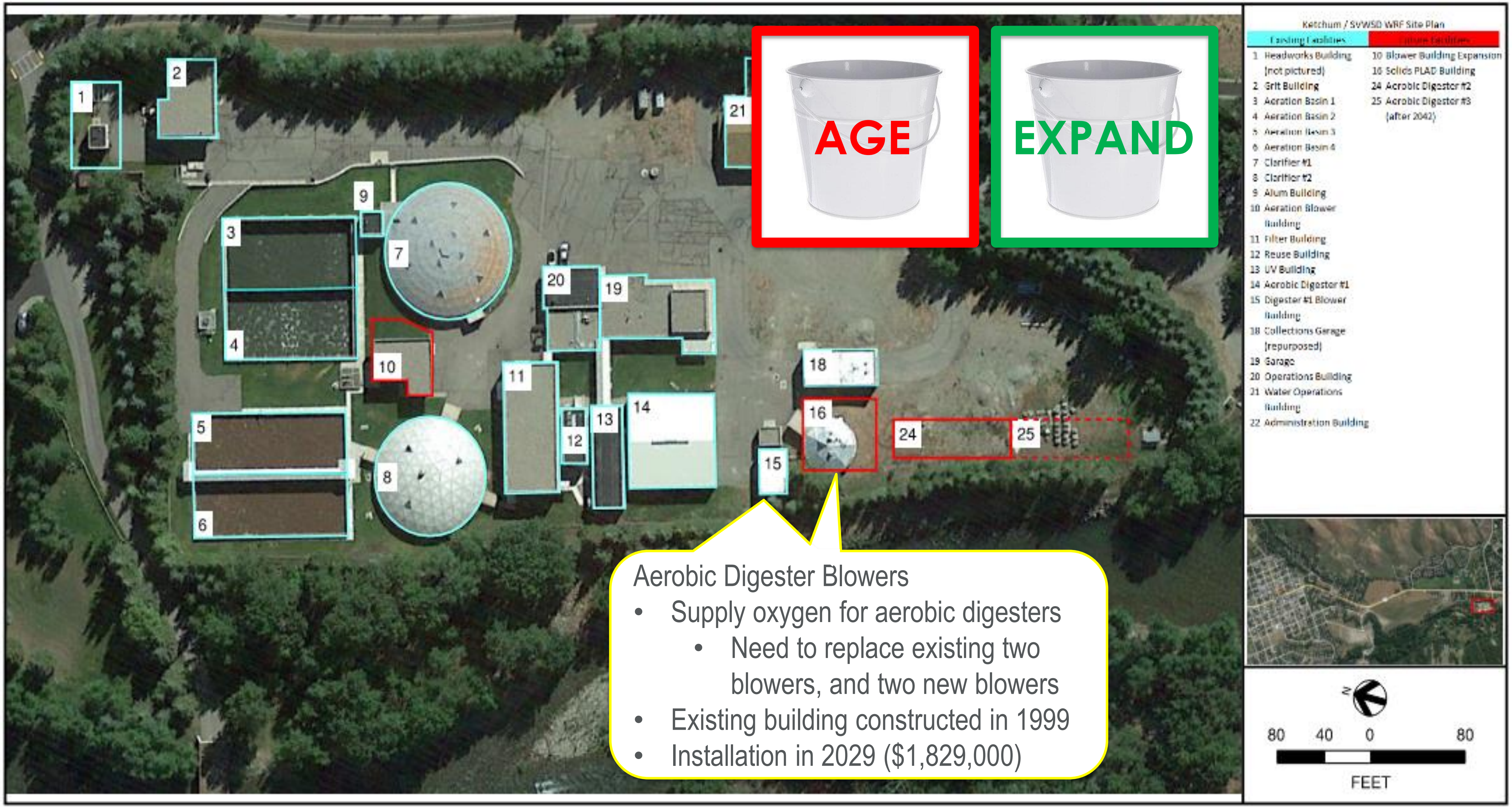
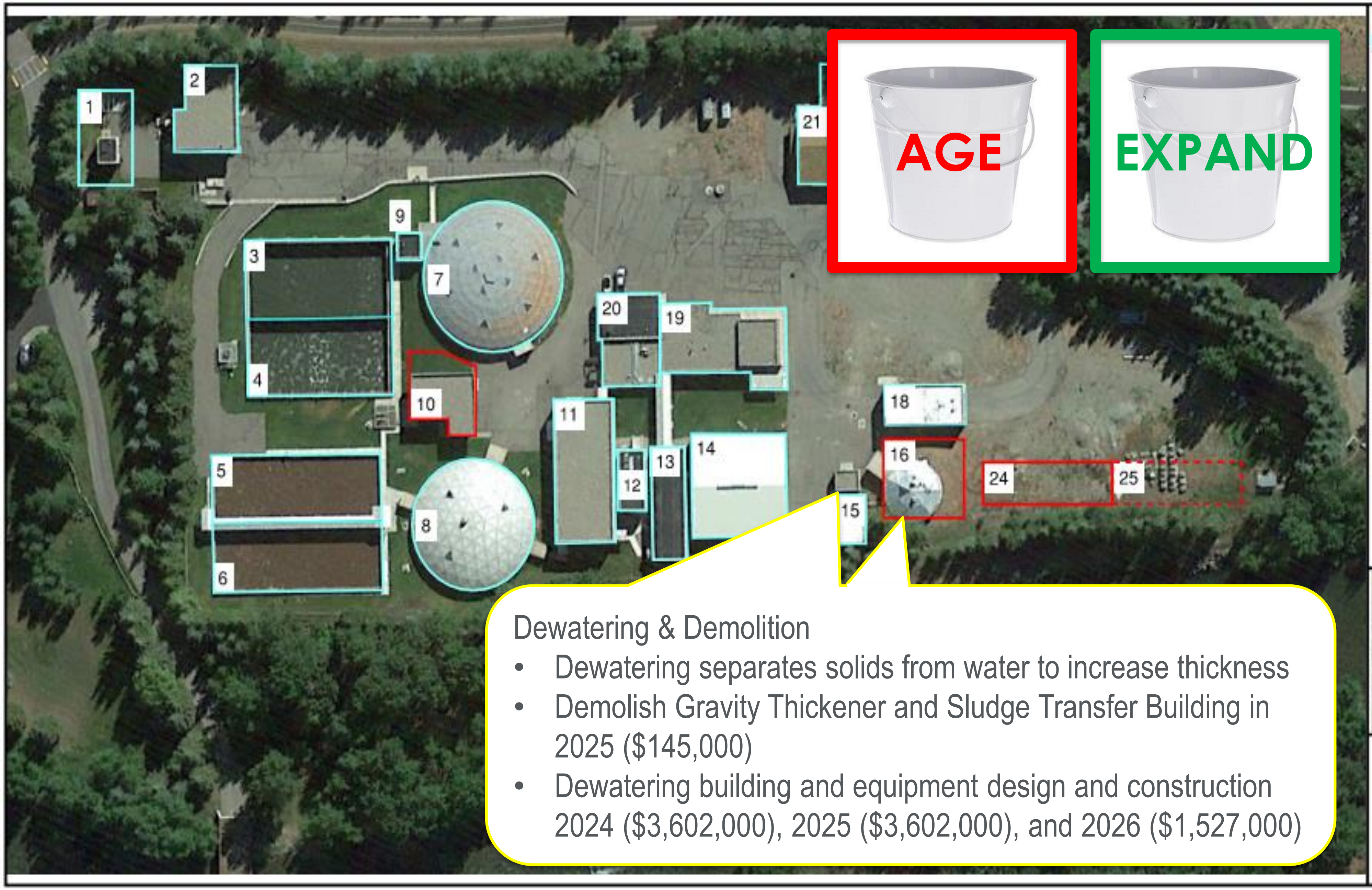



Aerobic Digester Blowers

- Supply oxygen for aerobic digesters
  - Need to replace existing two blowers, and two new blowers
- Existing building constructed in 1999
- Installation in 2029 ($1,829,000)

| '22-'27: $8,166,000 | '28-'32: $10,769,000 | '33-'37: $556,000 | '38-'42: $220,000 | Total: $19,711,000 |
|---|---|---|---|---|

2022 2027 2032 2037 2042




## Dewatering & Demolition

- Dewatering separates solids from water to increase thickness
- Demolish Gravity Thickener and Sludge Transfer Building in 2025 ($145,000)
- Dewatering building and equipment design and construction 2024 ($3,602,000), 2025 ($3,602,000), and 2026 ($1,527,000)

Ketchum / SVWSD WRF Site Plan

| | |
|---|---|
| 1 Headworks Building (not pictured) | 10 Blower Building Expansion |
| 2 Grit Building | 16 Solids PLAD Building |
| 3 Aeration Basin 1 | 24 Aerobic Digester #2 |
| 4 Aeration Basin 2 | 25 Aerobic Digester #3 (after 2042) |
| 5 Aeration Basin 3 | |
| 6 Aeration Basin 4 | |
| 7 Clarifier #1 | |
| 8 Clarifier #2 | |
| 9 Alum Building | |
| 10 Aeration Blower Building | |
| 11 Filter Building | |
| 12 Reuse Building | |
| 13 UV Building | |
| 14 Aerobic Digester #1 | |
| 15 Digester #1 Blower Building | |
| 18 Collections Garage (repurposed) | |
| 19 Garage | |
| 20 Operations Building | |
| 21 Water Operations Building | |
| 22 Administration Building | |


'22-'27: $17,042,000 | '28-'32: $10,769,000 | '33-'37: $556,000 | '38-'42: $220,000

2022 2027 2032 2037 2042

Total: **$28,587,000**

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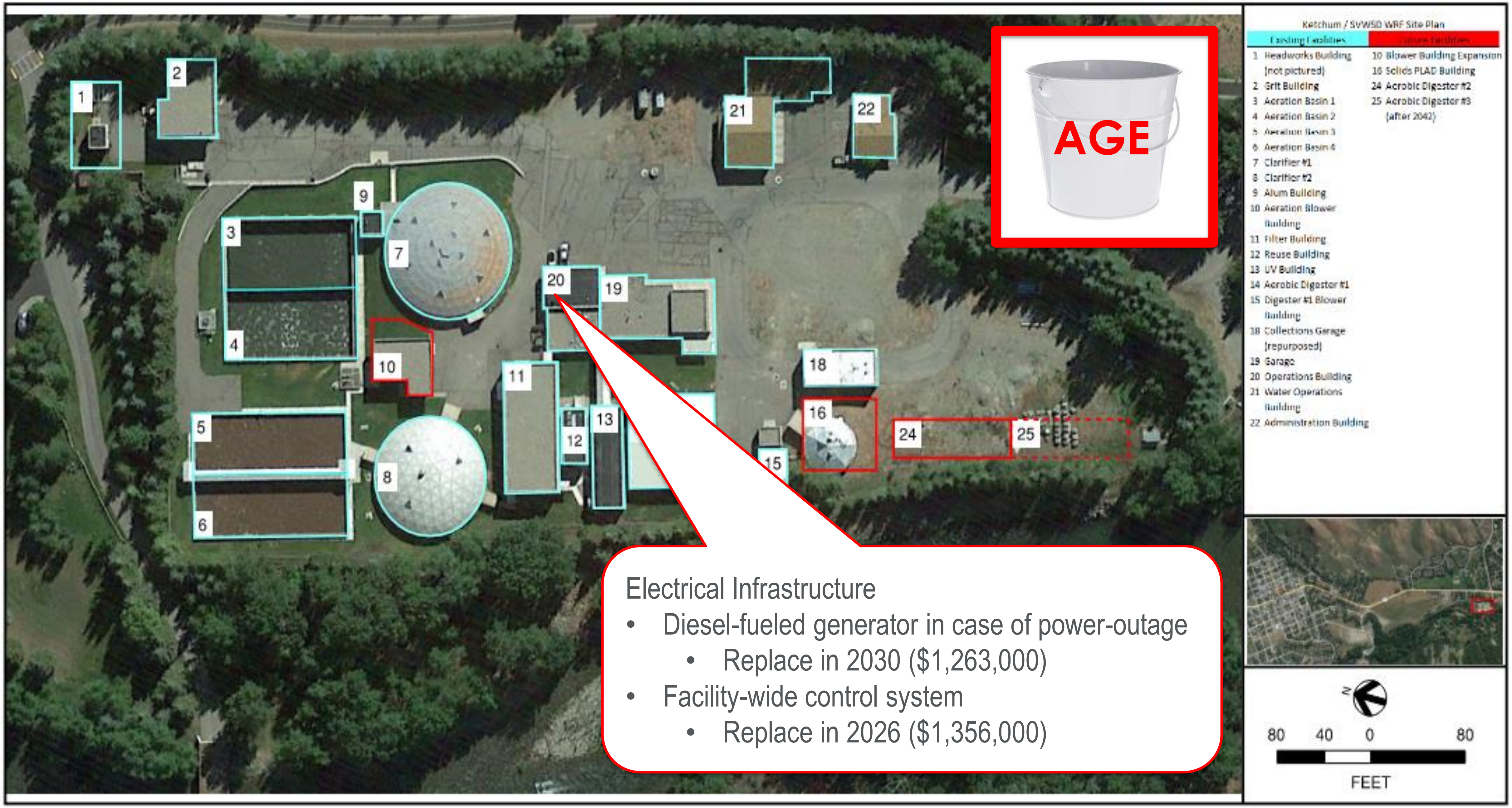


Electrical Infrastructure

- Diesel-fueled generator in case of power-outage
  - Replace in 2030 ($1,263,000)
- Facility-wide control system
  - Replace in 2026 ($1,356,000)

| 2022 | '22-'27: $18,398,000 | 2027 | '28-'32: $12,032,000 | 2032 | '33-'37: $556,000 | 2037 | '38-'42: $220,000 | 2042 |
|---|---|---|---|---|---|---|---|---|

Total: **$31,206,000**

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Pump Replacements

- Influent pumps at headworks
- Effluent pumps at filter building
- Solids pumps in aeration blower building
- Reuse pumps at reuse building
- Upgrades in 2027, 2032, 2037, and 2042 ($353,250 each year)

| '22-'27: $18,751,250 | '28-'32: $12,385,250 | '33-'37: $909,250 | '38-'42: $573,250 |
|---|---|---|---|

2022 2027 2032 2037 2042

Total: **$32,619,000**

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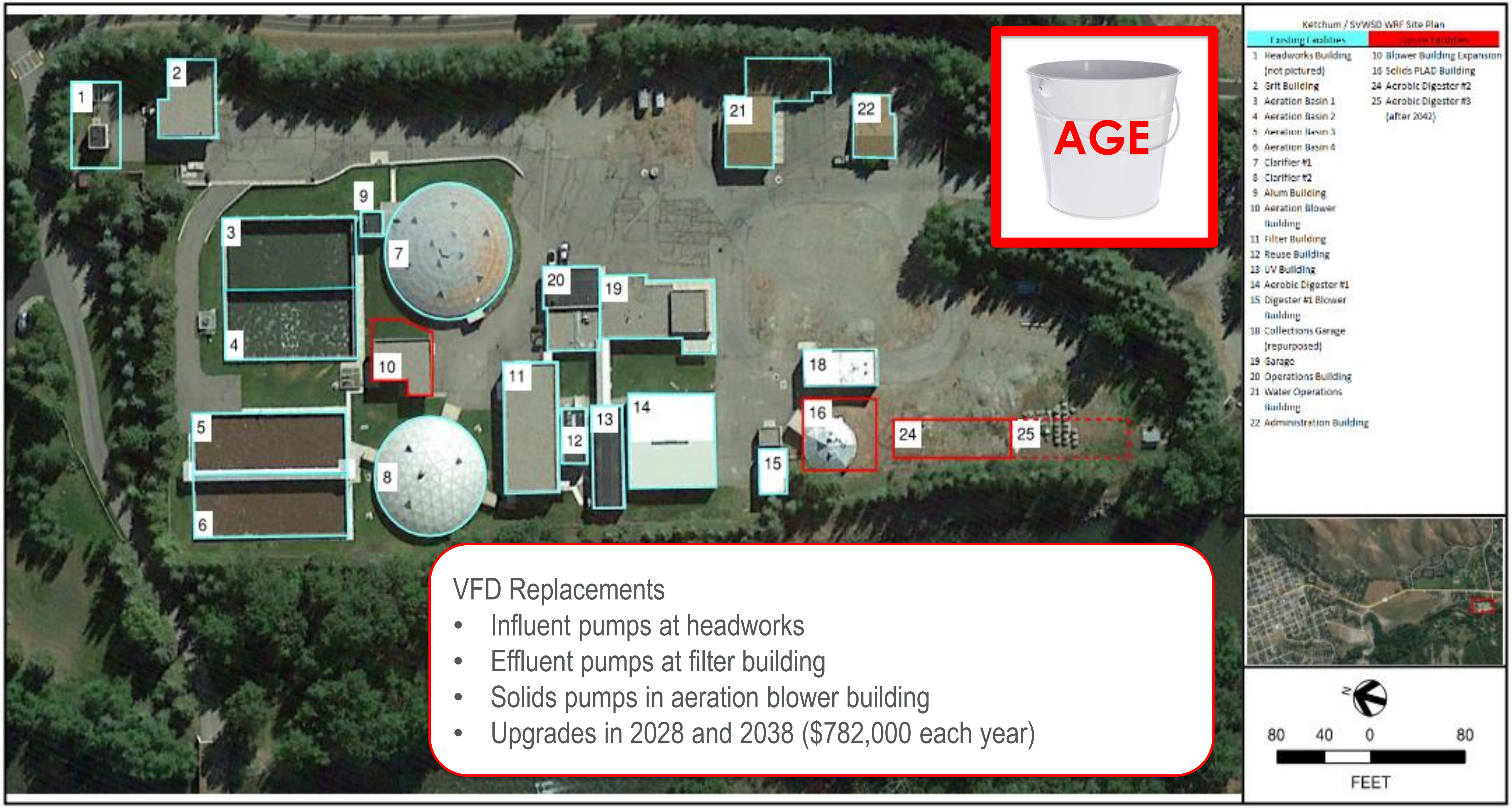


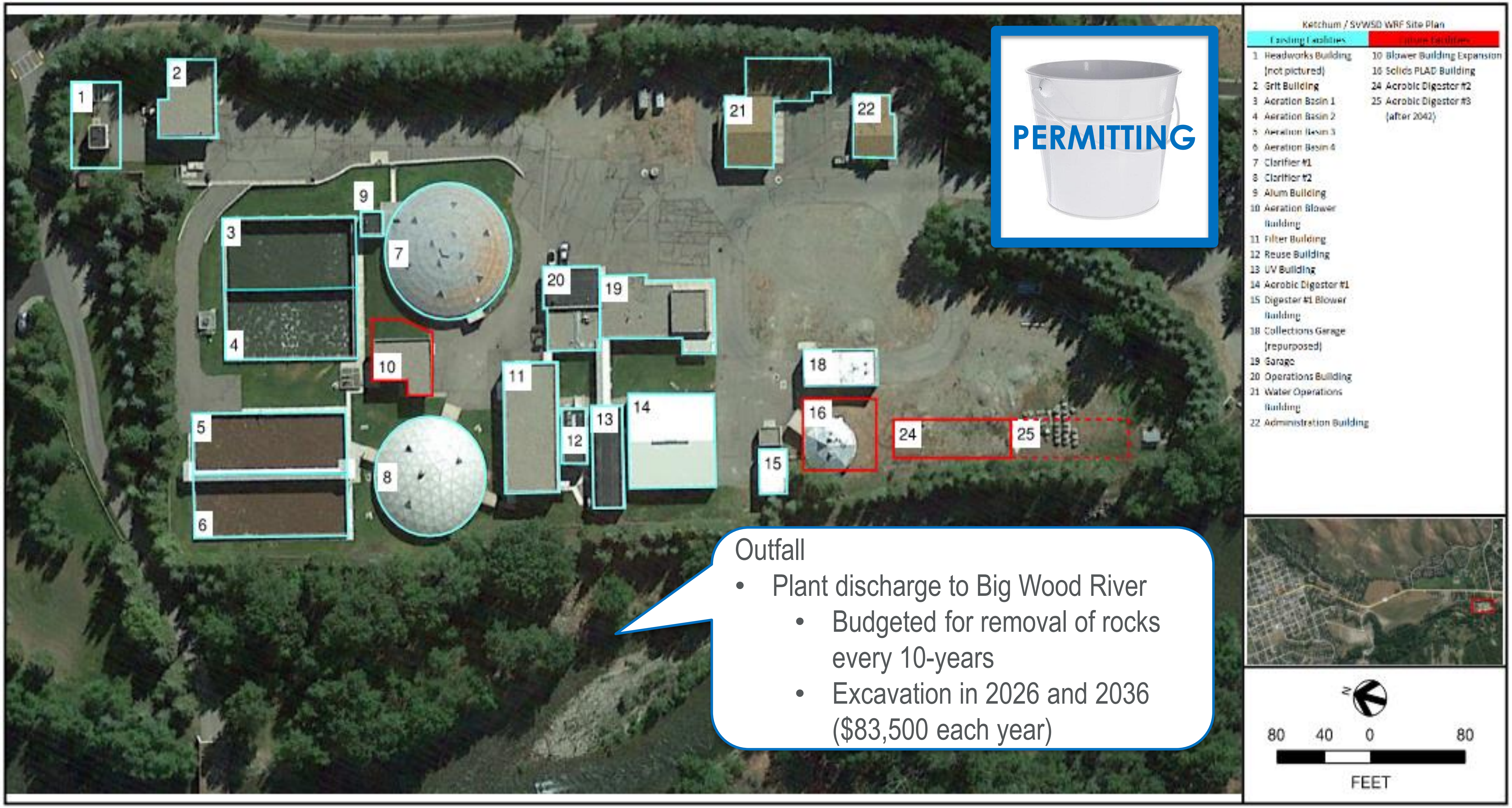

VFD Replacements

- Influent pumps at headworks
- Effluent pumps at filter building
- Solids pumps in aeration blower building
- Upgrades in 2028 and 2038 ($782,000 each year)

| 2022 | '22-'27: $18,751,250 | 2027 | '28-'32: $13,167,250 | 2032 | '33-'37: $909,250 | 2037 | '38-'42: $1,355,250 | 2042 |
|---|---|---|---|---|---|---|---|---|

Total: **$34,183,000**

# PERMITTING



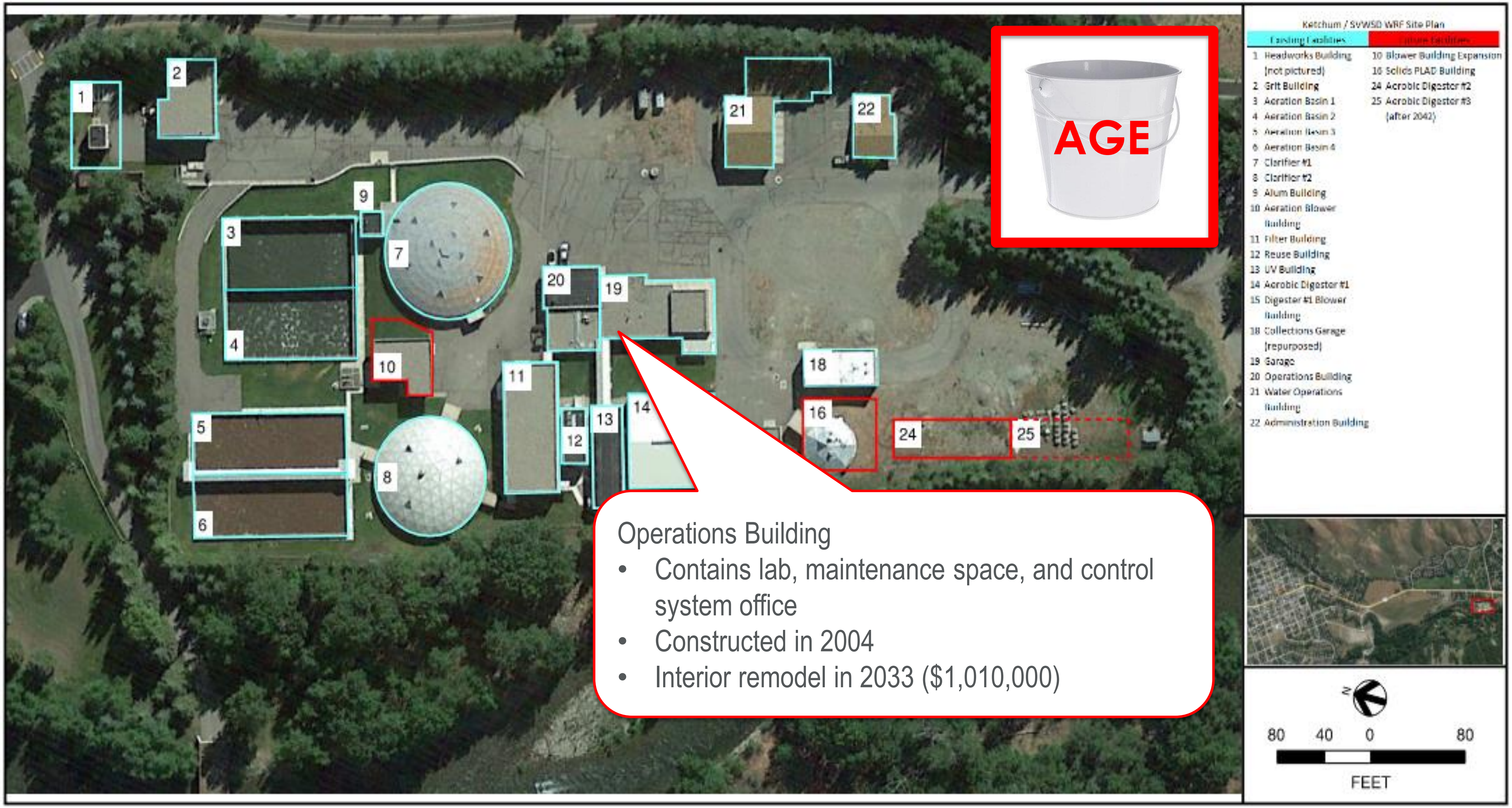

Outfall

- Plant discharge to Big Wood River
  - Budgeted for removal of rocks every 10-years
  - Excavation in 2026 and 2036 ($83,500 each year)

'22-'27: $18,834,750 | '28-'32: $13,167,250 | '33-'37: $992,750 | '38-'42: $1,355,250

2022 | 2027 | 2032 | 2037 | 2042

Total: **$34,350,000**




Operations Building

- Contains lab, maintenance space, and control system office
- Constructed in 2004
- Interior remodel in 2033 ($1,010,000)

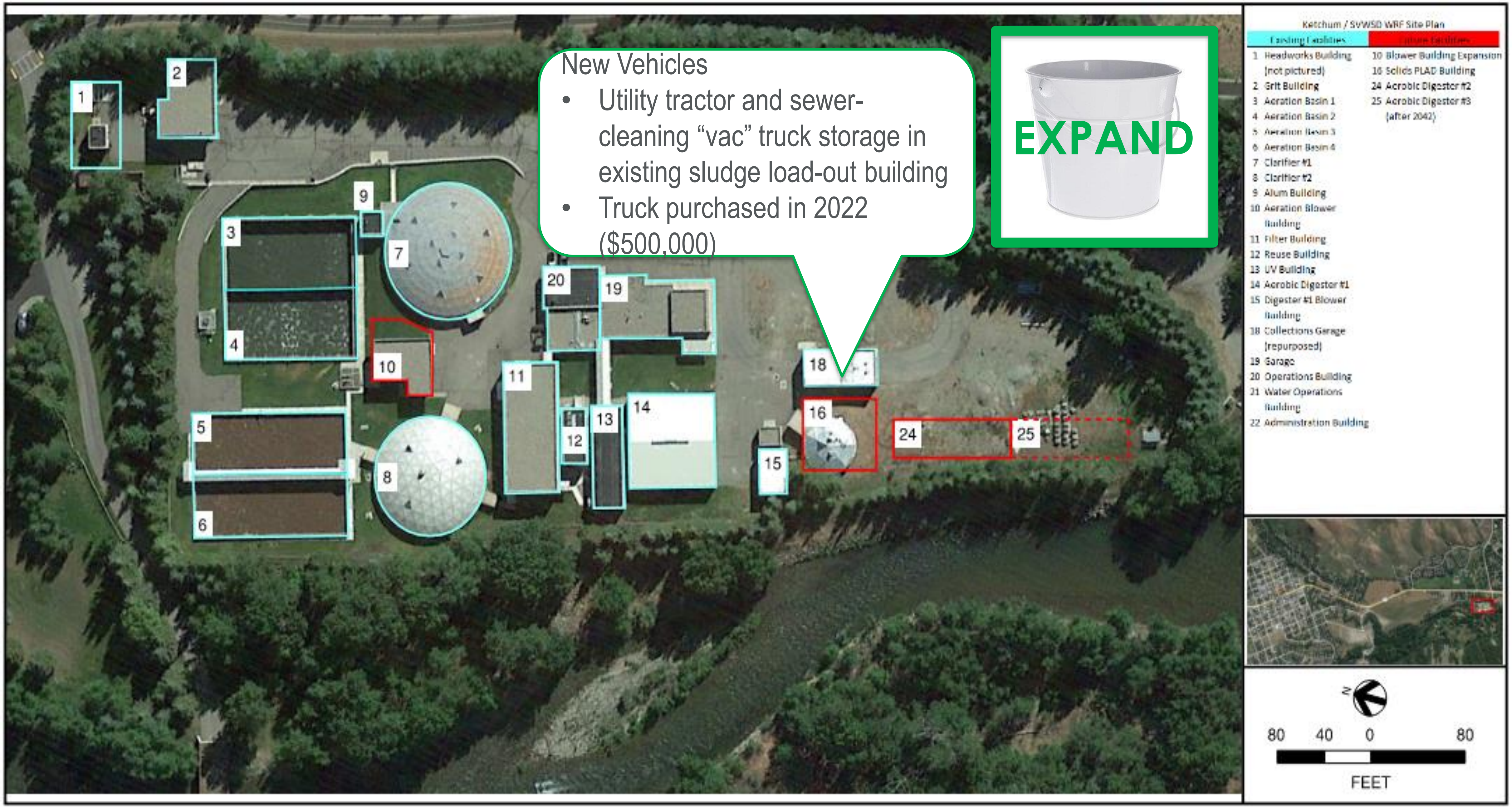
| 2022 | 2027 | 2032 | 2037 | 2042 |
|---|---|---|---|---|
| '22-'27: $18,834,750 | '28-'32: $13,167,250 | '33-'37: $2,002,750 | '38-'42: $1,355,250 | |

Total: **$35,360,000**

New Vehicles

- Utility tractor and sewer-cleaning “vac” truck storage in existing sludge load-out building
- Truck purchased in 2022 ($500,000)

**EXPAND**




| 2022 | 2027 | 2032 | 2037 | 2042 | |
|---|---|---|---|---|---|
| ‘22-’27: $19,351,750 | ‘28-’32: $13,167,250 | ‘33-’37: $2,002,750 | ‘38-’42: $1,355,250 | | Total: **$35,877,000** |

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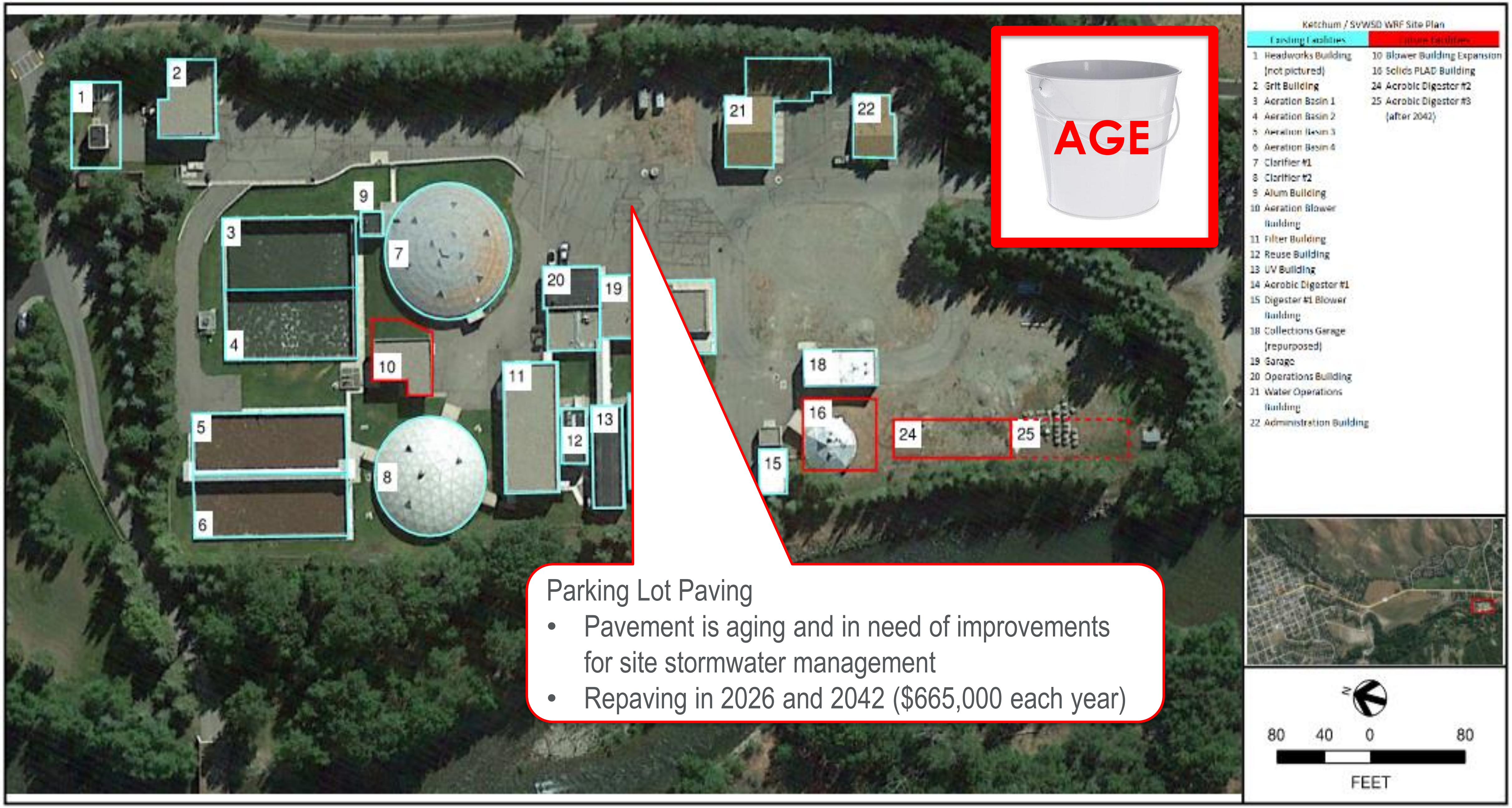



Parking Lot Paving

- Pavement is aging and in need of improvements for site stormwater management
- Repaving in 2026 and 2042 ($665,000 each year)

| ‘22-’27: $20,016,750 | ‘28-’32: $13,167,250 | ‘33-’37: $2,002,750 | ‘38-’42: $2,020,250 |
|---|---|---|---|

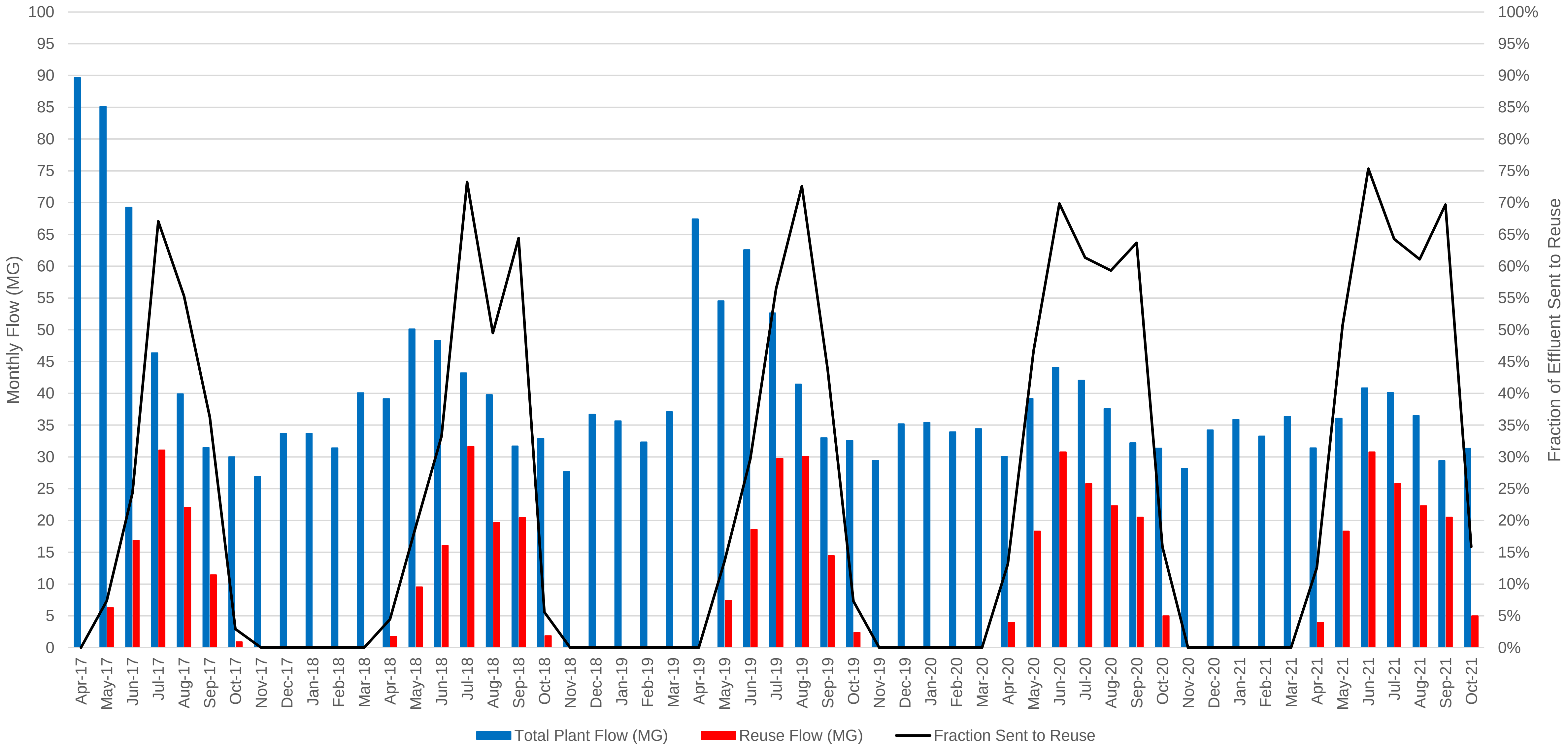
2022 — 2027 — 2032 — 2037 — 2042

Total: **$37,207,000**

# KETCHUM / SVWSD FACILITY PLAN

- Beneficial Reuse
  - Treated water “Class A” quality for irrigation
  - Biosolids used in “Class A – EQ” compost
- Energy Efficiency
  - New blowers
  - VFD’s on pumps and blowers
  - Aeration process changes use less energy

# WATER REUSE OPPORTUNITIES



# BIOSOLIDS DISPOSAL

- Composting pilot study in progress at Winn's Compost
  - Requires dewatering equipment at WRF to produce compostable biosolids
  - Winn's Compost can produce high quality Class A, EQ (exceptional quality) composted biosolids
- Currently landfilling dried biosolids- stable disposal plan

# ENERGY EFFICIENCY

- Blowers (largest power consumption in process)
  - Hybrid technology- up to 15% more efficient than centrifugal (standard for wastewater)
  - Add VFD's for digester blowers
- Aeration Basins
  - Anoxic zone and MLR promotes denitrification which reduces air demand (and energy use) by up to 20% of current setup
- All motor upgrades – higher efficiency than 20-year-old plus motors
- Reuse water decreases potable water demand for irrigation
- Composting reduces hauling by ~3,400 miles/year

# KETCHUM / SVWSD FACILITY PLAN

- Upgrade Costs
- O&M Costs
- Rate Revenue
- Sample Rate Increase Scenario

# UPGRADE PROJECT SCHEDULE

| Project | Project Cost (2022 Dollars) | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028-2032 | 2033-2037 | 2038-2042 |
|---|---|---|---|---|---|---|---|---|---|---|
| Aeration Basins - Anoxic and MLR (Nos. 3 & 4) | $987,000 | | $1,016,610 | | | | | | | |
| Aeration Basin Blower Repair | $65,000 | $65,000 | | | | | | | | |
| Grit Removal System | $1,015,000 | | | | | | | $1,324,345 | | |
| Aeration Basin Upgrades (Nos. 1 & 2) | $2,140,000 | | | | | | $1,240,423 | $1,277,636 | | |
| Rotary Drum Thickener & Dewatering Building | $7,204,000 | | | $3,821,362 | $3,936,003 | | | | | |
| Remove Digester No. 1 Building and New Flat Covers | $690,000 | | $710,700 | | | | | | | |
| Clarifier No. 1 HVAC and Roof Repair | $183,000 | | | $194,145 | | | | | | |
| Gravity Thickener & Transfer Building Demo | $145,000 | | | | $158,445 | | | | | |
| Digester No. 2 | $2,648,000 | | | | | | | $3,355,384 | | |
| Screw Press | $1,527,000 | | | | | $1,718,652 | | | | |
| New & Replacement Digester Blowers | $1,829,000 | | | | | | | $2,249,439 | | |
| Aeration Basin Blowers & Updated Electrical | $6,626,000 | | $2,185,660 | | $1,849,987 | | $1,276,361 | $2,298,097 | | |
| Replace Generator & MCC-3 | $1,263,000 | | | | | | | $1,599,931 | | |
| Pump Replacements | $1,413,000 | | | | | | $409,514 | $474,738 | $550,352 | $638,009 |
| Replace UV Equipment | $1,694,000 | | | | | | | $2,022,725 | | |
| Upgrade PLC Hardware | $1,356,000 | | | | | $1,526,190 | | | | |
| Upgrade Filter PLC | $102,000 | | $105,060 | | | | | | | |
| Digester No. 1 Diffusers | $250,000 | | | | | | | $326,193 | | |
| Clarifier Mechanism No. 1 Replacement | $553,000 | | | | | | | $743,186 | | |
| Upgrade Dewatering PLC | $102,000 | | | | | | | | $149,790 | |
| Misc. Headworks Improvements | $271,000 | | | | | | $59,123 | | | $353,035 |
| Upgrade UV PLC | $102,000 | | $105,060 | | | | | | | |
| Clarifier Mechanism No. 2 Replacement | $454,000 | | | | | | | | $666,714 | |
| Ancillary Buildings | $1,010,000 | | | | | | | | $1,398,076 | |
| Utility Tractor | $67,000 | $67,000 | | | | | | | | |
| Sewer Cleaning "Vac" Truck | $450,000 | $450,000 | | | | | | | | |
| Parking Lot Repaving | $1,330,000 | | | | | $748,463 | | | | $1,201,064 |
| Replace VFD's | $1,564,000 | | | | | | | $933,749 | | $1,254,880 |
| Outfall Clearing | $167,000 | | | | | $93,980 | | | $126,301 | |
| **Total 2022 Cost (including 3% inflation)** | **$37,207,000** | **$582,000** | **$4,123,090** | **$4,015,507** | **$5,944,435** | **$4,087,285** | **$2,985,421** | **$16,605,423** | **$2,891,234** | **$3,446,989** |

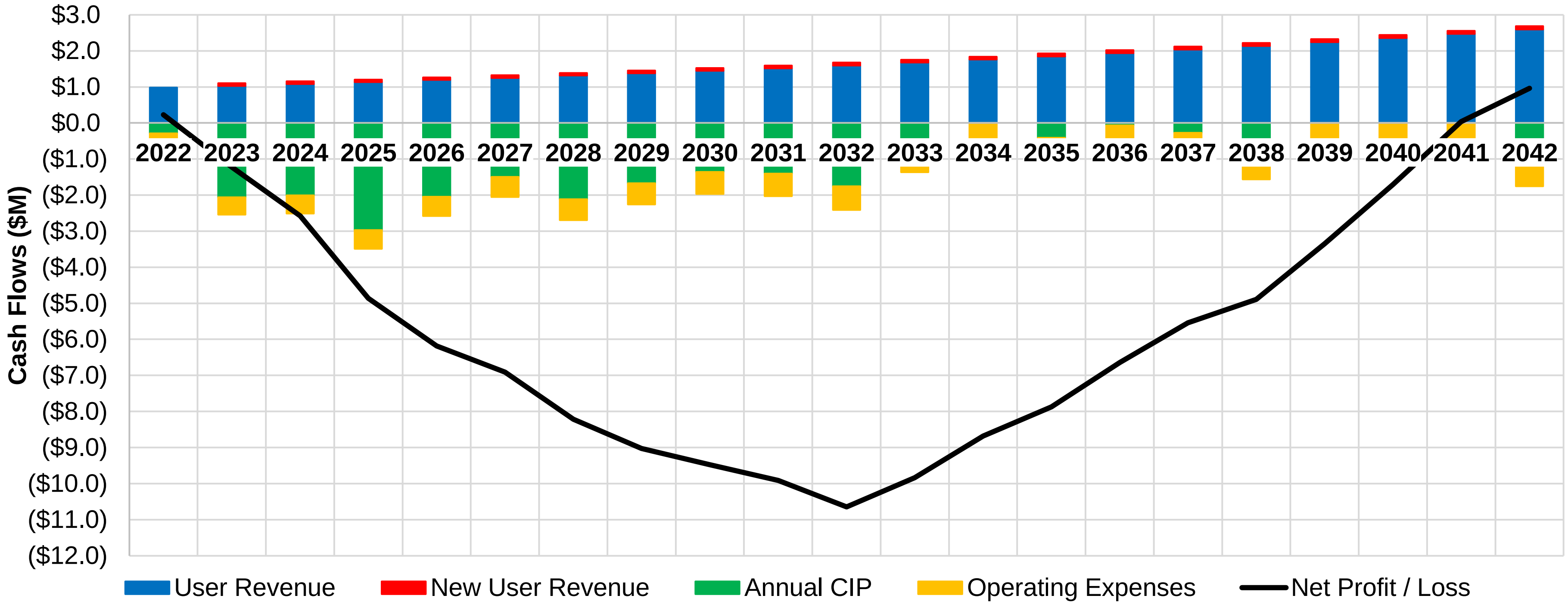
# O&M COSTS & REVENUE

| Item | Unit Cost | Units | 2021-2022 | 2042-2043 |
|---|---|---|---|---|
| Labor (including benefits) | $51.07 | per hour | $637,354 | $1,168,482 |
| Power (including demand and basis charges) | $0.063 | per kWh | $112,562 | $236,025 |
| Alum (17% $Al_2O_3$) | $472 | per dry ton | $7,772 | $12,808 |
| Polymer | $4,900 | per ton | $24,108 | $39,727 |
| Cloth Filter Replacement | $60,000 | every 10 years | $6,000 | $6,000 |
| Sodium Hypochlorite (12.5% NaClO) | $806 | per tote (330 gal) | $6,574 | $10,833 |
| Solids Hauling to Ohio Gulch Drying Beds | $3.00 | per mile | $19,062 | $4,443 |
| Solids Disposal to Milner Butte Landfill | $96 | per ton | $31,693 | $42,506 |
| | | **Total** | $845,125 | $1,520,823 |

| Item | Ketchum | SVWSD | Total |
|---|---|---|---|
| Connections[1] | 2,089 | 2,792 | 4,881 |
| Average Monthly Rate per Connection | $39.12 | $23.00 | - |
| Average Quarterly Revenue | $245,165 | $192,648 | $437,813 |
| Average Yearly Revenue | $980,660 | $770,592 | $1,751,252 |

# FINANCING - KETCHUM

- Breakeven annual user rate increase: ~3.8% per year
- Assumes no connection fee increase, doesn't include collection systems costs



# KETCHUM / SVWSD FACILITY PLAN

- QUESTIONS?

HDR

PUBLIC WORKS
KETCHUM
STREETS & UTILITIES

SUN VALLEY
WATER AND SEWER DISTRICT

# City of Ketchum / Sun Valley Water & Sewer District

*Wastewater Facility Planning Study*

*Ketchum ID*
June 9, 2022

PROFESSIONAL ENGINEER
REGISTERED
8778
STATE OF IDAHO
BRADLEY S. BJERKE
6/9/2022

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# Acronyms

| | |
|---|---|
| °C | degrees Celsius |
| °F | degrees Fahrenheit |
| µm | micron |
| BFP | belt filter press |
| BOD | biochemical oxygen demand |
| cf/hr | cubic feet per hour |
| cf/MG | cubic feet per million gallons |
| cfm | cubic feet per minute |
| CFR | Code of Federal Regulations |
| cfu/100 mL | colony forming units per 100 mL |
| CWA | 1972 Clean Water Act |
| DAF | dissolved air flotation |
| DEQ | Idaho Department of Environmental Quality |
| DO | dissolved oxygen |
| DWF | dry-weather flow |
| EPA | U.S Environmental Protection Agency |
| EQ | Class A Exception Quality |
| F:M | feed to microorganism ratio |
| FOG | fats, oils, and greases |
| FPS | Ketchum / Sun Valley Wastewater Facility Planning Study |
| GBT | gravity belt thickener |
| gpcd | gallons per capita per day |
| GPD | gallons per day |
| GPH | gallons per hour |
| GPM | gallons per minute |
| GST | gravity sludge thickener |
| hp | horsepower |
| HRT | hydraulic retention time |
| I&I | inflow and infiltration |
| IMLR | internal mixed liquor recycle |
| IPDES | Idaho Pollutant Discharge Elimination System |
| kW | kilowatt |
| LA | load allocation |
| lbs/d | pounds per day |
| LC | loading capacity |
| MG | million gallons |
| mg/L | milligrams per liter |
| MGD | million gallons per day |
| $mJ/cm^2$ | millijoules per square centimeter |
| MLE | Modified Ludzack-Ettinger |
| MLR | mixed liquor recycle |
| MLSS | mixed liquor suspended solids |
| mm | millimeter |
| MOS | margin of safety |
| MPN | most probable number |
| NB | natural background load |
| NPDES | National Pollutant Discharge Elimination System |
| O&M | operation and maintenance |
| OEM | original equipment manufacturer |
| PFAS | perfluoroalkyl and polyfluoroalkyl substances |
| PFP | plate filter press |
| PLC | programmable logic controller |

| | |
|---|---|
| PD | positive displacement |
| ppm | parts per million |
| Psi | pounds per square inch |
| psig | pounds per square inch gauge |
| RAS | return activated sludge |
| RC | responsible charge |
| RDT | rotary drum thickener |
| RPM | revolutions per minute |
| SCADA | supervisory control and data acquisition |
| SCFM | standard cubic feet per minute |
| SRT | sludge retention time |
| SVWSD | Sun Valley Water and Sewer District |
| SVED | Sun Valley Economic Development |
| TKN | total Kjeldahl nitrogen |
| TMDL | tot maximum daily load |
| TN | total nitrogen |
| TP | total phosphorus |
| TSS | total suspended solids |
| USDA-RD | U.S. Department of Agriculture-Rural Development |
| UV | ultraviolet |
| VFD | variable frequency drive |
| VSS | volatile suspended solids |
| WAS | waste activated sludge |
| WLA | wasteload allocation |
| WMP | Big Wood River Watershed Management Plan |
| WRF | wastewater reclamation facility |
| WWF | wet-weather flow |

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# Executive Summary

## Introduction

This Wastewater Facilities Planning Study (FPS) documents the upgrades and expansions needed for the wastewater treatment system serving the Cities of Ketchum and Sun Valley to meet regulatory discharge requirements through a 20-year planning period (2022 – 2042). Hereafter the facility will be referred to as the Ketchum / Sun Valley Water & Sewer District Water Reclamation Facility (WRF). The WRF infrastructure is equally owed by the City of Ketchum and SVWSD. The annual operating costs are shared based upon usage (flow) which is slightly skewed toward Ketchum, approximately 55/45. The wastewater collection systems for each community are managed separately, Ketchum's collection system by the City of Ketchum and Sun Valley's collection system by Sun Valley Water & Sewer District (SVWSD).

## Description of Existing Facilities

### Collection Systems

The Ketchum collection trunk system is made up of over 30 miles of 8-inch through 24-inch pipe. Except for newer developments, most of the piping is approximately 30 years old and consists mostly of asbestos cement sewer pipe. Newer piping is PVC.

The Sun Valley system is made up of about 27 miles of 8-inch through 18-inch pipe. The system was originally constructed using non-reinforced concrete and clay pipe. Developments that grew in the 1970's, such as Elkhorn, used asbestos-covered cement sewer pipes. The newer developments constructed after the late 1970's have all installed PVC sewer lines.

In previous studies, inflow and infiltration (I&I) has been noted as a serious problem for the collection systems of both communities. However, efforts over the last 20 years have reduced the I/I flows entering the WRF.

### Ketchum / SVWSD Water Reclamation Facility Overview

The WRF consists of screening, pumping, grit removal, activated sludge treatment (biological treatment), tertiary filtration, and disinfection. The treated water with increased disinfection meets Class A reuse standards and is used by the Weyyakin subdivision and Elkhorn Golf Course for irrigation. The biosolids produced and processed by the plant are thickened and aerobically digested. After aerobic treatment, the biosolids is hauled in liquid form by tanker truck to the Ohio Gulch drying beds.

## Population Estimates

The populations of both Sun Valley and Ketchum can be divided into four broad groups: permanent residents who live in the area year-round, second-home residents who occupy their homes for only part of the year, transitory workers, and tourists. Since the population of the area is so variable, the FPS estimates both the average annual population and the peak season population for use in sizing current and future unit processes. The FPS often refers to populations as "equivalents". This means that some of the population, specifically commuters and tourists, do not produce the same amount of wastewater flow as a "typical" resident. The population of these two groups are de-rated to adjust for their reduced flow contribution.

In addition to the populations within the city limits, the planning period values include population estimates for Impact Zones. Impact Zones are areas that are adjacent to the Ketchum and Sun

Valley communities which could be served by the WRF in the future. The estimate of current and planning period populations is listed in Table E. 1.

**Table E. 1. Estimate of current and planning period populations**

| Parameter | Ketchum | Sun Valley | Impact Zones | Totals |
|---|---|---|---|---|
| **Current** | | | | |
| Average Equivalents[1] | 7,190 | 4,955 | - | 12,146 |
| Peak Equivalents[1] | 9,567 | 7,401 | - | 16,968 |
| **Planning Period (2042)** | | | | |
| Average Equivalents[1] | 9,250 | 7,817 | 266 | 17,332 |
| Peak Equivalents[1] | 12,216 | 11,378 | 602 | 24,196 |

[1] Equivalents de-rate the tourist population to 80% and the commuter population to 20% of the actual population

The growth rates over the last 30 years as shown in Figure E. 1 provides the trends used to project growth during the 20-year planning period. The projected growth is estimated to be 1.14 percent per year for Ketchum and 2.14 percent for Sun Valley, for a combined growth of 1.44 percent.

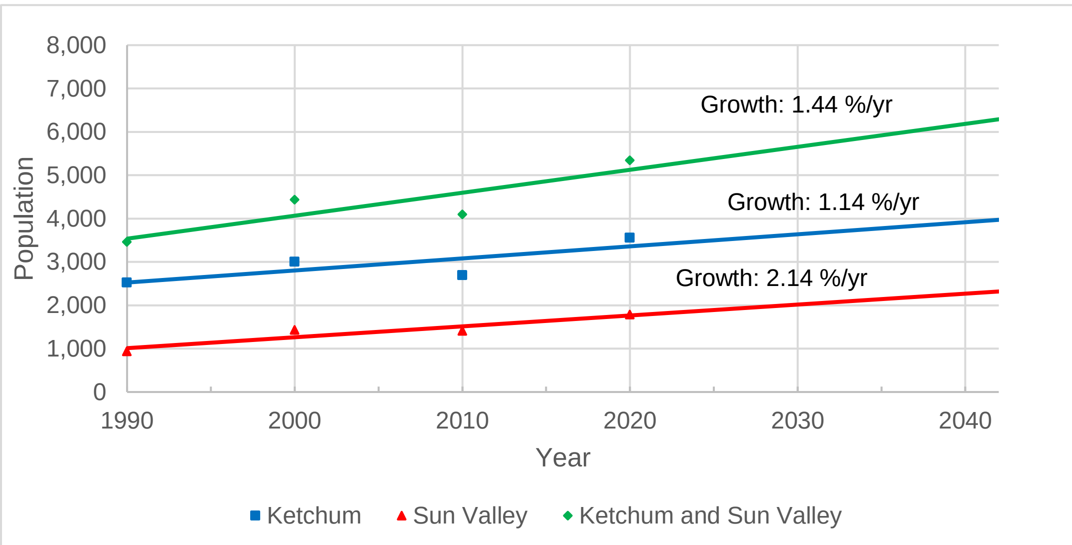


**Figure E. 1. Population growth estimate**

## Flows and Loads

Table E. 2 presents the current flows and loads to the WRF. The sources of wastewater flow are domestic flows from households and commercial businesses, and I&I. The future flows are based on historical and future population trends and past flow data. While pollutant loading values are based on historical concentration trends. The mass loads were determined by using the future flow rates and concentration values.

**Table E. 2. Current and future flows and loads**

| Parameter | Current (2021) | Planning Period (2042) |
|---|---|---|
| Average Annual Flow (MGD) | 1.05 | 1.73 |
| Peak Month Flow (MGD) | 1.34 | 2.57 |
| Peak Day Flow (MGD) | 1.49 | 3.47 |
| Peak Hour Flow (MGD) | 3.05 | 5.96 |
| BOD Average Annual (lbs/d) | 2,348 | 3,888 |
| BOD Peak Month (lbs/d) | 3,857 | 5,757 |
| TSS Average Annual (lbs/d) | 1,715 | 2,902 |
| TSS Peak Month (lbs/d) | 2,345 | 4,296 |
| TP Average Annual (lbs/d) | 34 | 58 |
| TP Peak Month (lbs/d) | 47 | 86 |
| TKN Average Annual (lbs/d)[1] | 351 | 580 |
| TKN Peak Month (lbs/d)[1] | 446 | 859 |

[1] Data based on typical WRF influent values from Metcalf & Eddy[1]. No actual influent TKN data available.

# Current WRF Capacity

The current WRF capacity is summarized in Table E. 3. The table lists both total and redundant capacities. The total capacity is the maximum amount of flow that each treatment system can handle with all units in service. The redundant capacity is the available treatment capacity with the largest unit out of service.

**Table E. 3. System capacity**

| Component | Total Capacity (MGD) | Redundant Capacity (MGD) | Detail |
|---|---|---|---|
| Headworks | 11.5 MGD | 4.0 MGD | Perforated mechanical screen at 4.0 MGD<br>Mechanical bar screen at 7.5 MGD |
| Aeration Basins | 3.7 MGD | 2.8 MGD | 4 aeration basins at 0.93 MGD each |
| Clarifiers | 9.7 MGD | 4.0 MGD | Clarifier 1 at 5.7 MGD<br>Clarifier 2 at 4.0 MGD |
| Tertiary Filtration | 11.6 MGD | 7.7 MGD | 3 filter units at 3.87 MGD each |
| UV Disinfection[1] | 11.3 MGD | 7.5 MGD | 2 channels at 3.75 MGD each |
| Solids Handling- Aerobic Digester | 15,000 GPD at 3% solids[2] | None | 1 digester at 300,000 gallons<br>HRT Design - 60 days at 15°C |

[1] Capacities shown based on 30 mJ/cm$^2$ dose. Redundant capacity certified at 3.1 MGD for 100 mJ/cm$^2$ dose (reuse-quality dose). See the Reuse section of the Executive Summary for more information.
[2] Solids production of 15,000 GPD at 3% solids is equivalent to approximately 1.75 MGD of influent wastewater flow.

# Plant Upgrades and Additions

Plant upgrades are needed either due to age or plant service area growth. The plant can be divided into several groups that need attention, including the headworks, activated sludge system, tertiary treatment, disinfection, solids handling, and effluent end-use.

[1] Metcalf & Eddy, Inc., Tchobanoglous, G., Abu-Orf, M., Bowden, G., & Pfrang, W. (2014). *Wastewater Engineering: Treatment and Resource Recovery* (5th ed.). McGraw-Hill Education.

The headworks are made up of the influent pumps, screening, grit chamber, and odor control. These components are generally adequate for current and future conditions with upgrades during the planning period generally needed due to age.

Activated sludge aeration basins are adequate for future conditions with improvements required related to baffling and process configuration. The configuration changes will significantly reduce energy costs associated with aeration and provide flexibility for additional total nitrogen removal, which is important for reuse water.

The heart of the activated sludge process is air supply to the biological system. Aeration blower replacements will require major future investment. The WRF operating cost is dominated by electrical power for aeration blowers. Therefore, future planning will continue to promote energy efficient blowers. Currently, the WRF uses high-efficiency turbo blowers. The recommended hybrid blower technology has nearly identical energy efficiency as turbo blowers and has a much simpler maintenance routine.

The tertiary treatment system is in good condition. Tertiary treatment at the WRF consists of cloth media filters. Future upgrades are related to miscellaneous equipment components and filter media.

The final liquid treatment step is disinfection. The ultraviolet (UV) light disinfection system works very well and leaves little residual living bacteria in the treated effluent. The system is 20 years old and will require replacement during the planning period. Final disposal of the treated water is normally into the Big Wood River but during irrigation season is diverted as a Class A reuse water for beneficial use by both Ketchum and SVWSD. The diversion not only supplies much needed water to landscape and golf course grounds, it relieves nutrient load to the Big Wood River.

The solids handling system is the weak-link in the current WRF system. The plant currently only has one aerobic digester / sludge holding tank. There is no redundancy in the system. The WRF currently has no sludge-holding capacity if the sludge holding tank must be taken offline for maintenance. The other concern with the solids handling system is transport of liquid biosolids to the Ohio Gulch drying beds. The practice has been to haul primarily water (only 3 percent solids) to the beds. Liquid hauling has been a cost-effective method as energy and labor costs were low.

Future operating conditions and changes in final disposal require a change from this liquid hauling approach. The recommended upgrades are a rotary drum thickener (RDT) to boost solids content from 3 percent to 6 percent and a screw press to further dewater to 15 – 18 percent solids. At this concentration, the biosolids can be hauled using an open-bed trailer rather than a tanker, and significantly reduces the volume (water) hauled. The wet tons hauled to Ohio Gulch reduces from approximately 16,500 tons to 3,300 tons per year. The other added benefit is the dewatered solids provide a better composting amendment.

## Improvement Financials

A sewer rate is based on the principle that total revenue shall be obtained from users (connections) who benefit from the facilities to cover new improvements, operations, and maintenance costs. The revenue comes from new connections fees and monthly user fees per connection. The current Ketchum and Sun Valley connections and quarterly user rates are shown in Table E. 4.

**Table E. 4. User rates summary**

| Item | Ketchum | SVWSD | Total |
|---|---|---|---|
| Connections | 2,089 | 2,792 | 4,881 |
| Average Monthly Rate per Connection | $39.12 | $23.00 | - |
| Average Quarterly Revenue | $245,165 | $192,648 | $437,813 |
| Average Yearly Revenue | $980,660 | $770,592 | $1,751,252 |

It is understood that the growth component of wastewater upgrade costs at Ketchum and SVWSD is funded using connection fees. The fee is currently $2,921 per connection and $3,100 per residential equivalent connection for Ketchum and SVWSD, respectively. The growth is anticipated to add 540 connections for Ketchum and 1,475 connections for SVWSD. Capital construction costs are split evenly between the two entities, and operation and maintenance costs are split based on the flow proportions.

The estimated user rates for improvements identified in this plan were calculated after first accounting for the revenue generated by impact fees using a connection growth rate of 1.14 percent in the City of Ketchum collection system and 2.14 percent in the SVWSD collection system per year. It is also assumed that the existing rates used by each community cover current operating costs and have paid off all previous bonds, in addition to producing no excess revenue. As seen in Table E. 5, the cost for all improvements needed through the planning period costs $37.2 million in 2022 dollars. This means that each community will have to generate $18.6 million.

### Table E. 5. Upgrades categories

| Project | Capital Cost[1] | Annualized Cost[2] |
|---|---|---|
| **Process Near-Term (2022-2032)** | | |
| Aeration Basins - Anoxic and MLR (Nos. 3 & 4) | $987,000 | $49,350 |
| Aeration Basin Blower Repair | $65,000 | $3,250 |
| Grit Removal System | $1,015,000 | $50,750 |
| Aeration Basin Upgrades (Nos. 1 & 2) | $2,140,000 | $107,000 |
| Rotary Drum Thickener & Dewatering Building | $7,204,000 | $360,200 |
| Remove Digester No. 1 Building and New Flat Covers | $690,000 | $34,500 |
| Clarifier No. 1 HVAC and Roof Repair | $183,000 | $9,150 |
| Gravity Thickener & Transfer Building Demo | $145,000 | $7,250 |
| Digester No. 2 | $2,648,000 | $132,400 |
| Screw Press | $1,527,000 | $76,350 |
| New & Replacement Digester Blowers | $1,829,000 | $91,450 |
| Aeration Basin Blowers & Updated Electrical | $6,626,000 | $331,300 |
| Pump Replacements[3] | $706,500 | $35,325 |
| Replace UV Equipment | $1,694,000 | $84,700 |
| Upgrade PLC Hardware | $1,356,000 | $67,800 |
| Upgrade Filter PLC | $102,000 | $5,100 |
| Digester No. 1 Diffusers | $250,000 | $12,500 |
| Clarifier Mechanism No. 1 Replacement | $553,000 | $27,650 |
| Upgrade UV PLC | $102,000 | $5,100 |
| Replace VFD's | $782,000 | $39,100 |
| Outfall Clearing[4] | $83,500 | $4,175 |
| Subtotal | $30,688,000 | $1,534,400 |
| **Process Long-Term (2033-2042)** | | |
| Replace Generator & MCC-3 | $1,263,000 | $63,150 |
| Pump Replacements[3] | $706,500 | $35,325 |
| Upgrade Dewatering PLC | $102,000 | $5,100 |
| Misc. Headworks Improvements | $271,000 | $13,550 |
| Clarifier Mechanism No. 2 Replacement | $454,000 | $22,700 |
| Replace VFD's | $782,000 | $39,100 |
| Outfall Clearing[4] | $83,500 | $4,175 |
| Subtotal | $3,662,000 | $183,100 |
| **Ancillary** | | |
| Parking Lot Repaving | $1,330,000 | $66,500 |
| Lab/Ops/Maintenance Remodel | $1,010,000 | $50,500 |
| Utility Tractor | $67,000 | $3,350 |
| Sewer Cleaning "Vac" Truck | $450,000 | $22,500 |
| Subtotal | $2,857,000 | $142,850 |
| **Total** | $37,207,000 | $1,860,350 |

[1] Costs are presented in 2022 dollars and are not escalated to year of construction. Also includes contingency.
[2] Based on 20-year period and assumed 3.0% inflation rate
[3] Pump replacements split in four installments- two short-term, two long-term.
[4] Two outfall clearings in planning period- one short-term, one long-term.
MLR=mixed liquor recycle; HVAC=heating, ventilation, and air conditioning; UV=ultraviolet; SCADA=supervisory control and data acquisition system; PLC=programmable controller logic

The City of Ketchum can generate sufficient revenue for the capital costs and share of operating costs by increasing user rates annually at an average rate of 3.8 percent, assuming connection fees are not increased. This will also leave the City with an operating wastewater budget of approximately $1,000,000 to be used as a reserve fund for unexpected costs, such as repairs for premature equipment failure. The monthly user rate using a 3.8 percent annual increase begins at $39.12 (in 2022) and ends at $72.51 (in 2042). Figure E. 2 provides a visual representation of the planning period cash flows for the City of Ketchum.

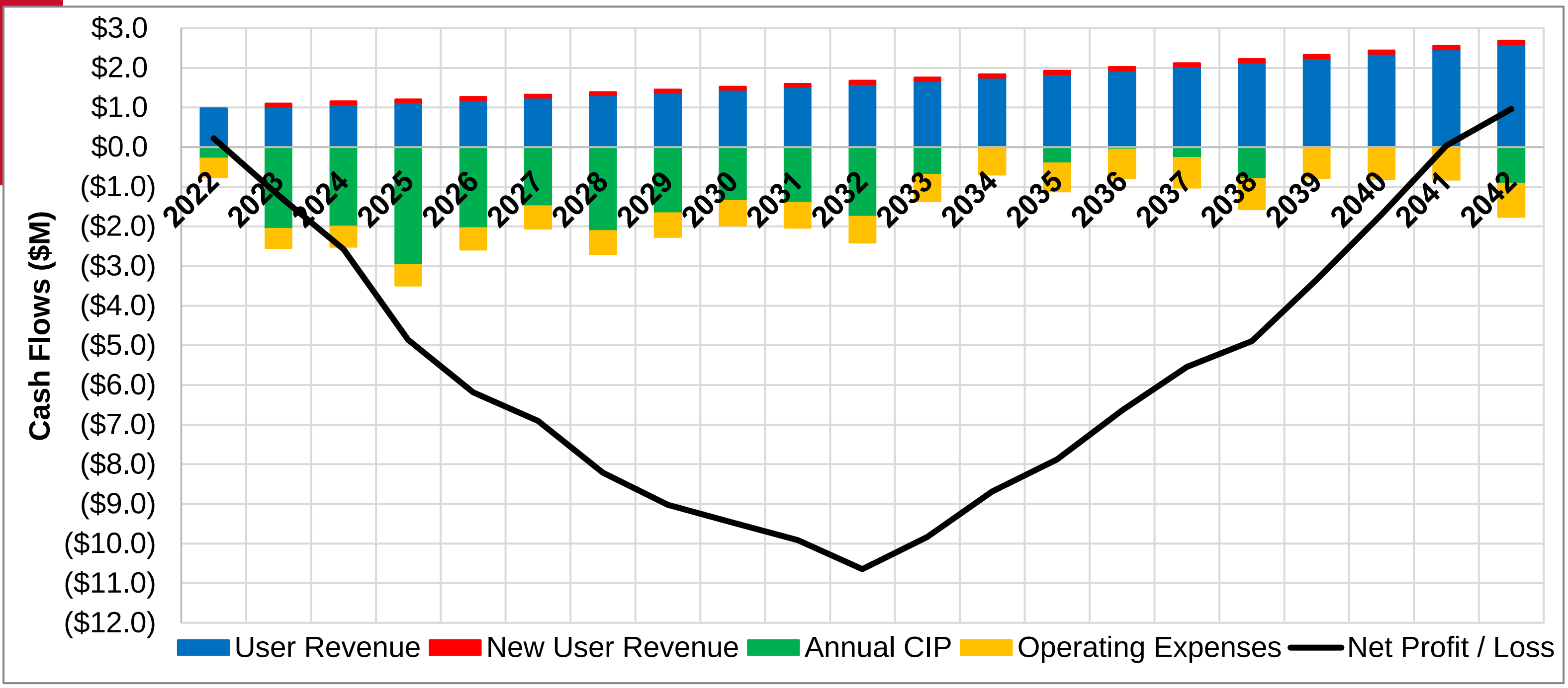


**Figure E. 2. City of Ketchum wastewater cash flows**

The SVWSD can generate sufficient revenue for the capital costs and share of operating costs by increasing user rates annually at an average rate of 3.4 percent, assuming connection fees are not increased. The SVWSD has contemplated increasing connection fees to reduce the required rate increase- if the SVWSD increases connection fees by 2.5 percent annually, then the user rates would only have to be increased at an average rate of 3.0 percent. Both alternatives will leave the SVWSD with approximately $1,000,000 in the wastewater budget for unexpected costs by the end of the planning period. The monthly user rate using a 3.0 percent annual increase begins at $23.00 (in 2022) and ends at $41.14 (in 2042). The new user connection fee using a 2.5 percent annual increase begins at $3,100 (in 2022) and ends at $5,080 (in 2042). Figure E. 3Figure 7-2 provides a visual representation of the planning period cash flows for the SVWSD with both connection fee and user rate increases.

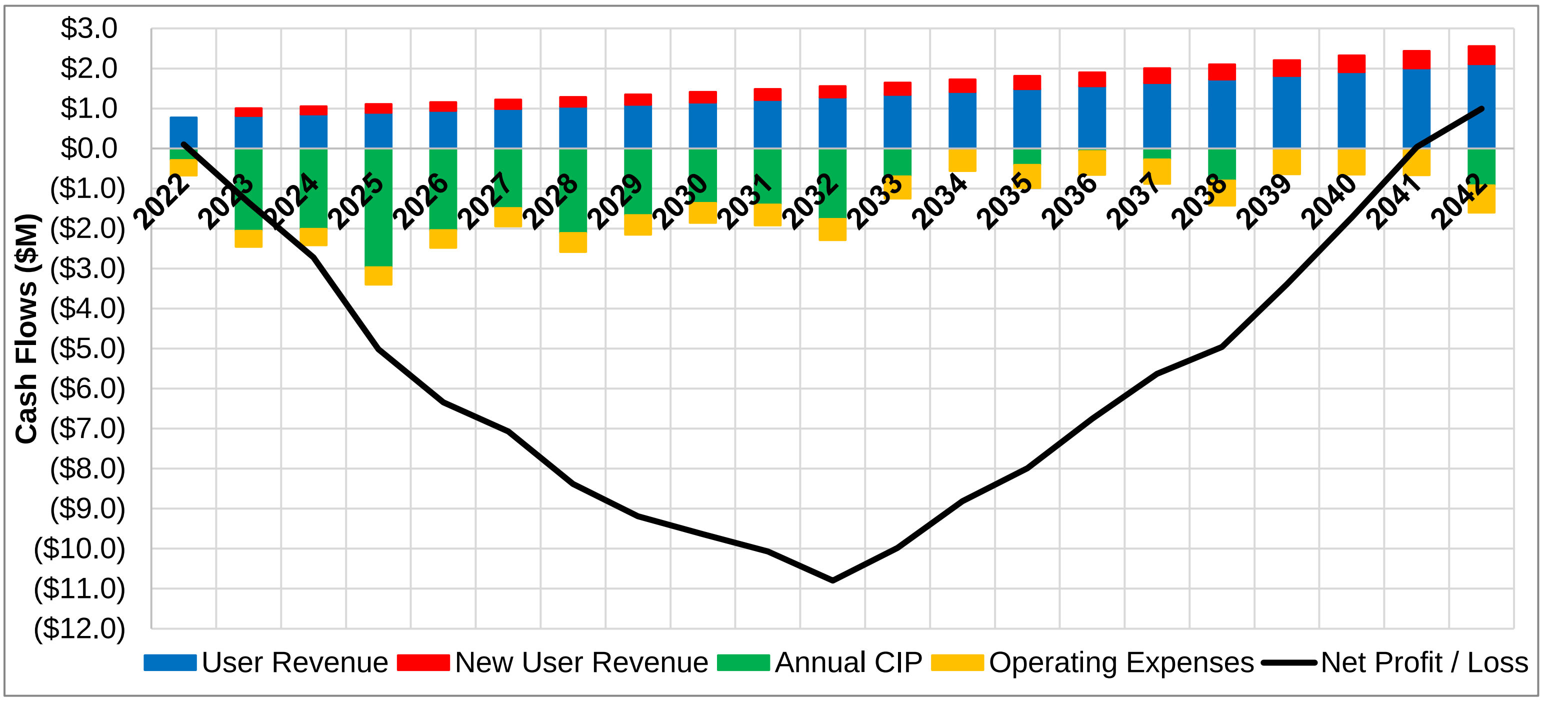


**Figure E. 3. SVWSD wastewater cash flows**

These alternatives would require both entities to take debt in 2023 to begin the substantial projects during the first 10 years. With a reasonable annual increase in rates (3-4 percent), the loans could be paid off by the end of the planning period (2042). This revenue plan is an example to illustrate the magnitude of rate increases needed to upgrade the plant through the planning period. The final financial plan will require adjustment to mesh the revenue generation with the upgrade schedule and is outside the scope of this document. A detailed rate study should be conducted to make a more accurate assessment of user rate adjustments required to fund the planning period projects.

# 1 Planning Criteria

## 1.1 Introduction

The objective of the Ketchum / Sun Valley Water & Sewer District (SVWSD) Facility Planning Study (FPS) is to aid the communities with options for handling wastewater at the wastewater reclamation facility (WRF). This section provides the basis for evaluating the facility and includes information used throughout the rest of the planning process:

- Planning area and period
- Population
- Permit requirements and water quality issues
- Regulatory trends and planning assumptions
- Basis of capital and operation and maintenance (O&M) costs
- Redundancy and reliability

### 1.1.1 Planning Area and Planning Period

The WRF serves the cities of Ketchum and Sun Valley, including St. Luke's Hospital. The hospital is currently the southernmost facility served by the WRF. In the future, the WRF could serve nearby development, defined as impact zones. Following are brief descriptions of these impact zones:

- Zone 1 – Developments north of Ketchum, including Hulen Meadows, Beaver Springs, and Flower Mill areas.
- Zone 2 – Developments west of Ketchum, including Warm Springs Ranch and Warm Springs Village.
- Zone 3 – Developments south of Ketchum, including the River Run base facilities to McHanville.
- Zone 4 – Developments in the Sun Valley area, including the White Cloud Development and Elkhorn Springs. Current completed developments in Elkhorn Springs are considered part of the Sun Valley tourist population. Future expansion of this development is considered part of Impact Zone 4.

Expansions south of McHanville and the Cold Springs limited impact development (LID) are not considered in this FPS. While it is possible that wastewater from this area could be pumped north to the WRF, it is not anticipated at this time. The Meadows LLC Wastewater Treatment Plant is an existing facility closer to this area that may be a more feasible alternative for wastewater treatment. Figure 1-1 shows the approximate locations of the separate zones.

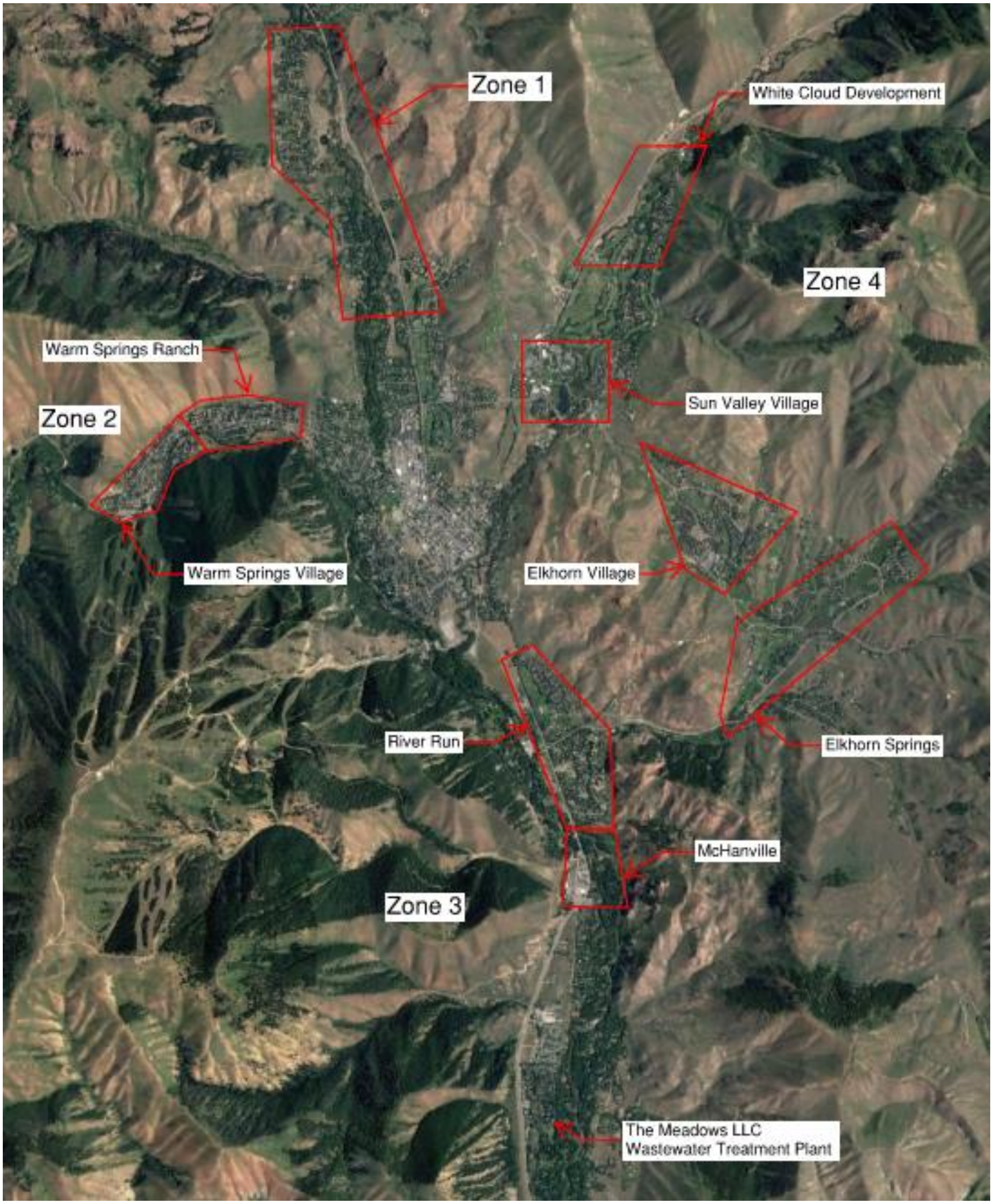


**Figure 1-1. Planning area**

# 1.2 Population and Land Use within the Planning Area

## 1.2.1 Population Categories

The population of the Ketchum / Sun Valley area can be divided into three general groups:

- Permanent residents: those who live year-round in the area.
- Second-home residents: those who own homes in the area, but only live in them for part of the year.
- Tourists: short-term visitors to the area.

This FPS will not differentiate between the summer and winter population peaks, which occur in the months of July to August and December to February. The FPS estimates the peak season highs during these months that affect the WRF. It also considers the average populations during the off-peak months, which is the estimated typical flow that the WRF treats through the year.

This FPS refers to the current population and planning period population (20 years forward). The "current" population is based on U.S. Census data for the year 2020 and estimated recent growth. The planning period is from years 2022 to 2042. In subsequent sections of this FPS, the term "plant buildout" is used to indicate the condition where the land locked WRF is at full capacity. To avoid removal of smaller treatment plant units and construction of incrementally larger units, construction is favored to fully use the space for the plant buildout flow conditions.

The plant buildout flows and loads were developed in the 1999 FPS and have been retained through subsequent planning studies. Previous planning studies estimated these buildout populations to be 20 years into the future. This was a conservative approach and over-estimated the growth rate. Moving forward, this FPS will provide a realistic, although conservative, future population for the 20-year planning period. This same growth trend will be used to provide a rough estimate of the future population when the plant reaches buildout flows and loads based upon a continuation of growth at the same assumed rate.

### Permanent Resident Population

Figure 1-2 shows the historical population trends for the permanent residents in Ketchum and Sun Valley, based on U.S. Census data and population studies performed by Sun Valley Economic Development (SVED). SVED is a 501(c)(6) whose mission is to "preserve and advance the Sun Valley region's economic vitality and diversity while recognizing the values of its citizens". SVED creates a yearly economic profile for the cities of Blaine County, and their most recent profiles for Ketchum and for Sun Valley were used to estimate population in the area that the U.S. Census does not provide. Note that the large observed population jump between 2019 and 2020 is because the population estimates from 2011-2019 were underestimating the actual population as seen in the 2020 U.S. Census.

As seen in **Error! Reference source not found.**, the growth rate of Ketchum from 1990 to 2010 was about 0.3 percent, based on U.S. Census data. The growth rate of Sun Valley was about 2.0 percent over the same period. The last 10 years (2010 – 2020) showed significantly greater growth with Ketchum's population increasing at a rate of 2.8 percent and Sun Valley's population increasing at a rate of 2.4 percent. The population trends over the last 10 years are not likely to be sustainable. The growth rates from 1990 to 2020 seem more reasonable with Ketchum increasing at 1.2 percent annually and Sun Valley increasing at 2.1 percent annually. The combined population is increasing at a rate of approximately 1.4 percent annually.

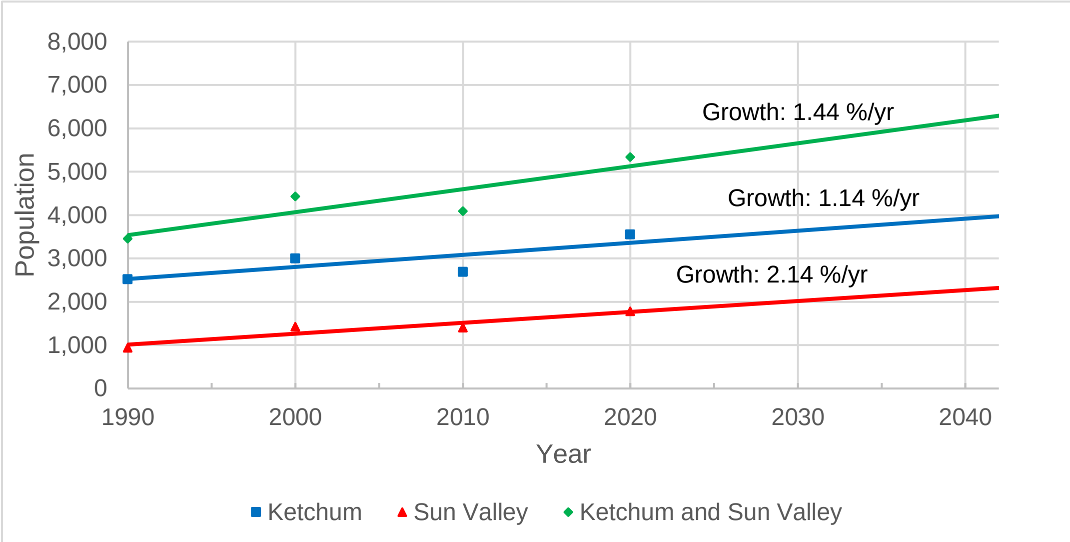


**Figure 1-2. Historical population of permanent residents in Ketchum and Sun Valley**

## Second-Home Resident Population

The second-home residential population was estimated using SVED's 2019 economic profiles for Ketchum and for Sun Valley. The economic profiles show that 2,413 homes are classified as seasonal in Ketchum and 2,144 homes are classified as seasonal in Sun Valley[2]. For the intent and purpose of this FPS, seasonal homes are synonymous with second homes. To determine the amount of people who live in these homes, the 2016 average household size for the two cities were used: 1.81 persons per home for Ketchum and 1.90 persons per home for Sun Valley. This FPS also assumes that the second homes are 100 percent occupied during the peak season and 30 percent occupied during the off-peak season. These second-home occupancy rate assumptions are consistent with the 1999 FPS and 2009 FPS. The estimations for the peak season and the average annual season population of second-home residents are shown in Table 1-1:

**Table 1-1. Estimation of second-home residents**

| Parameter | Ketchum | Sun Valley | Total |
|---|---|---|---|
| Seasonal Homes | 2,413 | 2,144 | 4,557 |
| Average Annual Second-Home Residents | 2,625 | 2,493 | 5,118 |
| Peak Season Second-Home Residents | 4,368 | 4,074 | 8,442 |

## Tourist Population

A "pillow count" strategy was used to determine the tourist populations. This strategy was also used in the 2009 FPS; it assumes that the number of people that can be housed in a hotel is equal to the number of "pillows" available in each room, either hotel or resort. It was also assumed that, on average, two pillows were used per room. This FPS assumes that 90 percent of the pillows are occupied during the peak season, which was also assumed in the 2009 FPS. The annual average

[2] SVED. 2019. 2019 Ketchum Economic Profile and 2019 Sun Valley Economic Profile.

tourist population was calculated using occupancy rate data for the Ketchum and Sun Valley area during the off-peak months from the 2019 Ketchum Economic Profile. The off-peak occupancy is estimated to be 35 percent of the available pillows. Table 1-2 shows the pillow count for the area based on information from the Ketchum and Sun Valley comprehensive plans as well as the Ketchum and Sun Valley economic profiles.

Tourists commonly contribute 50 to 80 percent of what a permanent resident contributes to the WRF[3]. This FPS assumes that a tourist has a population equivalent of 0.8, which was also assumed in the 2009 FPS.

**Table 1-2. Estimate of peak season and average tourist population**

| Parameter | Ketchum | Sun Valley | Total |
|---|---|---|---|
| Pillow Count | 1,450 | 1,980 | 3,430 |
| Peak Season Tourist Population[1] | 1,305 | 1,782 | 3,087 |
| Peak Season Tourist Equivalents[2] | 1,044 | 1,426 | 2,470 |
| Average Annual Tourist Population[3] | 513 | 701 | 1,214 |
| Average Annual Tourist Equivalents[2] | 411 | 561 | 972 |

[1] Assumes 90% of pillows occupied during peak season
[2] Equivalents are 80% of actual tourist population
[3] Assumes 58% of pillows occupied annually

## Commuter Population

Due to the high cost of property in the area, many employees commute to work from towns outside of Ketchum and Sun Valley, most notably Hailey and Bellevue. The 2019 economic profiles for Ketchum and Sun Valley estimate there are 6,242 jobs (4,849 in Ketchum and 1,393 in Sun Valley). To determine the commuter population, it was first necessary to establish the population of working-age permanent residents of the area. The working-age resident population was determined by the population of the 20-64 age group. It was assumed that approximately 20 percent of the under-20 age group were of working age. All working-age residents are assumed to currently hold a job in the area. Using these assumptions, 1,850 permanent residents in Ketchum have a job and 800 permanent residents in Sun Valley have a job. All other jobs not accounted for by permanent residents are equivalent to the population of commuters into the area. In addition, employees contribute approximately 20 percent of what a permanent resident contributes to the WRF[2]. Since the commuter population is defined as persons who work in the Ketchum and Sun Valley area, but who do not live within the service area of the WRF, the actual commuter population will be de-rated in a similar fashion as the tourist population. This FPS assumes that a commuter has a population equivalent of 0.2. Table 1-3 shows the commuter populations for Ketchum and Sun Valley.

**Table 1-3. Estimate of commuter population**

| Parameter | Ketchum | Sun Valley | Totals |
|---|---|---|---|
| Commuters | 2,999 | 593 | 3,592 |
| Commuter Equivalents[1] | 600 | 119 | 719 |

[1] Equivalents are 20% of actual commuter population

[3] Metcalf & Eddy, Inc., Tchobanoglous, G., Abu-Orf, M., Bowden, G., & Pfrang, W. (2014). *Wastewater Engineering: Treatment and Resource Recovery* (5th ed.). McGraw-Hill Education.

### 1.2.2 Total Peak Season and Average Annual Population

Table 1-4 shows the estimated peak season and average population served by the Ketchum / SVWSD WRF. The equivalent population is generated by de-rating the tourist population to 80 percent and the commuter population to 20 percent of the population of the groups, respectively.

**Table 1-4. Estimate of current population**

| Demographic | Ketchum | Sun Valley | Totals |
|---|---|---|---|
| **Average Annual** | | | |
| Permanent Residents | 3,555 | 1,783 | 5,338 |
| Commuters | 2,999 | 593 | 3,592 |
| Second Home | 2,625 | 2,493 | 5,118 |
| Tourists | 513 | 701 | 1,214 |
| Average Total | 9,692 | 5,570 | 15,262 |
| Average Equivalent[1] | 7,190 | 4,955 | 12,146 |
| **Peak Season** | | | |
| Permanent Residents | 3,555 | 1,783 | 5,338 |
| Commuters | 2,999 | 593 | 3,592 |
| Second Home | 4,368 | 4,074 | 8,442 |
| Tourists | 1,305 | 1,782 | 3,087 |
| Peak Total | 12,227 | 8,232 | 20,459 |
| Peak Equivalent[1] | 9,567 | 7,401 | 16,968 |

[1] Equivalents de-rate the tourist population to 80% and the commuter population to 20% of actual population

### 1.2.3 Population Projections

Permanent and second-home populations were projected using current estimates of population growth from the 2017-2019 economic profiles for Ketchum and Sun Valley. The 2019 economic profiles for the two cities show that 67 percent of Ketchum and 78 percent of Sun Valley dwellings are second homes. These profiles also show that the average family size of Ketchum is 1.81 members per household, and the average family size of Sun Valley is 1.90 members per household. This FPS will use the 30-year growth rates to find the time to reach the 20-year planning period populations, 1.14 percent for Ketchum and 2.14 percent for Sun Valley. Using this data, the population estimates were produced for 2042.

Projected numbers of additional tourists in the area were calculated assuming tourist accommodations increase by 0.25 percent per year. This estimation was used in the 2009 FPS, and it allows for an average population equivalent increase in Sun Valley from 4,955 to 7,817. The average population equivalent increase in Ketchum would increase from 7,190 to 9,250.

Table 1-5 summarizes the projected average annual and peak season populations of the planning area at the end of the 20-year planning period in 2042. It also shows the total equivalent population by de-rating the tourist population by 80 percent and the commuter population by 20 percent.

**Table 1-5. Estimate of planning period population (year 2042)**

| Demographic | Ketchum | Sun Valley | Impact Zones | Totals |
|---|---|---|---|---|
| **Average Annual** | | | | |
| Permanent Residents | 4,571 | 2,856 | 91 | 7,518 |
| Commuters | 3,946 | 991 | - | 4,937 |
| Second Home | 3,454 | 4,168 | 89 | 7,710 |
| Tourists | 545 | 744 | 107 | 1,396 |
| Average Total | 12,515 | 8,759 | 287 | 21,561 |
| Average Equivalent[1] | 9,250 | 7,817 | 266 | 17,332 |
| **Peak Season** | | | | |
| Permanent Residents | 4,571 | 2,856 | 91 | 7,518 |
| Commuters | 3,946 | 991 | - | 4,937 |
| Second Home | 5,747 | 6,811 | 295 | 12,852 |
| Tourists | 1,386 | 1,892 | 270 | 3,548 |
| Peak Total | 15,649 | 12,550 | 656 | 28,855 |
| Peak Equivalent[1] | 12,216 | 11,378 | 602 | 24,196 |

[1] Equivalents de-rate the tourist population by 80% and the commuter population by 20%

Figure 1-3 shows a comparison of the current and projected annual and peak season populations.

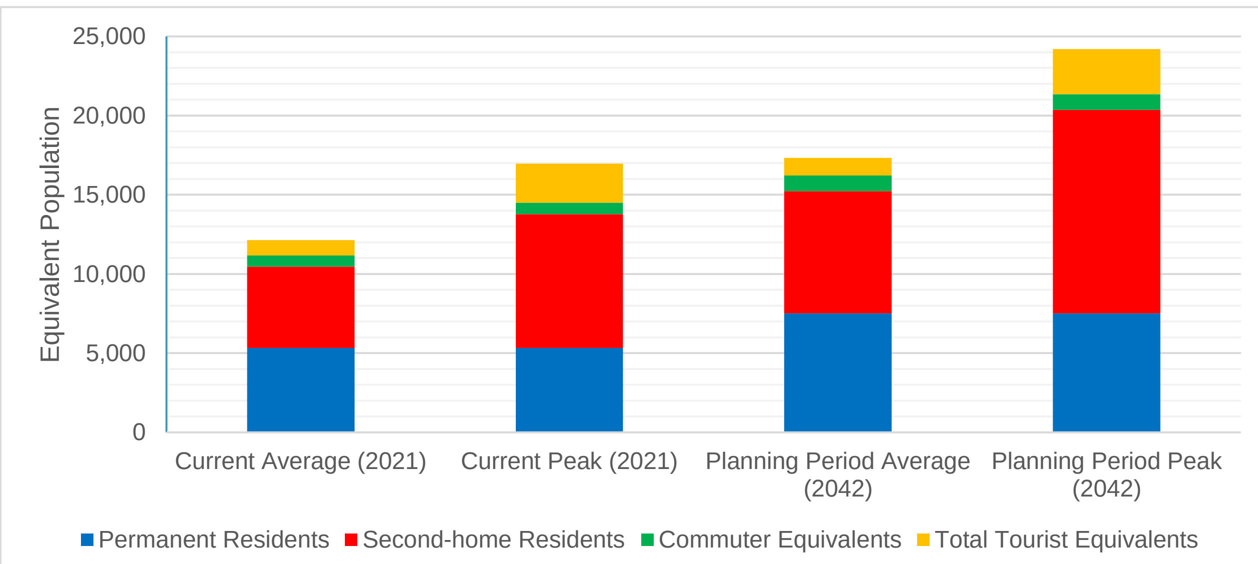


**Figure 1-3. Current and planning period average and peak populations**

## 1.2.4 Commercial/Light Industry

Commercial core areas include restaurants, retail stores, and other businesses. Sun Valley has several commercial areas, but the largest commercial area is in Ketchum. Flows from the Sun Valley commercial areas are assumed to be related to the population. As the tourist population increases, the flow in this area increases. Thus, in the flows and loads projection, the contribution from the commercial area is included in the per capita flows and loads.

No light industrial areas exist in Sun Valley and no areas are zoned for such future use. The City of Ketchum zones the commercial and light industry land under two zoning titles: light industry and community center. The light industry zones are established as a transition area, providing limited commercial service industries, limited retail, and offices that relate to building maintenance and construction, which generate little traffic from tourism or the public. The community core district zoning is designed to attract a compact and cohesive center of commerce with a safe pedestrian environment. These zones are located on State Highway 75 and Main Street in the middle of town and are served by the WRF. Approximately 162 acres are zoned for commercial/light industry. An additional source included in the commercial/light industrial category is St. Luke's 20-bed hospital and associated commercial facilities located on the south side of town.

## 1.3 Permit Requirements and Water Quality Issues

The Ketchum / SVWSD WRF is authorized to discharge to the Big Wood River under National Pollutant Discharge Elimination System (NPDES) Permit ID0020281 (Appendix A) issued by the U.S. Environmental Protection Agency (EPA). This permit became effective on August 1, 2012, and expired July 31, 2017. A permit renewal application was submitted prior to the submittal date of February 1, 2017, and EPA administratively extended the existing permit. The State of Idaho began administrating the permit under the Idaho Permit Pollutant Discharge Elimination System (IPDES) system on July 1, 2018. The administrative extension of the existing NPDES permit remains in effect under the authority of the State of Idaho until such time that the Idaho Department of Environmental Quality (DEQ) is able to renew the permit as part of the IPDES program. Table 1-6 summarizes the discharge limits in the existing permit.

**Table 1-6. Current NPDES permit limits**

| Effluent Characteristics | Unit of Measurement | Average Monthly Limit | Average Weekly Limit |
|---|---|---|---|
| BOD | mg/L | 30 | 45 |
| | lbs/d | 505 | 760 |
| | % removal | 85% (min) | |
| TSS | mg/L | 30 | 45 |
| | lbs/d | 275 | 542 |
| | lbs/d | Annual Average Limit[2]: 145 lb/day | |
| | % removal | 85% (min) | |
| *E.coli* Bacteria | cfu/100 mL | 126 (geometric mean) | 406[3] (instantaneous maximum) |
| | cfu/d | Annual Average Limit: 19.1x10$^{9}$ cfu/day | |
| pH | s.u. | 6.2 – 9.0 at all times | |
| TP | mg/L | 1.0 | 1.5 |
| | lbs/d | 9.9 | 14.9 |
| Copper, Total Recoverable | µg/L | 19.2 | 35.1 (maximum daily limit) |
| | lbs/d | 0.64 | 1.17 (maximum daily limit) |

[1] Currently operating under permit dated August 1, 2012 (expired July 31, 2017), administratively extended
[2] TSS limits were adjusted by EPA to an annual mass of 26.5 tons.
[3] *E. Coli* annual limit of 19 billion cfu/d
BOD=biochemical oxygen demand; TSS=total suspended solids; TP=total phosphorus; mg/L=milligrams per liter; lbs/d=pounds per day; cfu/100 mL=colony forming units per 100 milliliters; µg/L=micrograms per day

The 1972 Clean Water Act (CWA) requires that states adopt water quality standards that protect human health, fish, shellfish, and wildlife. Big Wood River is on the Idaho Rivers (CWA Section 303(d)) list for which the DEQ is mandated to develop a total maximum daily load (TMDL) based on water quality standards. This mandate makes the river a priority to meet the standards set by the CWA. To improve the water quality, TMDLs assign point sources wasteload allocations (WLAs) to reduce pollutants that exceed standards.

In 2002, DEQ completed part of the Big Wood River Watershed Management Plan (WMP). The WMP developed TMDLs for eleven waterbodies in the Big Wood River subbasin. For the Big Wood River, the pollutants with TMDLS are bacteria, nutrients, and sediment. The City of Ketchum POTW received WLAs of 26.5 ton/yr for total suspended (TSS), 9.9 lb/day for total phosphorus (TP), and 2.7 billion cfu per day for *Escherichia Coli (E.coli)* (DEQ 2002[4]).

In 2011, DEQ issued an errata to the Big Wood River WMP. Four tables were corrected due to calculation errors resulting from not using the correct design flow capacity for the wastewater treatment plants. The City of Ketchum POTW received a revised WLA of 19.1 billion cfu per day for *E.coli* (DEQ 2011[5]).

In 2017, DEQ completed the Big Wood River Watershed Management Plan: TMDL Five-Year Review (DEQ 2017[6]). In the prior documents, the WRF was in Big Wood River segment 2 (BWR-2). The segments were modified to assessment units (AU). BWR-2 is in AU ID17040219SK007_05, the Big Wood River from its confluence with Warm Springs Creek in the city of Ketchum to Seamans Creek/Cove Canal below the city of Hailey. The Ketchum and Mid-Valley Sewer Company WWTPs discharge to the Big Wood River within this AU.

For the review, water quality sampling data collected at the railroad truss below Ketchum in 2015 were assessed. “The TP target of 0.05 mg/L was exceeded three times in 2015, twice during spring months (May and June) and then again in late August. The TSS target of 25 mg/L was exceeded three times at the railroad trestle monitoring location, all in May and early June. These data show a connection between TSS and TP concentrations as might be expected with spring runoff. The increase in August TP is not coincident with increased TSS concentrations. E. coli numbers were generally low and did not exceed criteria. The geometric mean calculated for five samples within a 30-day period at the railroad trestle location did not exceed the target of 126 cfu/100mL” (DEQ 2017).

## 1.4 Regulatory Trends and Planning Assumptions

### 1.4.1 Total Suspended Solids

The concentration and removal rate limits for TSS are the technology-based effluent limits of 40 CFR 133.102. However, the mass limits for BOD5 and TSS are more stringent than the technology-based effluent limits. The mass limits for TSS are water quality-based effluent limits that are consistent with

[4] DEQ 2002. The Big Wood River Watershed Management Plan. Idaho Department of Environmental Quality. Twin Falls, ID.

[5] DEQ 2011. Errata to the Big Wood River Watershed Management Plan (TMDL) of 2002. Idaho Department of Environmental Quality. Twin Falls, ID.

[6] DEQ 2017. Big Wood River Watershed Management Plan. TMDL Five-Year Review. Idaho Department of Environmental Quality. Twin Falls, ID.

the assumptions and requirements of the wasteload allocation for the discharge in the Big Wood River WMP. The TMDL includes a WLA for TSS to 26.5 tons TSS per year (t/yr) (145 lbs/day). These are the existing permit limits and are not expected to change in permit renewal. The TSS concentration of this daily mass target varies with the flow rate. At a flow rate of 2.0 MGD, the concentration of plant effluent must be less than 8.7 mg/L TSS to meet the average annual limit of 145 lbs/d. At a flow rate of 5.0 MGD, the concentration of the plant effluent must be less than 3.5 mg/L TSS to meet the average annual limit of 145 lbs/d.

### 1.4.2 Nutrients

Dissolved nutrients can stimulate the growth of aquatic plant life. Excessive plant growth can directly impact aquatic life and recreation/aesthetics and may also cause normally aerobic (oxygen rich) environments to become depleted of dissolved oxygen (DO). These processes are known as eutrophication. Nitrogen and phosphorus are the primary nutrients that cause eutrophication. These contaminants are added to water bodies from both point sources, such as municipal and industrial plants, and nonpoint sources, such as runoff. While nitrogen is not currently limited in the discharge permit, it is limited in the reuse permit. Nitrogen is removed in the aeration basins by denitrifying bacteria. Phosphorus is removed from the plant by chemical precipitation with alum.

The following provision regarding excess nutrients is the basis of the nutrient TMDL: “surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance growths impairing designated beneficial uses” (IDAPA 58.01.02.200.06).

The current NPDES permit requires an average monthly phosphorus limit of 1.0 mg/L and 9.9 lbs TP/d. The effluent flow rate of 9.9 lbs TP/d at a concentration of 1.0 mg/L is equal to 1.2 MGD. The flow rate often exceeds 1.2 MGD, therefore the concentration would have to decrease to meet the 9.9 lbs TP/d average monthly mass limit. At flow rates of 2.0 MGD, the TP concentration must be less than 0.59 mg/L to meet the average monthly limit. At flow rates of 5.0 MGD, the TP concentration must be less than 0.24 mg/L to meet the average monthly limit. The 5-year WMP review (December 2017) did not determine that a new TMDL is necessary, but also concluded that additional data should be collected.

### 1.4.3 Fecal Coliform and *Escherichia Coli*

The final step of wastewater treatment is disinfection. The purpose of disinfection is to kill or inactivate any pathogens that remain in the effluent. At the Ketchum / SVWSD WRF, UV radiation is used to disinfect the wastewater before it is discharged to Big Wood River. Ultraviolet disinfection uses UV light to destroy the pathogen’s DNA, stopping its ability to reproduce.

Bacteria counts are typically used to measure the effectiveness of the treatment and ensure adequate disinfection. The types of bacteria used have historically been total coliform, fecal coliform or E. coli. Idaho’s water quality standards for surface waters use E. coli but has recently been revised to also include criteria for Enteroccic. DEQ has been looking at including Enterococci bacteria limits in some recent IPDES permits. When DEQ begins working on permit renewal, the WRF should be prepared to discuss the implications of this parameter.

The current NPDES permit limits the concentration of *E. coli* bacteria, a specific type of fecal coliform related to warm-blooded animals including humans. The current NPDES limit is 126 colony forming units of *E. coli* per 100 mL (cfu/100 mL) at 4 MGD. The 2002 TMDL for the Big Wood River includes a WLA for *E. coli* of 2.7 billion cfu per day based on flow (cfs) x target (cfu/100 mL) x 0.02445. DEQ determined the equation necessary to represent a total maximum daily load. The 2011 Errata revised the WLA for *E.Coli* to 19.1 billion cfu per day based on a design flow of 4.0 mgd.

The City of Hailey commented on the Errata that the interpretation of the *E.coli* WLA for permitting should be the water quality standard of 126 cfu per 100 mL. EPA wrote in the permit fact sheet “In the TMDL, the loading capacity was calculated using the annual average river flow and the maximum monthly geometric mean in-stream target of 126 cfu/100 mL total phosphorus. Therefore, it is appropriate to establish a monthly geometric mean effluent limit equal to the WLA.” Future criteria may include virus inactivation as tested by effluent monitoring for coliphage, a subset of bacteriophages that infect bacteria, indicating absence of human viral pathogens associated with fecal contamination. The inactivation requires a more robust disinfection step (i.e. increased UV dose).

Disinfection is much more stringent for Class A reuse water than for effluent discharge to surface water. The WRF is required to meet a median number of 2.2 cfu/100 mL total coliform, as determined by results from the last seven days with analysis, with no samples exceeding 23 cfu/100 mL. If the Ketchum / SVWSD WRF continues to produce Class A reuse water, these treatment standards will be the basis of upgrades. The current system is limited to 3.1 MGD by the UV disinfection system dose capability for Class A (100 mJ/cm2 dose). Class A water is currently only produced during the irrigation season (April – October) and flows seldom exceed 1.5 MGD. Normal flows are closer to 1.0 MGD and almost all the treated flow is delivered to irrigation customers.

### 1.4.4 Temperature

High effluent temperatures can adversely affect cold water aquatic biota and spawning salmonids in the Big Wood River. Cold water aquatic life and salmonid spawning diel values are either < 10 percent exceedances and thus supporting beneficial uses or else not supporting meeting beneficial uses. In the 2002 TMDL, DEQ concluded that for the most part cold-water aquatic life is supported and salmonid spawning is not supported for waterbodies in the Big Wood River subbasin. Evaluation of temperature (both for cold water aquatic life and salmonid spawning) were deferred until 2003 and until additional monitoring data are collected. The DEQ anticipated a later re-evaluation of temperature criteria based on more current monitoring data. The 2017 WMP 5-Year Review did not include data or an assessment of water temperature in the Big Wood River.

A review of recent Wood River Watershed Advisory Group meeting minutes did not reveal recent discussions regarding water temperature in the Big Wood River. There is mention of re-evaluating the Little Wood River temperature TMDL. The regional DEQ office is working on temperature issues; however, DEQ’s priority and timeline for addressing water temperature in the Big Wood River is unknown.

One of the first permits drafted by DEQ with temperature limits was for the City of Shoshone, issued in 2019. DEQ is currently working toward incorporating temperature limits into the IPDES permit for the City of Boise’s West Boise WRF. Therefore, the Ketchum / SVWSD WRF may anticipate DEQ to address or at least consider water temperature in its future IPDES permits.

### 1.4.5 Air Quality

Air quality can be a concern, especially in WRFs near areas frequented by the public and residential areas. Three air quality issues are of concern: odors, air toxics, and criteria air pollutants.

Odors are a local ordinance issue that can be dealt with by carefully locating treatment processes and enclosing odor-generating facilities. The treatment processes at the WRF typically do not produce much odorous gas when functioning properly. The proximity to residential areas and predominate wind direction also plays a role in odor complaints. The WRF headworks is generally the area with the most potential for offensive odors; in Ketchum, this is also the area of the plant closest to residential areas. For this reason, the screening and grit building have had odor scrubbers for over 20 years. The chemical scrubber was replaced by a carbon scrubber in 2017 with the screening upgrade. The other area of concern is sludge digestion, thickening and loadout. These activities are on the south end of the plant and have a greater buffer from residential areas. Future upgrades in the solids handling area should consider odor control methods.

The Ketchum/SVWSD WRF does not emit criteria pollutants or air toxics; therefore, it creates no impact on air toxic standards.

### 1.4.6 Solids

Biosolids produced through the wastewater processes are currently thickened to approximately 3 percent solids and trucked weekly to the Ohio Gulch Solid Waste Transfer Station, where they are discharged to drying beds. Over the course of drying for 12 months, the solids further stabilize and increase in solids content to greater than 75 percent. The final disposal of solar-dewatered biosolids is by landfill at the Milner Butte Landfill near Burley, Idaho. The Wood River Valley wastewater plants are in the process of evaluating using the biosolids in a composting operation near the Ohio Gulch Transfer Station. Biosolids composting is currently in the piloting stage.

Disposing of the solids at the drying beds has been an economical solids management alternative for the City of Ketchum for many years due to the drying bed arrangement with Blaine County, the owners of the transfer station. But the regular hauling of a biosolids solution containing 97 percent water has disadvantages as well. The long-term feasibility of disposing of solids at the landfill is further discussed in Chapter 5.

### 1.4.7 Emerging Constituents

Currently, one of the largest emerging constituents of concern are perfluoroalkyl and polyfluoroalkyl substances (PFAS). PFAS are long-lasting chemicals that have widespread industrial uses and have potential links to adverse health effects[7]. The chemicals are currently still under investigation with regards to exposure risks, harm to the environment, how to treat the chemicals, and how to regulate the chemicals. Currently, the Department of Defense has temporarily prohibited incineration of all materials containing PFAS[8]. Recently the state of Maine's LD 1911 prohibited disposal of biosolids by land application or by incineration due to concerns of the long-term effects of PFAS accumulated in biosolids. This means that all biosolids produced in Maine must be landfilled. This reaction to PFAS by Maine may be somewhat premature as the EPA has not yet reached this same action level.

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[7] United States Environmental Protection Agency. (n.d.). *PFAS Explained*. EPA. Retrieved June 8, 2022, from https://www.epa.gov/pfas/pfas-explained

[8] Cramer, P. D. (2022, April 26). *Temporary prohibition on incineration of materials containing Per- and Polyfluoroalkyl Substances (PFAS)*. Retrieved June 8, 2022, from https://media.defense.gov/2022/Apr/28/2002986273/-1/-1/1/TEMPORARY-PROHIBITION-ON-INC[%E2%80%A6]NG-PRE-AND-POLYFLUOROALKYL-SUBSTANCES-PFAS-APRIL-26-2022.PDF

PFAS will be a constituent of concern for the WRF, given the WRF is working with the City of Hailey and a local composting company to perform a composting pilot study. The resulting compost will be Class A, Exceptional Quality (EQ) designation by current EPA/IDEQ standards and allowed to be used with no restrictions.

# 1.5 Basis of Costing

Alternatives are developed throughout the FPS when updating and recommending improvements to the WRF. Besides comparing the alternatives' technical merits, the capital and operations and maintenance (O&M) costs are estimated and compared.

## 1.5.1 Capital Costs

The capital cost associated with facility updates are developed using experience from recent projects at the WRF and experience from similar WRFs. The costs are developed from broad-level planning and without detailed engineering, typically termed "order-of-magnitude" cost estimates. Depending on project definition, "order-of-magnitude" cost estimates can be either a Class 5 or a Class 4 estimate[9]. Wastewater facility planning studies are generally considered to be approximately 10% project definition, and this FPS is no exception. The cost estimates presented in this document are considered Class 4 estimates.

Capital costs are those the City of Ketchum can expect to pay a contractor to complete the updates. Also included with the capital costs are the engineering design and construction services costs.

The project costs depend on several factors, including required improvements and the actual cost of labor and material associated with the specific update. It is normally expected that an estimate of this type would be accurate within plus 40 percent and minus 20 percent range.

## 1.5.2 Operations and Maintenance Costs

The O&M cost is an estimate of the annual cost to operate the facilities. Table 1-7 presents unit costs associated with the operation of the Ketchum/SVWSD WRF.

[9] AACE International. (2020). *18R-97: Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries* (August 7, 2020).

**Table 1-7. Operational and maintenance unit costs**

| Item | Unit Cost | Units | 2021-2022 |
|---|---|---|---|
| Labor (including benefits) | $51.07 | per hour | $637,354 |
| Power (including demand and basis charges) | $0.063 | per kWh | $112,562 |
| Alum (17% Al2O3) | $472 | per dry ton | $7,772 |
| Polymer | $4,900 | per ton | $24,108 |
| Cloth Filter Replacement | $60,000 | every 10 years | $6,000 |
| Sodium Hypochlorite (12.5% NaClO) | $806 | per tote (330 gal) | $6,574 |
| Solids Hauling to Ohio Gulch Drying Beds | $3.00 | per mile | $19,062 |
| Solids Disposal to Milner Butte Landfill | $65 | per ton | $21,493 |
| | | **Total** | $834,925 |

[1] Trips are approximately 18 miles round-trip from the Ketchum / SVWSD WRF to the Ohio Gulch drying beds. Hauling to Ohio Gulch at $3/mile is approximately equivalent to $9.50 per 1,000 gallons.
kWh=kilowatt hour; gal=gallon

## 1.5.3 Present Worth Analysis

Present worth analysis compares alternatives using both the capital and annual costs. This analysis allows for comparing an alternative with a higher initial cost but low O&M costs to an alternative with a low capital cost but higher O&M costs. DEQ approves this method and the values listed below are used for the analysis. The current loan (discount) rate is the market value obtained from U.S. Department of Agriculture-Rural Development (USDA-RD; communities < 10,000 population). The inflation rate is based upon an assumption that the high inflation in 2021 and currently in 2022 is not sustained (the average inflation from 2012 – 2021 was 2.15 percent).

- Evaluation period – 20 years (2022 – 2042)
- Discount rate – 2.5%[10]
- Inflation rate – 3.0%

## 1.5.4 Non-Cost Evaluation Criteria

Several non-cost criteria are also important to consider when evaluating the alternatives. These criteria include the following:

- Treatment effectiveness and reliability
- Resistance to upset from variable flows and loads
- Ease of operation and maintenance
- Solids handling considerations
- Minimization of odors, noise, and visual impacts
- Ability to accommodate potential new effluent permit limits
- Reliability and the ability to repair and maintain
- Energy usage and sustainability

[10] McLean, C. A. (2022, March 17). United States Dept. of Agriculture – Rural Development. Interest Rate Changes for Water and Waste Disposal Loans.

All facilities constructed will need to meet the requirements of the Lane Ranch Settlement Agreement. This agreement sets standards for building appearances at the WRF. In general, the agreement requires all buildings to have similar architectural design, which includes tan stucco building exteriors with no shiny surfaces and limited height, as seen in **Error! Reference source not found.** and **Error! Reference source not found.**.

# 1.6 Redundancy and Reliability

Redundancy and reliability refer to the level of protection required by the EPA's *Design Criteria for Mechanical, Electrical, and Fluid System Component Reliability*[11] and IDAPA 58.01.16 *Wastewater Rules*[12], which provides guidance for redundancy and reliability at WRFs.

The preliminary sizing, conceptual layouts, and cost estimating processes incorporate these redundancy and reliability criteria.

# 1.7 Sustainability

Sustainability was identified as a national policy by National Environmental Policy Act of 1969. Since that time the public's interest in sustainability has broadened. Sustainability efforts are essentially best practices to ensure the greatest environmental, economic, and social impact benefit. With wastewater treatment systems the goals are Energy and Emissions (greenhouse gases, energy efficiency, renewable energy), Green Buildings (construction/renovations, high-performance buildings, facility resiliency), and Water Management (water conservation, stormwater management, landscaping).

## 1.7.1 Energy and Emissions

- A natural carbon system treats odors from the headworks area
- High-efficiency blowers and fine bubble diffusers are planned in the activated sludge process
- Variable frequency drives (VFD's) are used throughout the plant to optimize energy efficiency
- Aeration basin modifications to MLE configuration reduces airflow (and energy used by blowers) by up to 20 percent
- Ultraviolet (UV) light is used for disinfection instead of chlorine (and de-chlorination chemical agents)

## 1.7.2 Green Buildings

- Insulation systems meet local and international building code standards
- Natural lighting using glass blocks
- High efficiency lighting systems (LED) and motion detection light switches

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[11] United States Environmental Protection Agency. *Design Criteria for Mechanical, Electrical, and Fluid System Component Reliability* . EPA.

[12] Idaho Administrative Procedures Act. *Wastewater Rules*.

### 1.7.3 Water Management

- Reuse water to Weyyakin Subdivision and Elkhorn Golf Course irrigation
    - Nutrients to ground instead of Big Wood River
    - Lessens potable water demand
- Stormwater to dry wells
- Water efficient fixtures for restrooms and sinks

Sustainability regarding energy generation using a wastewater process to generate methane gas is not compatible with the treatment system process design. The WRF does not have primary clarifiers to separate the raw materials needed for anaerobic treatment. Solar and wind generation also have limiting application. Solar power generation can be considered for building roofs. Wind generation likely has major aesthetic drawbacks considering the WRF location.

# 2 Wastewater Flows and Loads

## 2.1 Introduction

This section bases flow and load projections on historical data from 2017 through the first quarter of 2022 and projections for future growth taken from Section 1. Also presented is a discussion of alternatives for reducing influent flows and mass loads of constituents as a benefit of reduced impact on the Big Wood River.

## 2.2 Flow Projection

Wastewater flow contributions can be divided into the following groups:

- Residential – Includes flow from the permanent residents, second-home residents, and tourists as described in Section 1. Since the residential flow includes both tourists and second-home residents, it is anticipated to vary greatly over the year.
- Light Industrial – Includes the flow associated with the hospital, retail stores, restaurants, and other small businesses that may produce flows other than domestic. The light industrial flow should not change drastically over the year.
- Inflow and Infiltration (I&I) – Includes stormwater that enters the sewer system from points of direct connection to the system (inflow) and groundwater that enters the sewer system through cracks and leaks in the sewer pipes (infiltration). I&I varies significantly during the year. Peaks generally occur during the spring and early summer because of rain and snowmelt. The peaks of I&I flow vary directly with annual precipitation.

## 2.3 Determining Flows and Peaking Factors

### 2.3.1 Base Flow

To determine residential flows, population data is used in conjunction with influent wastewater flows to determine an average flow rate per user. Typical residential per capita residential flows range between 60 and 80 gallons per capita per day (gpcd)[13]. The Ketchum and Sun Valley area has two distinct population periods, average and peak season. Likewise, the WRF has distinct flow patterns to match the population trends. During the off-peak season months, the per capita flows are approximately 87 gpcd. During the peak season months, the per capita flows are approximately 79 gpcd.

The per capita flows reduce during peak seasons since the tourist population produces less flow than a typical permanent resident. The WRF service area is also on the high end to slightly above typical flow per capita values. This can likely be attributed to the transient population, and more than adequate water rights, where the City of Ketchum and SVWSD do not have issues related to forced water conservation.

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[13] Metcalf & Eddy, Inc., Tchobanoglous, G., Abu-Orf, M., Bowden, G., & Pfrang, W. (2014). *Wastewater Engineering: Treatment and Resource Recovery* (5th ed.). McGraw-Hill Education.

Since the off-peak per capita flow value is higher, this value is the basis of design for the projected average annual flow. To be conservative, 100 gpcd was used in place of 87 gpcd to account for inflow and infiltration (I&I) multiplied by the average annual population equivalent of 17,332 to estimate an average annual flow of 1.73 MGD at the end of the planning period.

### 2.3.2 Inflow and Infiltration

Table 2-1 lists current I&I flow estimates. Inflow is stormwater that enters the sewer system from points of direct connection to the system. Infiltration is groundwater that enters the sewer system through cracks and leaks in the sewer pipes and manholes.

In previous studies, I&I was a large part of the flow seen at the WRF. In the 1999 FPS, 106 gpcd was attributed to I&I. However, Ketchum and SVWSD efforts have significantly decreased the I&I contribution. Infiltration is excessive when the flow per capita is greater than 100 gpcd[14] during the dry-weather flow (DWF), where 20 gpcd is attributed to I&I. The DWF was tabulated from the averages of October and November, typically the two driest months for infiltration in the year. Table 2-1 lists the historical estimate for DWF, the equivalent population during the DWF, and the per capita values.

Inflow is excessive when the wet-weather flow (WWF) per capita exceeds 255 gpcd[4], where 175 gpcd is attributed to I&I. The WWF typically occurs in late spring and early summer when precipitation is relatively high, and when the winter snow accumulation is melting. Historically, the WWF has been seen in May and June. Since both the DWF and WWF are found in the off-peak months, the average annual equivalent population is used to calculate the DWF per capita and the WWF per capita, as shown in Table 2-1.

**Table 2-1. Inflow and infiltration analysis**

| Parameter | 2017 | 2018 | 2019 | 2020 | 2021 | Avg |
|---|---|---|---|---|---|---|
| **Infiltration Analysis (120 gpcd)** | | | | | | |
| DWF (MGD)[1] | 0.93 | 0.89 | 0.91 | 0.89 | 0.86 | 0.89 |
| DWF per Capita (gpcd) | 86 | 82 | 84 | 73 | 69 | 79 |
| Average Equivalent Population | 10,783 | 10,836 | 10,859 | 12,146 | 12,472 | 11,419 |
| **Inflow Analysis (275 gpcd)** | | | | | | |
| WWF (MGD)[2] | 3.09 | 1.72 | 2.20 | 1.44 | 1.34 | 1.96 |
| WWF per Capita (gpcd) | 287 | 158 | 203 | 118 | 107 | 175 |
| Average Equivalent Population | 10,783 | 10,836 | 10,859 | 12,146 | 12,472 | 11,419 |

[1] Average two consecutive driest months
[2] Peak month flow
DWF=dry-weather flow; WWF=wet-weather flow; MGD=million gallons per day; gpcd=gallons per capita per day

For projecting flows, the design I&I contribution was estimated at 75 gpcd in the 2009 FPS. There were significant improvements made in the facility and the collection system to reduce I&I prior to the 2009 FPS that reduced the I&I design value by approximately 34 percent from the 1999 FPS.

The DWF has consistently declined since 2017 attributable to several possible reasons. The first reason could be continued collection system improvements that the City of Ketchum and the SVWSD have performed in the last few years by replacing sewer lines in problem areas. A second

[14] USEPA [U.S. Environmental Protection Agency]. 1985. *I/I Analysis and Project Certification.*

reason could be attributed to the COVID-19 pandemic. During 2020 and into 2021, the DWF per capita dropped tremendously. This extreme wastewater characteristic change is very likely attributed to the reduction in transient population. Many second-home residents chose to spend this time in the Ketchum/Sun Valley area, with commuter and tourist populations reaching nearly zero for portions of this time period.

While the WWF per capita rates for the analyses are considerably smaller than in the 2009 FPS, the values are not truly representative of the historical flows. From 2018 through 2021, the annual flow of Big Wood River was consistently much lower than in previous years due to smaller amounts of snow melt. However, in 2017, there was close to normal winter snow-pack and an unusual spring rain on snow event as seen by an increase in the annual flow of Big Wood River and an excessive inflow rate. Rather than using a smaller I&I contribution as the data suggests, this FPS will continue to use 75 gpcd for wet weather inflow to estimate historically average years of snow melt more accurately.

### 2.3.3 Flow Peaking Factors

For this FPS, the design flow is the peak month flow determined from the population estimates, per capita usage, and I&I component developed above. Although the design flow is an important value used for future design, it is also important to look at average annual and peak flows that could occur at a given day or hour. Peaking factors are used to calculate these flows. The peaking factors for this FPS were developed from data over the past 5 years and are listed in Table 2-2.

**Table 2-2. Flow peaking factors and analysis**

| Ratio | 2017 | 2018 | 2019 | 2020 | 2021 | Average | Typical[2] |
|---|---|---|---|---|---|---|---|
| Average:Peak Month | 0.50 | 0.69 | 0.64 | 0.76 | 0.79 | 0.67 | 0.80 |
| Peak Day:Peak Month | 1.37 | 1.81 | 1.37 | 1.08 | 1.11 | 1.35 | 1.20 |
| Peak Hour:Peak Month | - | - | - | - | - | 2.32[1] | 1.50 |

[1] Estimated value based on current peak equivalent population (16,698)[16]
[2] Typical values from M & E[15]

Peak hour flow values could not be determined for 2017 through 2021. The WRF uses a supervisory control and data acquisition (SCADA) system that produces spikes and errors during high-flow events, which makes gathering accurate data difficult. However, the other peaking factors were produced from available data. The peak hour to annual average flow peaking factor was determined to be 2.9[16], which is equivalent to a peak-hour to peak-month flow peaking factor of 2.32.

Typical peak-hour-to-peak-month flow peaking factors are around 1.5. This value can be significantly affected by precipitation and collection line conditions related to I&I. Years with reduced precipitation have lower peak day to peak month correlations, as there is much lower inflow during the wet weather season. Less snowfall in the winter months produces smaller peak-day events. Peak-hour factors are more pronounced during low-precipitation years, as the diurnal sanitary wastewater flow variation is not diluted by a constant stream of snowmelt I&I. For the planning period, this FPS uses the calculated peaking factors as they are more representative of the facility's flow variation over the

[15] Metcalf & Eddy, Inc., Tchobanoglous, G., Abu-Orf, M., Bowden, G., & Pfrang, W. (2014). *Wastewater Engineering: Treatment and Resource Recovery* (5th ed.). McGraw-Hill Education.

[16] Fair, G.M. and Geyer, J.C. "Water Supply and Waste-water Disposal". 1st Ed., John Wiley & Sons, Inc., New York (1954), p.136

last 5 years. The peaking factors will require continual monitoring over time as historical flow trends may change.

### 2.3.4 Design Flows

The current flow values were pulled together from daily flow data from 2021. The projected planning period flows were scaled up from the calculated average annual flow of 1.73 MGD using the average peaking factors shown in Table 2-2 The current and planning period values used for this FPS are listed in Table 2-3.

**Table 2-3. Current and planning period design flows**

| Parameter | Current (2021) | Planning Period (2042) |
|---|---|---|
| Average Annual Flow (MGD) | 1.05 | 1.73 |
| Peak Month Flow (MGD) | 1.34 | 2.57 |
| Peak Day Flow (MGD) | 1.49 | 3.47 |
| Peak Hour Flow (MGD) | 3.05 | 5.96 |

Figure 2-1**Error! Reference source not found.** compares current flows to anticipated future flows at the WRF. The current peak hour flow is an estimated flow using the peak hour-to-average annual peaking factor of 2.9. Previous buildout average versus peak hourly factors were likely low and present peaking factors offer more realistic values. As mentioned in Section 2.3.3, as the WRF's service area and influent flows grow, and collection system I&I improvements reduces this source, these peaking factors are likely to decline closer to typical peaking factors.

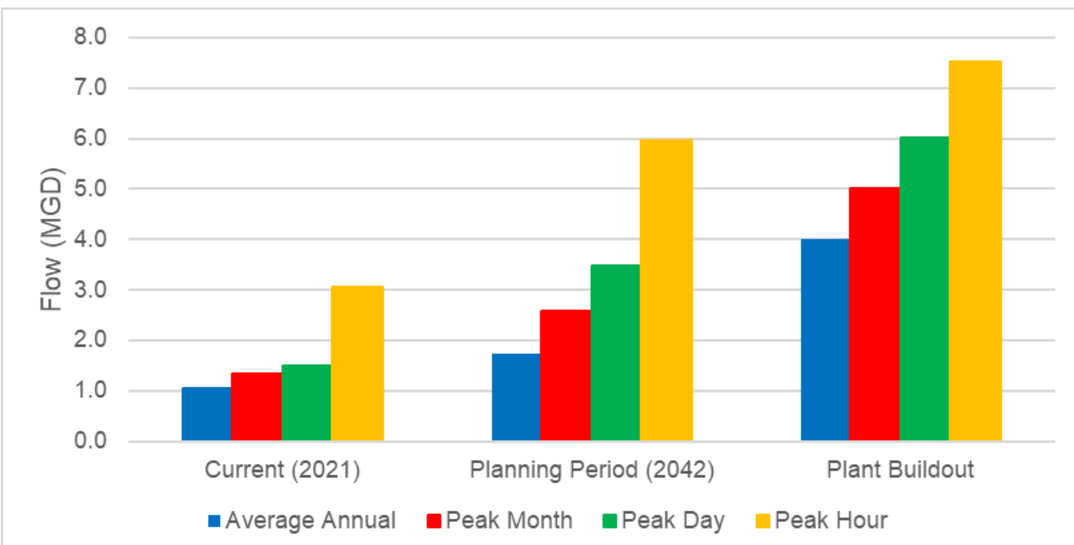


**Figure 2-1. Current and projected wastewater flows**

The WRF and I&I improvements have reduced flows due to I&I and have significantly increased the length of time before the buildout flows are expected. Table 2-4 compares the 2008 flows from the 2009 FPS with recent 2021 flows in this FPS The table shows that even though the flows should have increased due to the average annual population equivalent increase of approximately 50 percent, they have decreased by approximately 20 percent.

**Table 2-4. Comparison of 2008 and 2021 (current) design flows with plant buildout**

| Parameter | 2008 Update | 2022 Update | Plant Buildout |
|---|---|---|---|
| Average Annual Flow (MGD) | 1.59 | 1.05 | 4.02 |
| Peak Month Flow (MGD) | 1.98 | 1.34 | 5.02 |
| Peak Day Flow (MGD) | 2.41 | 1.49 | 6.02 |
| Peak Hour Flow (MGD) | 2.60 | 3.05[1] | 7.53 |

[1] Estimated using 2022 peaking factor
MGD=million gallons per day

Figure 2-2 graphically represents the results from Table 2-4. As can be seen in the figure, the collection system maintenance and continued I&I repairs efforts have extended the plant buildout date.

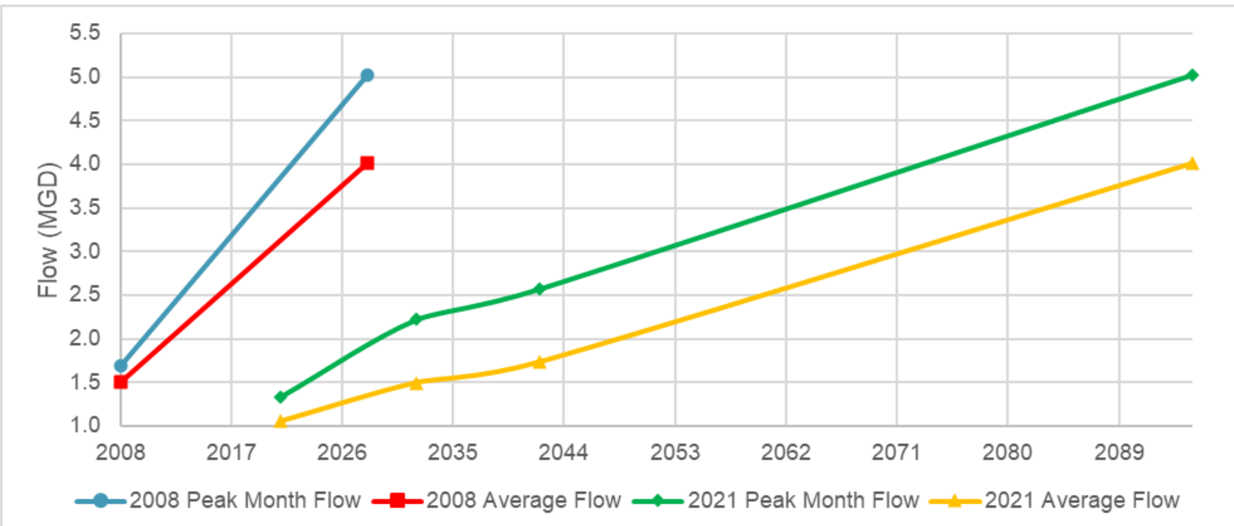


**Figure 2-2. Plant buildout flow projection in 2008 plan versus 2020 plan**

## 2.4 Load Projection

Influent wastewater concentrations for BOD, TSS, and TP are listed in Table 2-5. Both the current per capita values, collected in December 2020 and December 2021, as well as the per capita values used in the 2009 FPS, collected from 2008 data, are shown for comparison. Typical per capita loads of the constituents were taken from Metcalf & Eddy (2014)[17] as another point of comparison.

**Table 2-5. Per capita factors for wastewater parameters**

| Constituent | 2008 | Average Annual 2020 | Peak Season 2020 | Average Annual 2021 | Peak Season 2021 | Typical [17] |
|---|---|---|---|---|---|---|
| | Per capita Values - pounds per capita per day (lbs/cap/d) | | | | | |
| BOD | 0.18 | 0.146 | 0.170 | 0.193 | 0.227 | 0.20 |
| TSS | 0.2 | 0.132 | 0.141 | 0.141 | 0.138 | 0.19 |
| TP | 0.005 | 0.0029 | 0.0027 | 0.0028 | 0.0028 | 0.005 |

BOD=biochemical oxygen demand; TSS=total suspended solids; TP=total phosphorus

[17] Metcalf & Eddy, Inc., Tchobanoglous, G., Abu-Orf, M., Bowden, G., & Pfrang, W. (2014). *Wastewater Engineering: Treatment and Resource Recovery* (5th ed.). McGraw-Hill Education.

### 2.4.1 Design Loads

The current average annual and peak month values were determined from the 2020 flow data. The population estimates (Table 1-4 and Table 1-5) and per capita contributions (Table 2-5) were used to calculate the planning period average annual and peak month loads for each parameter. These values are listed in Table 2-6.

**Table 2-6. Current and planning period design loads**

| Constituent | 2021 Average Annual | 2021 Peak Month |
|---|---|---|
| BOD (lbs/d) | 2,348 | 3,857 |
| TSS (lbs/d) | 1,715 | 2,345 |
| TP (lbs/d) | 34 | 47 |
| TKN (lbs/d)[1] | 351 | 446 |

[1] Data based on typical WRF influent values from Metcalf & Eddy (2014)[2]. No actual influent TKN data available.
BOD=biochemical oxygen demand; TSS=total suspended solids; TP=total phosphorus; TKN=total Kjeldahl nitrogen; lbs/d=pounds per day

Table 2-7 compares the design loading from the 2009 FPS and estimates for this FPS. Table 2-7 also shows the change in average annual load of each constituent. TSS and TP loadings per capita have decreased since the 2009 FPS, which is why the average annual loads of the two constituents have decreased. The influent data suggests that the wastewater characteristics have changed in recent years, producing a significantly higher soluble organic load. Testing has been performed across the collections in an attempt to locate a possible source, but none have been found. BOD loading per capita significantly increased in 2021 to a point that it is not anticipated that BOD loading will reach an equilibrium between 2020 and 2021 data. The previous FPS estimates were based on buildout being reached by the end of the planning period rather than estimating growth. This explains why the planning period loads are currently all significantly smaller than the 2028 estimated values, even though the loading per capita is much higher currently.

**Table 2-7. Comparison of 2008 and 2021 current and planning period loads**

| Parameter | BOD (lb/d) | TSS (lb/d) | TP (lb/d) |
|---|---|---|---|
| **Current (2021)** | | | |
| 2008 Average Annual | 1,752 | 1,946 | 49 |
| 2021 Average Annual | 2,348 | 1,715 | 35 |
| 2008 Peak Month | 2,962 | 3,291 | 83 |
| 2021 Peak Month | 3,857 | 2,345 | 44 |
| Percent Change (Average Annual) | 34.0% | -11.9% | -29.4% |
| **Planning Period (2042)** | | | |
| 2028 Average Annual | 3,055 | 3,394 | 85 |
| 2042 Average Annual | 3,888 | 2,902 | 58 |
| 2028 Peak Month | 5,027 | 5,586 | 140 |
| 2042 Peak Month | 5,757 | 4,296 | 86 |
| Percent Change (Average Annual) | 27.3% | -14.5% | -31.7% |

BOD=biochemical oxygen demand; TSS=total suspended solids; TP=total phosphorus; lbs/d=pounds per day

The discrepancy in the TP values can be attributed to the previous methods of attaining the load data. In the 2009 FPS, influent TP was not sampled, so the per capita value was estimated using a common value of 0.005 lbs/capita/d[18]. In recent years, the Ketchum / SVWSD WRF has tested influent TP levels, which revealed that the per capita estimation of TP is much higher than the actual values of 0.0028 lbs/capita/d for both average annual and peak season conditions. The TSS per capita values are also lower than in the 2009 FPS.

The typical per capita values found in Table 2-2 represent the typical values with ground up kitchen waste due to garbage disposals. Communities that have access to in-sink garbage disposals send more organic material into the WRF sewer system and the facility. The actual per capita values for TSS align relatively closely with the typical per capita values without ground up kitchen waste[18], 17 percent below the typical value for TSS. One possible explanation is accommodations for visitors could create a lower per capita TSS quantity.

BOD per capita values (peak season) have varied greatly since 2008, where the WRF received approximately 0.18 lbs/capita/d. This value reduced to 0.153 lbs/capita/d in 2020 and increased up to 0.193 lbs/capita/d. This change can be attributed to an increase in soluble organic concentration. The 2020 average annual influent BOD concentration was 192 mg/L and jumped up to 268 mg/L in 2021.

However, the TP per capita load (peak season) is 30 percent smaller than the typical per capita value with ground up kitchen waste. This may be attributed to commuters and tourists. This would help to lower the actual per capita loads. Up to 26 percent of TP influent to a typical WRF is from heavy industry[19], which is not prevalent in the service area of the Ketchum / SVWSD WRF. Another common source of TP is in detergents and soaps. These products have seen widespread changes in last few decades due to implementation of phosphorus limits, or even bans, on these products. This is compounded by the tourist and commuter populations that typically will not contribute much, if any, waste flow due to washing dishes or clothes to the WRF. These are some of the primary reasons that the per capita phosphorus loads are drastically lower than commonly seen across the country.

Figure 2-3 graphically represents the results from Table 2-7 for average annual and peak month BOD and TSS loads from 2021 and projected through the planning period to 2042.

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[18] Metcalf & Eddy, Inc., Tchobanoglous, G., Abu-Orf, M., Bowden, G., & Pfrang, W. (2014). *Wastewater Engineering: Treatment and Resource Recovery* (5th ed.). McGraw-Hill Education.

[19] Azam, H., Alam, S. T., Hasan, M., & Kwon, M. J. (2020, October 19). *Phosphorous in the environment: characteristics with distribution and effects, removal mechanisms, treatment technologies, and factors affecting recovery as minerals in natural and engineered systems*. ResearchGate.

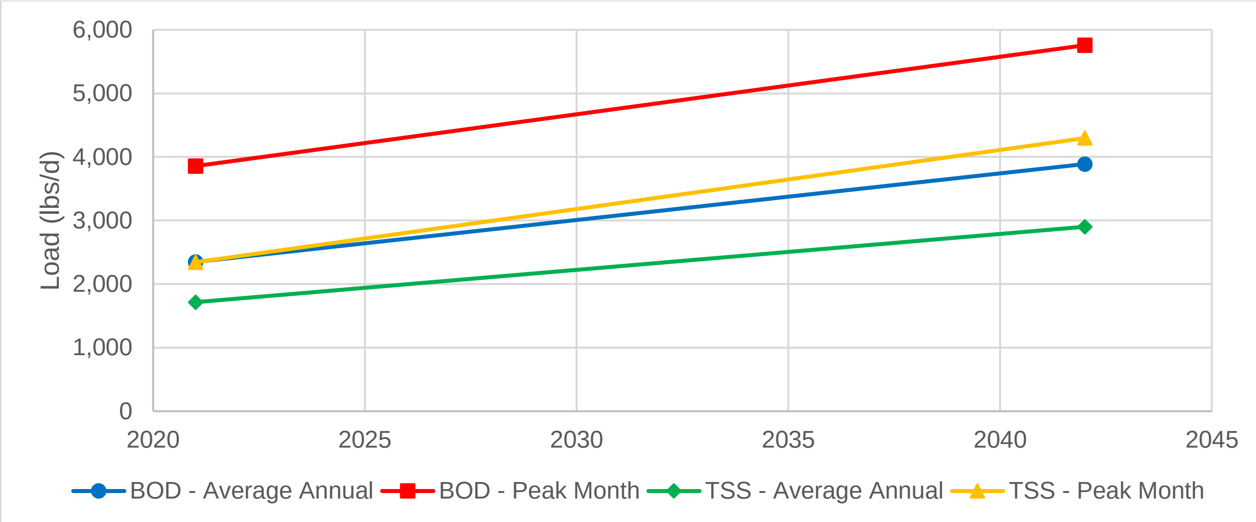


**Figure 2-3. Planning period projected wastewater loads**

## 2.5 Flow and Load Reduction Alternatives

Due to the increasing requirements in the CWA, Pollution Prevention Act, National Energy Policy Act, and the anti-backsliding effluent permit limits, Ketchum and Sun Valley have attempted to reduce flows and loads to the WRF. Reducing the flows and loads of the WRF can help extend the length of time to buildout. Since the current permanent population of the Ketchum / Sun Valley area is less than 10,000 residents, a flow and load analysis is not required as part of the FPS (40 Code of Federal Regulations [CFR], Part 35, Subpart E, Appendix A). Alternatives are discussed below for consideration by the cities served by the plant.

### 2.5.1 Water Conservation Programs

Conserving water generally reduces wastewater flows but does not reduce the wastewater loads. If a WRF has a limited capacity for additional flow, but excess capacity for treating pollutant loads, a successful water conservation program would allow the community to postpone plant expansion.

### 2.5.2 Infiltration and Inflow Reduction

I&I has already been reduced by 34 percent between the 1999 FPS and 2009 FPS, when it was an area of extreme concern. This reduction will allow the plant to operate over a longer time span without expanding. In the available plant data from 2017 through the first quarter of 2022, infiltration is well below the EPA criteria of 20 gpcd attributed solely to infiltration. Inflow at the WRF is highly variable due to winter snow loads in the Wood River Valley and design considerations must take this into account. It is recommended that the past improvements to the collection system be continued to further reduce I&I.

### 2.5.3 Pollutant Bans

A pollutant ban prohibits the release of problem-causing contaminants into the wastewater system. No special pollutant bans exist in the community. However, by limiting specific pollutants such as phosphorus, the WRF can reduce the costs of chemical coagulants and sludge hauling operations associated with phosphorus removal.

### 2.5.4 Pollution Prevention and Toxics Reductions

There are no large industrial users serviced by the WRF; therefore, an industrial pretreatment program would not benefit the community. However, a plan to reduce toxics dumped into the system would benefit the plant. By limiting the toxics entering the treatment works, the microbes would be healthier and exhibit better treatment and settling properties. A hazardous waste collection program is an effective way to reduce the amount of hazardous waste that enters the sewer system.

### 2.5.5 Grease Trap Cleaning

Many industries and restaurants have grease traps to help prevent fats, oils, and greases (FOG) from entering the collection system. For the grease traps to be effective, they must be routinely cleaned. More aggressive policing of grease trap maintenance may reduce the FOG load on the WRF.

### 2.5.6 Lawn Care Chemicals

Minimizing the use of lawn care chemicals and preventing excessive runoff from lawns resulting from over-irrigation can reduce the nutrient load to the WRF. Runoff can enter the wastewater stream through I&I.

### 2.5.7 Public Information Programs

Public education is essential to the success of community-supported programs aimed at reducing flows to the wastewater treatment facilities. For community-sponsored programs to be successful, the public must be convinced that changing water use habits will benefit themselves, the community, and the environment.

# 3 Current Plant Capacity and Performance

## 3.1 Introduction

This section discusses the current capacity of the WRF and the general condition of the equipment and facilities. Any changes and upgrades to the plant are discussed in the next sections. The design flow and loads developed from the previous sections were used to develop the requirements for process sizing. Along with the analysis of the treatment capacity, other needs that are associated with O&M are assessed. It is also important to plan for the eventual replacement of pumps, electrical systems, blowers, buildings, etc. Generally, a 15- to 20-year life can be expected from process equipment and a 50-year life for buildings and concrete tanks. The plant layout is shown in Figure 3-1and a flow schematic is shown in Figure 3-2.

Table 3-1 summarizes the approximate dates of WRF structure construction and latest upgrades to process equipment.

**Table 3-1. WRF structure and process equipment age**

| Structure | Year Installed | Age |
|---|---|---|
| Screening Building | 2019 | 3 |
| Influent Pump Station | 1997 | 25 |
| Grit Building | 1991 | 31 |
| Aeration Basins 1 & 2[1] | 1968 | 54 |
| Aeration Basins 3 &4 | 2005 | 17 |
| Clarifier #1 (90-ft diam.) | 2000 | 22 |
| Clarifier #2 (75-ft diam.)[2] | 1984 | 38 |
| Effluent Pump Station | 2004 | 18 |
| Filter Building & Filter Tanks | 2007 | 15 |
| UV Building | 2004 | 18 |
| Reuse Pump Station | 2012 | 10 |
| Control Building | 2004 | 18 |
| Lab Building | 1984 | 38 |
| Administration Building | 2001 | 21 |
| Aerobic Digester Tank[3] | 1984 | 38 |
| Solids Gravity Thickener | 1991 | 31 |
| Digester Blower Building | 1999 | 23 |
| Sludge Loadout Building | 1999 | 23 |

[1] Ceramic diffusers installed 1984
[2] New mechanism in 2006
[3] New diffusers in 1999

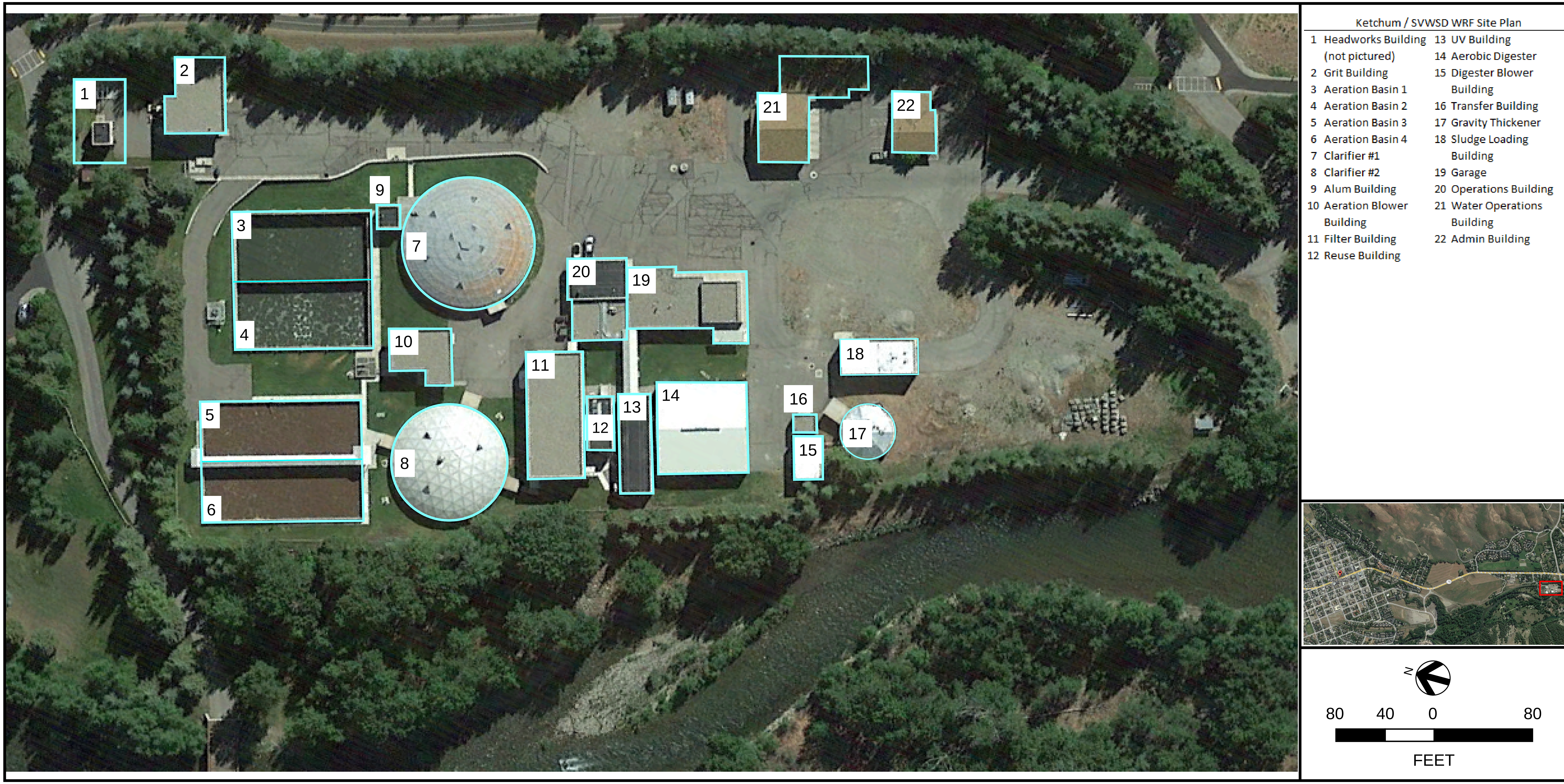


**FIGURE 3-1. PLANT LAYOUT**

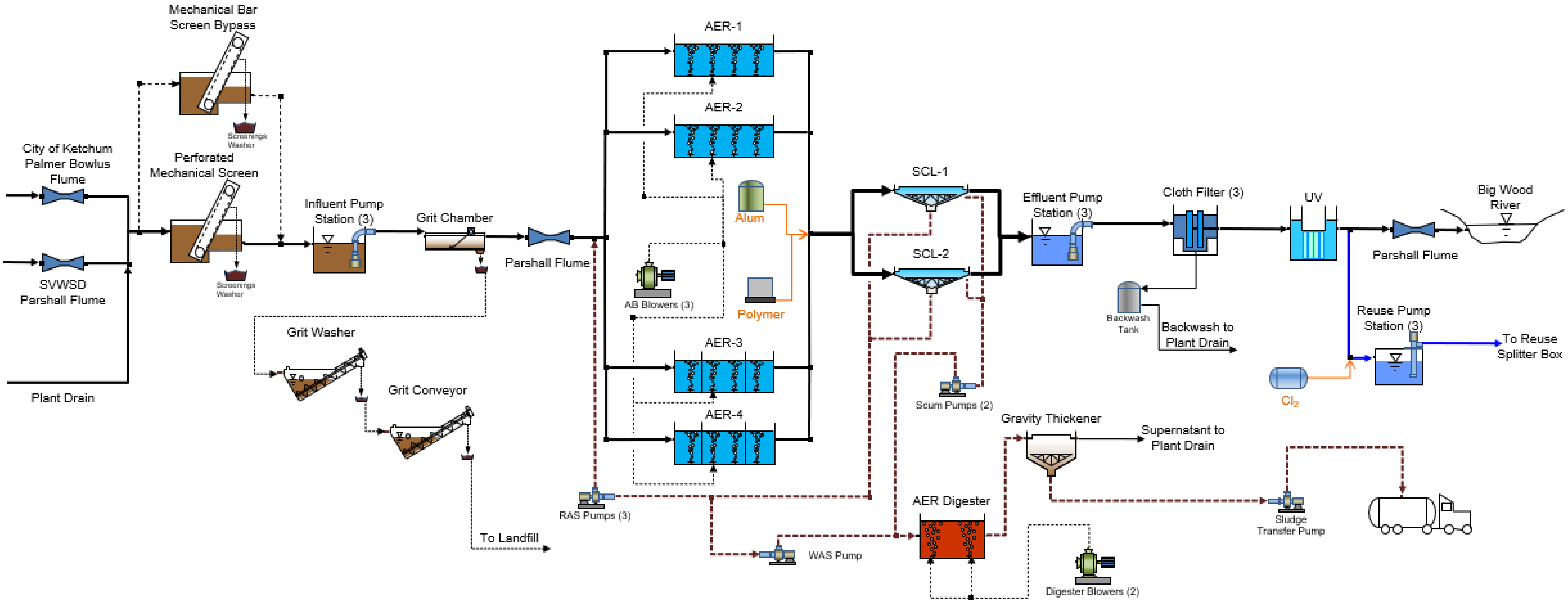


**Figure 3-2. Flow schematic**

AER=aeration basin; SCL=secondary clarifier; WAS=waste-activated sludge; UV=ultraviolet

## 3.2 Treatment Capacity

The current and future flows and loads that the WRF is treating are listed in Table 3-2. Table 3-3 through Table 3-5 summarizes the existing unit processes (headworks, activated sludge system, phosphorus removal, filtration, and UV disinfection). The capacity and future requirements of each unit process is discussed briefly throughout this section.

**Table 3-2. Current and future flows and loads**

| Parameter | Current (2021) | Short-Term Period (2032) | Planning Period (2042) |
|---|---|---|---|
| Average Annual Flow (MGD) | 1.05 | 1.50 | 1.73 |
| Peak Month Flow (MGD) | 1.34 | 2.22 | 2.57 |
| Peak Day Flow (MGD) | 1.49 | 2.99 | 3.47 |
| Peak Hour Flow (MGD) | 3.05 | 5.15 | 5.96 |
| BOD Average Annual (lbs/d) | 2,348 | 3,352 | 3,888 |
| BOD Peak Month (lbs/d) | 3,857 | 4,964 | 5,757 |
| TSS Average Annual (lbs/d) | 1,715 | 2,502 | 2,902 |
| TSS Peak Month (lbs/d) | 2,345 | 3,704 | 4,296 |
| TP Average Annual (lbs/d) | 34 | 50 | 58 |
| TP Peak Month (lbs/d) | 47 | 74 | 86 |
| TKN Average Annual (lbs/d)[1] | 351 | 500 | 580 |
| TKN Peak Month (lbs/d)[1] | 446 | 741 | 859 |

[1] No available influent data. Estimated based on 40 mg/L, which is a typical concentration for WRF influent (Metcalf & Eddy).

MGD=million gallons per day; BOD=biochemical oxygen demand; TSS=total suspended solids; TP=total phosphorus; TKN=total Kjeldahl nitrogen; lbs/d=pounds per day

**Table 3-3. Headworks unit process summary**

| Unit Process | Existing Facilities | Treatment Criteria | Existing Capacity | Remarks |
|---|---|---|---|---|
| Mechanical Perforated Screen | Number - 1<br>Width - 42 inch<br>Hole Size - 6 mm | Hydraulically pass peak flow rate | 4.0 MGD (peak day)<br>6.0 MGD (peak hour) | Backup into flume will occur at peak hour flow |
| Mechanical Bar Screen | Number - 1<br>Width - 24 inch<br>Bar spacing - 7/16 inch | Hydraulically pass peak flow rate | 7.5 MGD | Rack replacement reduced openings from 5/8 inch to 7/16 inch |
| Screenings Washer/Compactor | Number - 2 | Hydraulically pass peak flow rate | 35 cf/hr solids each | Each screen has washer/compactor |
| Influent Pumps | Number - 2<br>Type - Submersible<br>Size - 25 hp, 2,300 GPM @ 28 feet TDH each<br>Number - 1<br>Type - Submersible<br>Size - 15 hp, 2,189 GPM @ 60 feet TDH | Hydraulically pass peak flow rate with one pump offline | 6.5 MGD with two pumps in service (one offline)<br>9.8 MGD with three pumps in service | There is space for the fourth pump.<br>New VFDs are in screenings building electrical room (2018). |
| Grit Chamber with Air Lift Pump | Number - 1<br>Diameter - 12 feet<br>Mechanism - 1 hp | Hydraulically pass peak flow and slow velocity enough to settle grit | 12 MGD | There is no redundant chamber. Chamber may be bypassed |
| Grit Conveyor and Grit Washer | Number - 1 each | | 7.0 cf/hr of grit | Grit removal to protect downstream equipment |
| Odor Control System | Number - 1 | Remove $H_2S$ from Headworks building | 5,110 SCFM<br>Average inlet $H_2S$ Conc.: 2 ppm<br>Peak inlet $H_2S$ Conc.: 20 ppm<br>Removal Efficiency: 99.0% or < 0.1 ppm | Removal efficiency based on whichever noted criteria is greater. |
| Ketchum and SV Influent Flumes | Ketchum - Palmer Bowlus Flume, 24-inch<br>SVWSD - Parshall Flume, 3-inch<br>Total Influent - 12-inch Parshall Flume | Hydraulically pass peak flow rate | 21 MGD | Has capacity for peak flow |

mm=millimeter; MGD=million gallons per day; cf/hr=cubic feet per hour; GPM=gallons per minute; hp=horsepower; VFD=variable frequency drive; SCFM=standard cubic feet per minute; ppm=parts per million

**Table 3-4. Secondary treatment unit process summary**

| Unit Process | Existing Facilities | Treatment Criteria | Existing Capacity | Remarks |
|---|---|---|---|---|
| Aeration Basins | Number - 4<br>Volume - 500,000 gal each<br>Sidewater Depth - 12 feet | F:M - 0.10 lbs BOD/lb MLSS/d<br>MLSS - 3,000 - 5,000 mg/L | 5,000 - 8,340 lbs BOD/d<br>~3.7 MGD (four basins in service) | Basins 1-2 complete mix<br>Basins 3-4 plug flow.<br>Capacity based on influent BOD at 270 mg/L. |
| Blowers | Number - 2<br>Type - Turbo<br>Size - 160 hp, 2,400 SCFM @ 5.8 PSIG<br>Number - 1<br>Type - Centrifugal<br>Size - 125 hp, 2,100 SCFM @ 5.8 PSIG | D.O. - 2.0<br>SOTE - 17%<br>Winter temp - 10°C<br>Summer temp - 18°C | 12,100 lbs O2/d<br>2021 Peak Day BOD: 5,032 lbs/d<br>2021 Peak Day NH3-N: 318 lbs/d | 1.34 lbs O2/lb BOD +4.6 lbs O2/lb NH3-N= 8,205 lbs O2/d req'd |
| Diffusers | Type - fine bubble ceramic<br>Number - 1,230 per Basin 1-2<br>Number - 1,720 per Basin 3-4 | 1,500 $ft^3$ air / lb BOD<br>200% avg. day O2 demand | 8,850 SCFM @ 1.5 SCFM/diffuser | Firm capacity with four basins in service. |
| Secondary Clarifiers | Number - 1 (No. 1)<br>Diameter - 90 feet<br>Sidewater Depth - 13 feet<br>Number - 1 (No. 2)<br>Diameter - 75 feet<br>Sidewater depth - 14 feet | SLR - < 35 lbs/sf/d Peak Hour<br>SOR - 900 GPD/sf | 9.7 MGD with both clarifiers online. MLSS - 15,000 mg/L | 5.7 MGD clarifier 1<br>4.0 MGD clarifier 2<br>Suction header mechanisms |
| RAS Pumps | Number - 3<br>Type - Centrifugal<br>Size- 25 hp, 1,560 GPM @ 36 feet TDH | Match peak month flow | 4.5 MGD with two pumps in service (one offline)<br>6.74 MGD with three pumps in service | Planning period peak month (2042) is 3.48 MGD. |
| WAS pump | Number - 1<br>Size - 3 hp, 120 GPM @ 30 PSI | 60,000 GPD (42 GPM) @ 1.2% solids (peak month) | Capacity - 120 GPM | Current peak month: 66,000 GPD (46 GPM) @ 1% solids |
| Scum Pumps | Number - 2<br>Type - Hose<br>Size - 3 hp, 85 GPM @ 12 feet TDH | | 122,400 GPD with one pump in service (one offline)<br>244,800 GPD with two pumps in service | |

BOD=biochemical oxygen demand; lbs/d=pounds per day; MLSS=mixed liquor suspended solids; mg/L=milligrams per liter; hp=horsepower; SCFM=standard cubic feet per minute; PSIG=pounds per square gauge; °C=degrees Celsius; $ft^3$=cubic feet; lbs/sf/d=pounds per square foot per day; GPD/sf=gallons per day per square foot; MGD=million gallons per day; GPM=gallons per minute; TDH=total dynamic head; RAS=return-activated sludge; WAS=waste-activated sludge

**Table 3-5. Tertiary treatment and disinfection unit process summary**

| Unit Process | Existing Facilities | Treatment Criteria | Existing Capacity | Remarks |
|---|---|---|---|---|
| Alum Storage Tank | Number - 1<br>Volume - 7,000 gal | Dosage - 60 mg/L<br>Average annual - 64 GPD | 7,000-gallon storage - sufficient storage for 3 months at average conditions. | 6,000 gallons is usable storage<br>Storage volume is adequate for future conditions |
| Alum Feed Pump | Number - 1<br>Type - Peristaltic<br>Size - 56 GPH | Current flows require 3-4 GPH solution (47% slurry) | Max flow of 56 GPH | Pump is adequately sized for future flows<br>There is no redundant pump |
| Polymer Feed | Number - 1<br>Volume - 330 gallons | Dosage - 1 lb/MG | Liquid polymer is stored in 330-gal totes | Storage for about 4 months at average conditions. |
| Polymer Feed Pump | Number - 1<br>Type - Peristaltic<br>Size - 5.0 GPD @ 100 PSI | Current peak day flow rate requires 0.6 GPD polymer (50% slurry) | 5.0 GPD | One pump designed to feed filter system, one for phosphorus removal<br>Designed as redundant units for each duty |
| Effluent Pumps | Number - 2<br>Type - Submersible<br>Size - 2,700 GPM, 40 hp<br>Number - 1<br>Type - Submersible<br>Size – 2,205 GPM, 17 hp | Hydraulically pass peak flow rate with one pump offline | 6.6 MGD with two pumps in service (one offline) 9.9 MGD with three pumps in service | There is space for a fourth pump |
| Filtration | Number - 3<br>Each with 10 disks | TSS < 10 mg/L | 7.74 MGD with one unit out of service | Loading rate at peak hour flows with one filter out of service is 5 GPM/sf |
| Disinfection | Number - 3 banks 2 channels<br>Low-Pressure-High Intensity bulbs | 17.8 cfu/100 mL at 4 MGD | 3.75 MGD per channel | Redundant Capacity 7.5 MGD |
| | | 2.2 cfu/100 mL | 3.1 MGD | Reuse Redundant Capacity - 3.1 MGD |
| Reuse Pump Station | Number - 2<br>Type - Vertical Turbine<br>Size - 50 hp, 1,500 GPM @ 100 feet TDH<br>Number - 1<br>Type - Vertical Turbine<br>Size - 20 hp, 750 GPM @ 75 feet TDH | Chlorine dosage to 1 mg/L | 3.24 MGD with two pumps in service (one offline)<br>5.40 MGD with three pumps in service<br>Sufficient chlorine dosing system for planning period flows | There is space for a fourth pump. |
| Effluent Flow Measurement | 24-inch Palmer-Bowlus | - | | Measure discharge to the Big Wood River |

gal=gallons; GPD=gallons per day; GPH=gallons per hour; lbs/MG=pounds per million gallons; mg/L=milligrams per liter; GPM/sf=gallons per minute per square foot; hp=horsepower; cfu/100mL=colony forming units per 100 milliliters; PSI=pounds per square inch; MGD=million gallons per day; GPM=gallons per minute; TDH=total dynamic head

## 3.3 Headworks

The headworks consist of influent wastewater collection, screening, screenings washer/compactor, influent pumping, grit removal, grit conveyance and washing, carbon scrubber, and flow measurement. The headworks building was upgraded in 2019. As such, the screens and odor control facilities are new and in excellent condition. The grit system was not upgraded at the same time. The capacity of the grit system is adequate, but the condition is poor. The current plant influent peak day flow is estimated at 1.5 MGD and current peak hour flow is estimated at 3.0 MGD for 2021. The planning period peak day flow is projected to be 3.5 MGD with the planning period peak hour flow projected at 6.0 MGD. The headworks equipment should be sized to handle these planning period values.

### 3.3.1 Screening

A perforated mechanical screen was installed in 2019 to reduce the amount of stringy solids (hair, rags, plastics, etc.) flowing downstream to other processes. The mechanical bar screen was insufficient to remove these materials. The perforated screen has a capacity of 4 MGD, which is sufficient for current peak hour flows. The perforated screen can be seen in Figure 3-3**Error! Reference source not found.**. A bypass mechanical bar screen operates as standby for the perforated screen. The existing mechanical bar screen was designed to pass 7.5 MGD. It was placed in the backup position due to age and on-going issues with stringy solids passing between the bars. The new perforated plate screen solves the problems with stringy solids in subsequent treatment units.


**Figure 3-3. Perforated mechanical screen**

## 3.3.2 Influent Pumps

The influent submersible pump station has a capacity of 6.5 MGD with one pump out of service. This capacity is enough to handle planning period peak hourly flows and plant buildout peak monthly flows. The influent pumps will need replacement before the end of the planning period due to age. Two pumps are 25 horsepower (hp), submersible centrifugal pumps with a capacity of 2,300 gallons per minute (GPM) and the third pump is a 15 hp submersible centrifugal pump capable of 2,189 GPM. The pumps are arranged with a redundant pump. The current capacity of 6.5 MGD satisfies the planning period peak hourly flow with one of the pumps out of service. Space is available for an additional pump if required.

## 3.3.3 Grit Chamber, Conveyor, and Washer

The grit chamber was sized to handle up to 12 MGD. Therefore, it will be able to handle the projected peak flows. Using a typical grit production value of 2.0 cubic feet per million gallons (cf/MG), the plant would produce about 0.63 cubic feet per hour (cf/hr) of grit during the projected plant buildout peak hour flow of 7.53 MGD.

The grit conveyor and washer need to meet grit production capacity. The current system is designed to handle 7.0 cf/hr. Since the plant is anticipated to produce 0.63 cf/hr of grit, the conveyor and washer are more than adequately sized to handle grit production.

The grit chamber is in need of upgrade due to its age. The grit chamber is becoming problematic with the amount and intensity of maintenance required to keep it operational. The grit removal system can be seen in Figure 3-4.

**Figure 3-4. Grit chamber, conveyor, and washer room**

Grit removal inefficiency due to oversizing was seen during October 2021 aeration basin maintenance. It was discovered that approximately 1.5 feet of grit had built up and settled in the bottom of aeration basins 3 and 4 over the course of 15 years, as seen in Figure 3-5. Only basin 3 has been cleaned so far due to limitations in aeration basin capacity without using aeration basins 1 and 2. Although the grit chamber is 30 years old, the chamber itself is made of concrete and is in good condition. Grit chambers do not properly settle grit when oversized due to water flow patterns.

Retrofit upgrades to equipment will be required to reduce the capacity of the chamber for improved grit separation at lower flows.

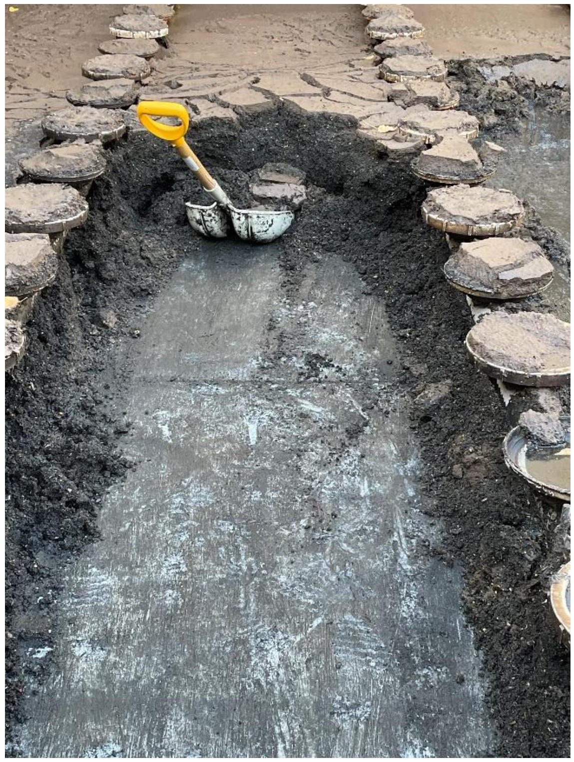

**Figure 3-5. Grit buildup in aeration basins**

### 3.3.4 Odor Control

The release of odors is a concern in all WRFs. Typically, odors in municipal wastewater streams are released by the biological conversion, under anaerobic conditions, of organics containing sulfur and nitrogen. These odors are typically found at the head of the plant - the screening and grit removal areas. To control these odors, the plant collects and treats them with an activated carbon scrubber system. The Ketchum / SVWSD WRF uses a 2-bed carbon filter with a capacity of 5,110 standard cubic feet per minute (SCFM). The odor control system can be seen in Figure 3-6. The odor control system blowers move air from both the screening building and grit building. The system was installed with the new screening equipment in 2019 and is in excellent condition.

**Figure 3-6. Carbon filter system for odor control**

### 3.3.5 Influent Flow Measurement

There are three influent flow measurement devices for the Ketchum / SVWSD WRF. The Ketchum influent collection line uses a 24-inch Palmer Bowlus flume and the SVWSD influent collection line uses a 3-inch Parshall flume. A 12-inch Parshall flume measures the combined flow after grit treatment (prior to the aeration basins). The influent flow measurement systems are adequately sized for planning period flows.

## 3.4 Activated Sludge System

The activated sludge system consists of the aeration basins, blowers, diffusers, clarifiers, the return activated sludge (RAS) pumps, and waste activated sludge (WAS) pumps.

### 3.4.1 Aeration Basins

There are two aeration trains, each of which contains two basins. Each basin contains 0.5 million gallons (MG) of reactor volume, each train has 1.0 MG of reactor volume and the total plant aeration basin volume is 2.0 MG. The basins are reactors in which BOD and ammonia are removed from the wastewater. They were designed based on a food to microorganism ratio (F:M) of 0.10 pounds of BOD per pound of mixed liquor suspended solids (MLSS) per day (lbs BOD/lbs MLSS/d), with a design minimum sludge retention time (SRT) of 10 – 20 days. Additionally, a design max month MLSS concentration of 5,000 mg/L has been contemplated as a reliable operational ceiling for MLSS. Using these criteria, the BOD removal capacity of the current system is as follows:

Mass of sludge in system = (5,000 mg/L) * 8.34 * (2.0 MG) = 83,400 lbs MLSS

BOD design capacity = (0.10 lbs BOD/lbs MLSS/d) * (83,400 lbs MLSS) = 8,340 lbs/d BOD

Given the recent higher concentrations of incoming BOD to the treatment system (approximately 270 mg/L average with seasonal fluctuation), the nominal flow capacity to the system is less than previous Planning Study ratings. The system capacity is around 3.7 MGD depending on seasonal fluctuations in incoming organic and solids concentrations which satisfy peak day flows.

Basins 3 and 4 were constructed in 2005 and added an additional 1 MG to the aeration basins. These baffled basins provide a plug flow arrangement and have been very effective at improving removal efficiencies. The plug flow configuration also encourages better settling characteristics. They have been so effective that basins 1 and 2 are only used when needed. Given that basins 3 and 4 were constructed with plug flow capability (i.e., three zones inside each basin), there is potential for the application of anoxic conditions inside the first zone (anoxic meaning a DO concentration of near zero and denitrification happening inside the tank). This would be possible by installing a mixer in the first zone and by installing a submersible internal mixed liquor recycle (IMLR) pipe, which returns basin nitrate-rich effluent MLSS back into the anoxic zone for denitrification.

Figure 3-7 shows the southern portion of aeration basins 3 and 4 from the center walkway.

**Figure 3-7. Aeration basins 3 and 4 from the center walkway**

### 3.4.2 Blowers and Diffusers

There are two 160-hp (2,400 SCFM) turbo blowers and one 125-hp (2,100 SCFM) centrifugal blower supplying the aeration basins. The total capacity of the two turbo blowers is 4,800 SCFM. The older centrifugal blower airflow is about 2,100 SCFM.

Current facility process modeling indicates that the facility requires an average airflow of about 2,450 SCFM and a peak day airflow of about 4,330 SCFM. This is a peak-to-average airflow ratio of 1.76. The current modeling was conducted assuming an incoming BOD load of about 2,350 lbs BOD/d (recent trends during 2021 were higher than this value). The modeling also assumes standard influent values for total Kjeldahl nitrogen (TKN) and NO2+NO3-N (40 mg/L TKN and 0 mg/L NO2+NO3-N). Historical NH3-N from 2019-2021 were used.

The Ketchum / SVWSD WRF monitors influent NH3-N weekly to ensure operational efficiency in the aeration basins and blowers. The original design concept for the aeration basin blower building was five 125-hp blowers each capable of 1,800 SCFM, with one of the five blowers on standby. The building was constructed in 1984, when centrifugal blowers were the technology of choice. It was not realized at the time that more efficient aeration technologies would increase in size. Since the RAS pump variable frequency drives (VFDs) and electrical equipment are also on the first floor of the blower building, there is even less space than originally intended.

The WRF switched to turbo blowers in 2014 for increased energy efficiency inherent to turbo blowers when compared to standard blowers. The turbo blowers are approximately 10 years old. One of the two 160-hp turbo blowers has recently failed and requires repair or replacement. There is currently no redundancy for aeration with only one turbo and one smaller centrifugal blower. As the temperatures continue to rise into the summer of 2022, more air will be required. Comparison of repair versus purchase of a new larger blower showed the new blower cost was about double. The

WRF decided to repair the failed turbo blower due to delivery time issues related to blower purchase and electrical modifications for a new larger blower. The repair will be completed before the summer 2022 to meet warm-weather peak air demands.

The two turbo blowers and one old 125 hp blower can be seen in Figure 3-8.


**Figure 3-8. Aeration basin blower room**

## 3.4.3 Clarifiers

Both clarifiers use suction header-type mechanisms. This style of mechanism has a rotating rake arm at the water surface to remove any scum buildup from the clarifier surface. There is also a rotating arm at the clarifier floor with pumped suction ports to remove settled solids from the clarifiers. Clarifier 1 can be seen in Figure 3-9**Error! Reference source not found.**.

**Figure 3-9. Clarifier 1 interior**

The mixed liquor from the aeration basins is routed to one of two clarifiers. Clarifiers 1 and 2 are a 90-foot diameter tank and a 75-foot diameter tank, respectively. During low flows (less than 1.8 MGD) flow is sent to clarifier 2. Flows between 1.8 and 2.6 MGD are sent to clarifier 1 and flows that are greater than 2.6 MGD are sent to both clarifiers. One of the limiting criteria for clarifiers is the surface overflow rate (SOR) at peak hourly flow (GPD/SF). The design value for extended aeration activated sludge is 900 GPD/sf[20]. Peak hourly flow for clarifier 1 is 5.7 MGD and clarifier 2 is 4.0 MGD. The capacities for each clarifier satisfy peak day flow rates.

The other design criterion for a clarifier is a solids loading rate (SLR) of less than 35 pounds per day per square foot (lbs/d/sf). Assuming 4,000 mg/L and a RAS rate of 70 percent, the following loading conditions shown in Table 3-6 apply to current loading conditions.

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[20] Health Research, Inc. (n.d.). *Recommended Standards for Wastewater Facilities, 2014 Edition*. Retrieved March 14, 2022, from https://www.broward.org/WaterServices/Engineering/Documents/WWSTenStateStandardsWastewater.pdf

**Table 3-6. Clarifier solids loading conditions**

| Parameters | Clarifier 1 | Clarifier 2 | Clarifier 1 & Clarifier 2 |
|---|---|---|---|
| Diameter (ft) | 90 | 75 | - |
| Surface Area (sf) | 6,362 | 4,418 | 10,780 |
| MLSS (mg/L) | 4,000 | 4,000 | 4,000 |
| Solids Loading Rate (lbs/sf/d) | 18.7 | 18.7 | 18.7 |
| RAS Rate | 70% | 70% | 70% |
| Hydraulic Loading Rate (GPD/sf) | 560 | 560 | 560 |
| Peak Day Flow Rate (MGD) | 3.56 | 2.47 | 6.04 |
| Max Peak Hour (GPD/sf) | 900 | 900 | 900 |
| Max Peak SLR (lbs/sf/d) | 35 | 35 | 35 |
| Hydraulic Capacity (MGD) | 5.73 | 3.98 | 9.70 |
| MLSS Capacity (mg/L) | 8,753 | 6,078 | 14,831 |

ft=feet; sf=square feet; mg/L=milligrams per liter; lbs/sf/d=pounds per square foot per day; RAS=return-activated sludge; MGD=million gallons per day; GPD/sf=gallons per day per square foot

Clarifier 1 was constructed in 2000. The floor and mechanism of clarifier 2 were replaced in 2007. At current wastewater characteristics, the clarifiers provide an acceptable level of solids removal for planning period conditions. However, the exterior of the dome on clarifier 1 requires repair and the heating systems should be replaced due to corrosion.

### 3.4.4 RAS,WAS, and Scum Pumping

There are three 20-year-old, 25-hp RAS pumps. The pumps have rated capacity ranging from 520 to 1,560 GPM. Assuming that one of the RAS pumps is offline, the remaining RAS capacity is 3,120 GPM (4.49 MGD). This capacity is adequate to meet planning period flow conditions (assuming RAS flow equals peak month flow).

The WAS solids are primarily wasted off the RAS pump discharge pipe. A progressive cavity pump, operating at a variable speed, effectively wastes solids to the aerobic digester. Scum from the two clarifiers is pumped to the aerobic digester using hose pumps located in the basement of the blower building.

The hose scum pumps were installed in 2008. Hose pumps require little maintenance, have a minimal footprint, and easily pump scum or sludge.

The RAS and WAS pumping room can be seen in Figure 3-10**Error! Reference source not found.**.


**Figure 3-10. RAS and WAS pumping room**

# 3.5 Tertiary Treatment

One of the requirements of the NPDES discharge permit is that effluent phosphorus be less than 9.9 lbs TP/day (approximately 1.0 mg/L at current average annual flow). At the Ketchum / SVWSD WRF, phosphorus is removed by dosing with alum. The alum forms a precipitant with phosphorus that settles with the rest of the activated sludge in the clarifiers and is wasted with WAS. To increase the settling characteristics of the precipitant, a polymer is also added.

## 3.5.1 Alum Feed

A 7,000-gallon alum storage tank (working volume 6,000 gallons) and two 56-gallon-per-hour (GPH) alum feed pump make up the alum feed system. The operators dose alum at approximately 60 to 80 mg/L (same as parts per million [ppm]) to remove phosphorus to the desired treatment level. As the flows and loads to the WRF increase, it will be important to readjust the alum dose to remove the additional phosphorus that will be entering the plant. The alum storage tank has a capacity for about 3 months of operation at average annual conditions and the pump needs to operate at approximately 2.5 to 4 GPH (60 to 100 gallons per day [GPD]) to deliver the correct dose.

## 3.5.2 Polymer Feed

A polymer blending unit (1.0-GPH feed pump) feeds polymer into the clarifier splitter box to improve settling in the clarifier. A second polymer blending unit (1.0-GPH pump) is designed for polymer application prior to the filters. At present, the filters do not require the addition of polymer to meet treatment TSS goals; however, the pumps are designed to provide redundancy in case one pump must be taken offline. The 2021 annual average polymer feed concentration is 2.34 ppm for solids flocculation (and subsequent improved phosphorus removal). This equates to a polymer usage rate of 27 lbs/d. Polymer is supplied in 275-gallon totes.

Improvements 15 years ago provided a polymer dilution system to create a 0.5 – 1.0 percent solution. The polymer dilution system was over-sized and performed poorly so the polymer was fed directly into the plant directly into the clarifier splitter box from the totes.

### 3.5.3 Effluent Pump Station

The original plant hydraulics discharged activated sludge treated effluent to a chlorine contact tank and the river. The chlorination/dichlorination disinfection system was replaced in 2004 with UV disinfection. Plant hydraulics could not fit the UV disinfection into the flow stream without lifting the treated wastewater for the final treatment steps, so a final effluent pump station was required. Two submersible pumps at 2,700 GPM each and one submersible pump at 2,205 GPM, lift the secondary clarifier effluent for the final filtration and UV disinfection treatment.

### 3.5.4 Filtration

In 2007, AquaDisk cloth media filters were installed at the WRF. Cloth media filters are a tertiary treatment technology used to meet the TMDL limits for TSS and have a secondary benefit of TP removal. The filter is Aqua-Aerobic's PA2-13 media, which is formed around disks and is made of nylon and polyester with a 10-micron (µm) nominal pore size.

The water is filtered by gravity over the influent weir into the main tank that houses the filter disks. Filtered water flows "into" the disks where it enters a pipe located along the filter disk shaft. The pipe delivers water to the effluent box and out of the unit.

The filters consist of three 10-disk units and were designed for a peak hourly flow of 7.74 MGD. Each filter unit has an area of 538 sf and a design hydraulic loading of 5 GPM/sf. The filters are adequately designed to meet plant buildout loads and do not need to be replaced before the end of the planning period (in 2042) but will require replacement prior to plant buildout. The filtration system diagram can be seen in Figure 3-11.

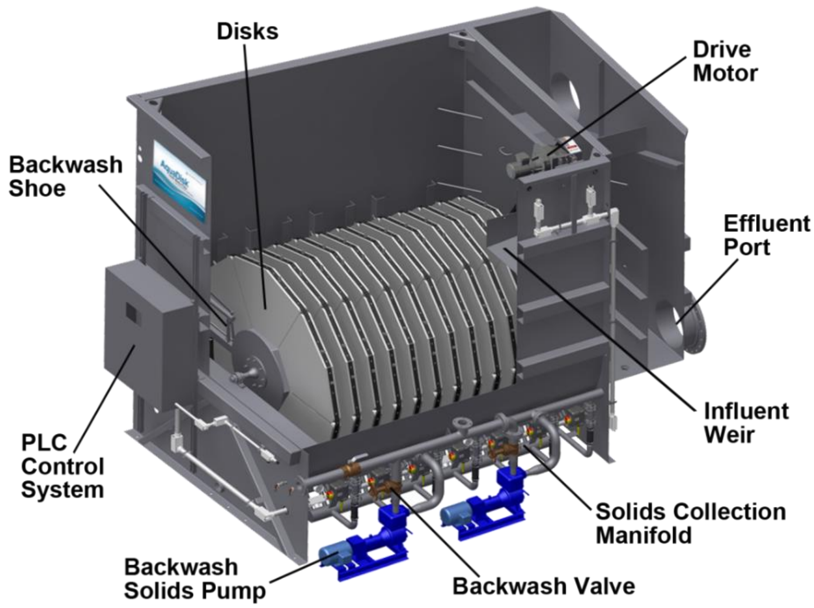


**Figure 3-11. Cloth media filter system**

The backwash pumps have had cavitation issues recently due to excessive suction vacuum. This is likely attributed to the filter media style and backwash shoe nozzle plates. The PA2-13 media currently in use is the “type 1” non-open back style. Along with the existing 10-millimeter (mm) nozzle plates, the non-open back media does not see sufficient backwash velocity to clean the media. It is also not resistant to free chlorine so the cloths cannot be chemically cleaned easily. The WRF is in the process of switching to the PES-14 filter media and 8-mm nozzle plates, which has a 5-µm nominal pore size and is chlorine resistant. The new media will be “type 2”, which is open back style. The combination of the new filter media backing and smaller nozzle plates should clean the media more efficiently and reduce suction vacuum in the backwash pumps.

The filter programmable logic controller (PLC) panels will not last the duration of the planning period. Because of the aging of the electronics in the panels, they will no longer be serviceable soon. The PLCs will need to be replaced within the next 2 to 3 years.

### 3.5.5 Disinfection

The plant uses a UV disinfection with low-pressure, high-intensity lamp system (LP-HI). The system includes Wedeco TAK-55 low-pressure/high-intensity open-channel units, consisting of two channels with three UV banks per channel. Each bank contains four modules with eight lamps per module.

The system was designed around a two-channel system with two banks operating (one redundant bank per channel). The unit is designed to handle a flow of 7.3 MGD with two banks in service in each channel. The UV system was added approximately 15 years ago and can be seen in Figure 3-12.


**Figure 3-12. UV disinfection system**

The regular servicing of the system is to replace the lamps every 14,000 hours, or approximately once every year and a half with continuous use. Ballasts should be replaced approximately once every 2 years.

## 3.6 Outfall

There is a 24-inch Palmer-Bowlus Flume after the UV disinfection system, and before the outfall, that measures the plant effluent flow rate. The current outfall is a single 24-inch pipe that discharges into Big Wood River. The river shifted in 2006, blocking the outfall with river cobble. This required excavation to uncover the outlet and restore flow mixing of discharge with river water. It is likely that the outfall will be blocked again when flood-stage flows alter the stream channel. This will require regular maintenance and it is recommended that it is budgeted to be done every 10 years. The outfall flume is adequately sized to handle flows through the planning period.

## 3.7 Reuse Water System

The Elkhorn golf course in the Elkhorn Springs area southeast of Ketchum has 118 acres of land using WRF reuse water for irrigation. The Weyyakin Subdivision includes 44 acres of residential lawns and commons areas and a 22 acre of horse pasture using WRF reuse water for irrigation. The two areas irrigated with the Class A reuse water are shown in Figure 3-16.

### Treatment Requirements for Class A Reuse

A reuse permit was issued by DEQ in March 2009 and can be seen in Appendix B. The permit allows the WRF to irrigate lawns on the WRF property, the Weyyakin Subdivision, and the Elkhorn Golf Course with Class A reuse water. Class A reuse water demands a high standard of treatment, as well as full redundancy of plant treatment units. It also has more stringent disinfection standards than the National Pollutant Discharge Elimination System (NPDES) permit that the plant currently abides by.

The water reuse program employed by the WRF has seen tremendous success. At times almost 100 percent of the plant's effluent is being directed to reuse, as the effluent flow is lower than the daily reuse water demand. Although the normal monthly usage is about 75 percent.

The Ketchum / SVWSD WRF currently sends its reuse water to the Weyyakin Subdivision, Weyyakin pastures, and the Elkhorn Golf Course. The facility's UV disinfection system has been approved by DEQ to produce Class A reuse water with flows up to 3.1 million gallons per day (MGD), which is below the projected current peak hour flows. If the WRF have instantaneous flow rates through the UV disinfection system that exceeds this limit, effluent reuse is discontinued and discharge is routed to the Big Wood River.

For reuse water to be considered Class A, it must be treated and oxidized, filtered, and subsequently disinfected. The activated sludge process satisfies the oxidized requirement and the cloth media filters satisfy the filtration. The UV disinfection at the WRF is a Wedeco TAK-55 low-pressure/high-intensity open-channel units, consisting of two channels with three UV banks per channel. Each bank contains four modules with eight lamps per module.

National Water Research Institute (NWRI) guidelines require a design UV dose of at least 100 millijoules per square centimeter (mJ/cm$^2$) and a filtered effluent UV transmittance of 55 percent or greater at 254 nanometers (nm) when using non-membrane filtration (such as the AquaDisk cloth filters) as part of the treatment process upstream of UV disinfection (the UV transmittance has consistently been greater than 75 percent, which improves the effective dose). The WRF underwent UV disinfection validation about 10 years ago to approve the current reactor system rather than upgrading the complete system for Class A reuse.

Chlorine disinfection is currently used as a microbial growth deterrent downstream of the UV disinfection system. The chlorinated effluent is transferred through a 12-inch force main approximately 0.4 miles where it is discharged to the Weyyakin Irrigation Pond and the SVWSD reuse pump station.

### Hydraulic Loading and Disinfection

Table 3-7 shows the maximum hydraulic loading for the three management units currently in service, and Figure 3-13 shows reuse water usage during the last 5 years.

**Table 3-7. Reuse Water**

| Month | Grass Turf | | GPD - Weyyakin[1] | GPD - Elkhorn GC[2] | Grass Pasture | | GPD - Weyyakin[3] | Total (GPD) |
|---|---|---|---|---|---|---|---|---|
| | Inches/ day | Gallons/ acre/day | | | Inches/ day | Gallons/ acre/day | | |
| April | 0.004 | 113 | 4,981 | 13,357 | 0.012 | 339 | 7,448 | 25,785 |
| May | 0.051 | 1,396 | 61,427 | 164,737 | 0.070 | 1,889 | 41,551 | 267,715 |
| June | 0.174 | 4,729 | 208,078 | 558,028 | 0.211 | 5,719 | 125,828 | 891,934 |
| July | 0.233 | 6,339 | 278,913 | 747,995 | 0.280 | 7,608 | 167,378 | 1,194,286 |
| August | 0.196 | 5,320 | 234,088 | 627,781 | 0.233 | 6,325 | 139,155 | 1,001,025 |
| September | 0.086 | 2,327 | 102,379 | 274,562 | 0.099 | 2,690 | 59,190 | 436,130 |
| October | 0.002 | 63 | 2,767 | 7,421 | -0.010 | -267 | -5,880 | 4,308 |

Based on precipitation deficit data from ETIdaho -- Evapotranspiration and Net Irrigation Requirements for Idaho (uidaho.edu) for Grass – Turf (lawns) – Irrigated and Grass Pasture – Low management with irrigation efficiencies of 85% and 60%, respectively.
[1] Weyyakin, 44 acres
[2] Elkhorn Golf Course, 118 acres
[3] Weyyakin, 22 acres

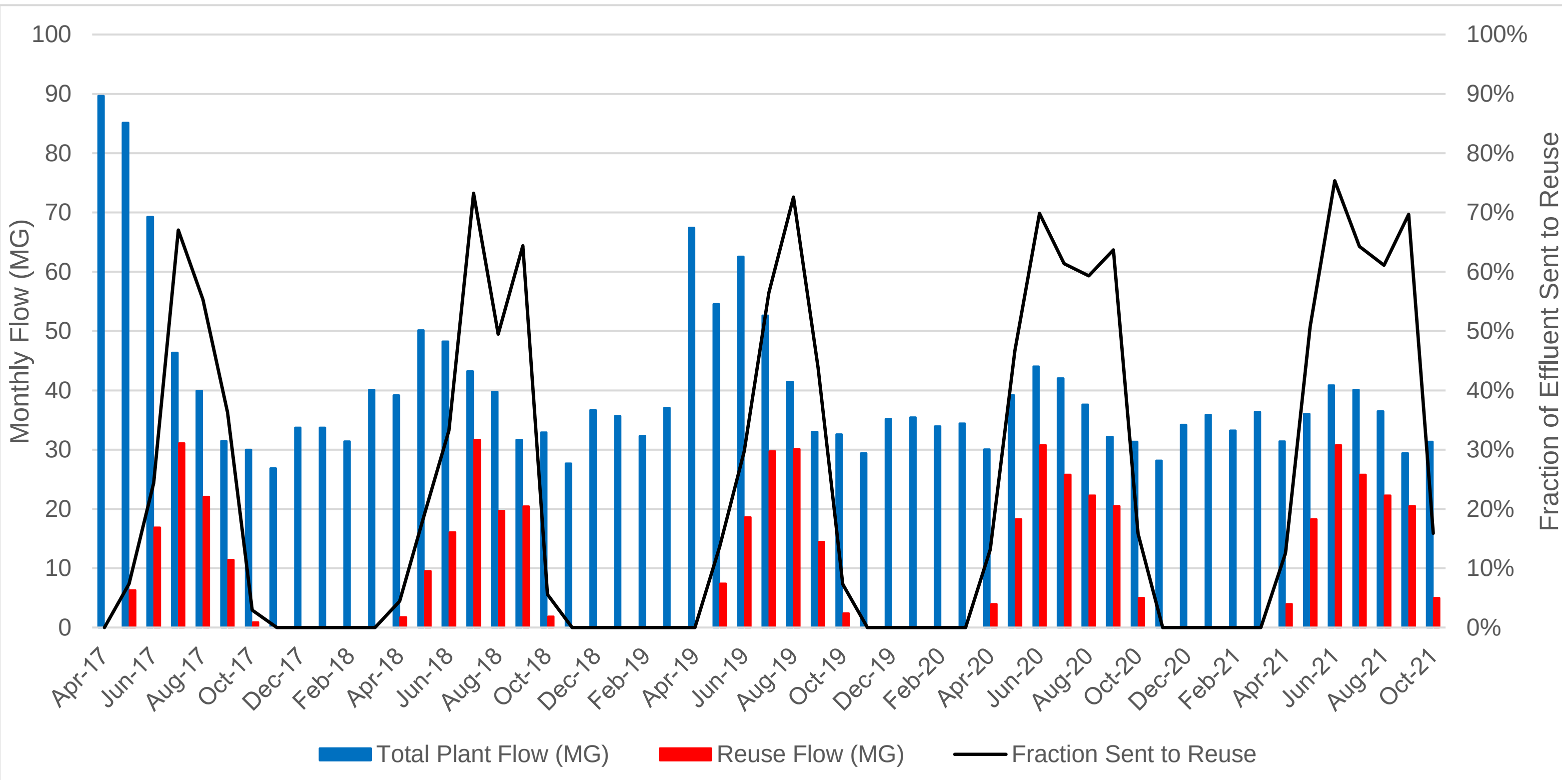


**Figure 3-13. Historical reuse water usage**

Effluent quality is tested prior to discharge for reuse. If the effluent from the system does not meet Class A requirements for turbidity (2 nephelometric turbidity units [NTU]), flow to the reuse pump station will be automatically halted and all effluent will be discharged to Big Wood River.

DEQ has validated the existing UV system to be capable of treating 3.1 MGD of effluent to Class A standards. Flows that exceed 3.1 MGD are not acceptable to be used as reuse water until the UV system is upgraded. Once flows regularly exceed this flow rate, a new disinfection system will be required. This is sufficient to reuse water up to the projected peak day flow of 3.0 MGD in 2032.

During the months where reuse water generation exceeds reuse water demands, especially in April and October, the excess reuse water is discharged to Big Wood River. In the summer months, with a higher reuse water demand for irrigation, there are days where the plant does not produce enough reuse water to satisfy the needs of Weyyakin and the Elkhorn Golf Course.

### Buffer Zone and Site Management

The buffer zones, as stated in the *Rules for the Reclamation and Reuse of Municipal and Industrial Wastewater* (IDAPA 58.01.17) and *Guidance for the Reclamation and Reuse of Municipal and Industrial Wastewater* are as follows:

- 0 ft from reuse site and inhabited dwellings
- 0 ft from reuse site and areas accessible by the public
- 0 ft from reuse site and permanent and intermittent surface water
- 0 ft from reuse site and irrigation ditches and canals
- 100 ft from reuse site and private water supply wells
- 100 ft from reuse site and public water supply wells
- Berms and other best management practices (BMPs) shall be used to protect the well head of onsite wells

In addition to the buffer zones discussed above, the facility was required to prepare several management plans for both the reuse sites as well as aspects of the wastewater treatment process.

## 3.7.1 Reuse System

The existing reuse wet well houses the three vertical turbine reuse pumps and doubles as a chlorine contact basin. Chlorine is fed into the reuse wet well to 1 mg/L, as mentioned in the Reuse Details section above.

A section view of the reuse wet well and vertical turbine pumps are shown in Figure 3-14.

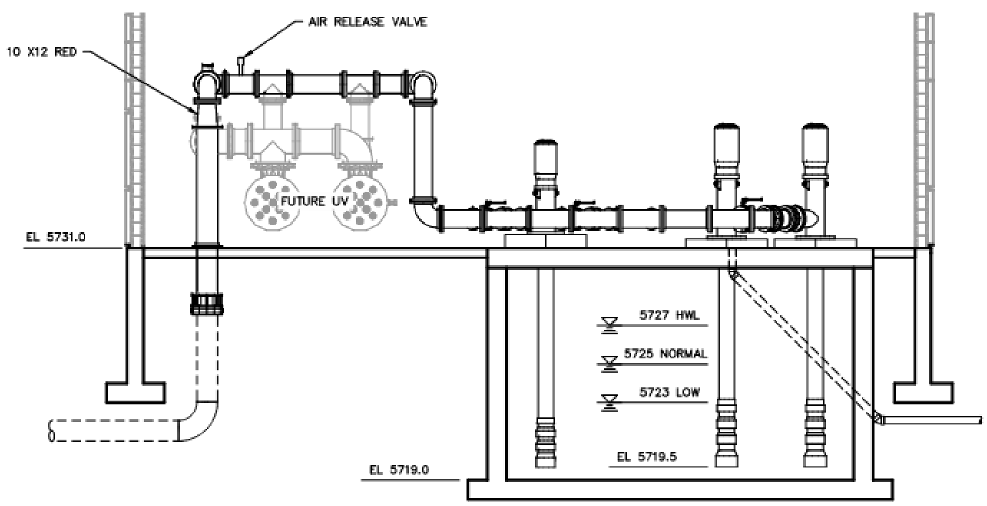


**Figure 3-14. Reuse wet well section view**

The reuse water system consists of a reuse chlorination chamber after the UV disinfection system for additional disinfection. There are two 50-hp vertical turbine pumps that are capable of 1,500 GPM and one 20-hp vertical turbine pump capable of 750 GPM..

There is 12-inch PVC pipe from the reuse pump station wet well to the edge of the plant property, 12-inch HDPE pipe from Meadow Circle to Highway 75, 12-inch HDPE pipe crossing under Highway 75, and 12-inch HDPE pipe to the splitter box in the Weyyakin pasture, for a total of approximately 1,600 feet of 12-inch pipe.

The splitter box is used to divert the flow between the Weyyakin Subdivision and the Elkhorn Golf Course. The branch line to Weyyakin flows into the pond with a storage volume of approximately 0.5 MG. The pipe is 8-inch HDPE from the splitter box to the pond. The branch line to the SVWSD pump station from the splitter box is 12-inch HDPE pipe.

The reuse water distribution system after the Weyyakin Pond for the Weyyakin Subdivision is operated and maintained by the homeowner's association for the subdivision. SVWSD operates and maintains the reuse water distribution system after the splitter box for the Elkhorn Golf Course.

Figure 3-15 shows the location of the reuse splitter box and the pipelines to both the Weyyakin Pond and the SVWSD reuse pump station.


**Figure 3-15. Location of reuse system pipeline**

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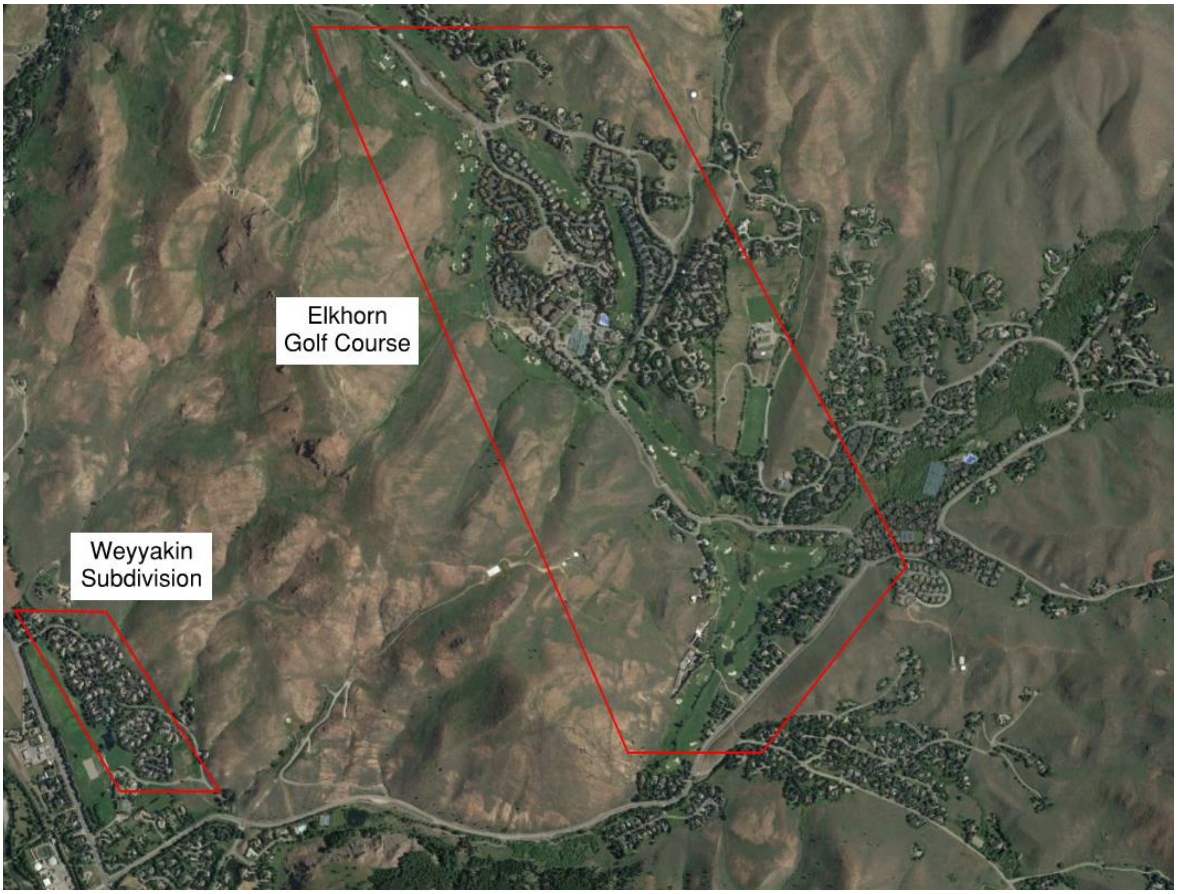



Figure 3-16. Location of the Elkhorn Golf Course and Weyyakin Subdivision

Figure 3-17. Reuse water pump room

# 3.8 Solids Handling

Table 3-8 presents a summary of WAS produced in the current system and at planning period conditions.

**Table 3-8. Biosolids production summary**

| Parameter | 2021-2022 Production | Planning Period Production (2042) |
|---|---|---|
| **Average Annual** | | |
| Total Dry Solids (lb/d) | 1,357 | 2,430 |
| Volume @ 3% Solids (gpd) | 5,425 | 10,800 |
| Volume @ 2% Solids (gpd) | 8,137 | 14,568 |
| Volume @ 1% Solids (gpd) | 16,274 | 32,400 |
| Percent Volatile Solids (%) | 70 | 70 |
| **Peak Month** | | |
| Total Dry Solids (lb/d) | 5,478 | 5,700 |
| Volume @ 3% Solids (gpd) | 21,896 | 22,800 |
| Volume @ 2% Solids (gpd) | 32,845 | 34,173 |
| Volume @ 1% Solids (gpd) | 65,689 | 68,300 |
| Percent Volatile Solids (%) | 70 | 70 |
| **Overall Production** | | |
| Annual Dry Solids Produced (tons) | 248 | 443 |

gpd=gallons per day; lbs/d=pounds per day

The current biosolids management process for the Ketchum / SVWSD WRF removes WAS by pumping to the aerobic digester. The existing aerobic digester is a square 55-foot by 55-foot tank with a maximum liquid depth of 13.3 feet (2 feet freeboard). The tank holds approximately 301,000 gallons and is aerated using fine bubble diffusers and centrifugal blowers. The digested sludge is sent to the gravity thickener, where the sludge is thickened from about 2 percent solids to about 3 percent solids before transfer to the WRF's tanker for disposal. Table 3-9 shows a brief overview of the current solids handling capabilities of the WRF.

**Table 3-9. Current solids capacity**

| Unit Process | Existing Facilities | Treatment Criteria | Existing Capacity | Remarks |
|---|---|---|---|---|
| Aerobic Digester | Number - 1<br>Volume - 301,000 gal<br>Sidewater Depth - 13.3 feet | 60d HRT at 10°C<br>0.3 lbs VSS/ft3/d<br>38% VSS destruction | 8,085 gpd (if full) | 2021 peak month 10 day HRT |
| Sludge Mix Diffusers | Type - Diffused air fine-bubble membranes | Dissolved oxygen > 2 mg/L | 2,050 SCFM | Installed in year 2000. |
| Sludge Mix Blowers | Number - 2<br>Size - 100 hp, 1,600 SCFM | Design Air Requirement: 37 cfm / 1,000 ft3 | 1,600 SCFM with one blower out of service. | Design required air (for full digester): 1,600 SCFM |
| Gravity Thickener | Number - 1<br>Diameter - 30 feet<br>Volume - 67,700 gal<br>Area - 707 sf | 10 lb/sf/d for digested WAS | 7,070 lbs/d<br>Current solids loading averages 17 lbs/d (11,850 lbs/batch) | Thickener is run in batch mode- operates adequately. Buildout peak month: 5,700 lbs TSS/d |
| Thickened Sludge Pump | Number - 1<br>Type - PD<br>Piston Size - 5 hp, 200 GPM @ 35 feet TDH | Transfer thickened solids to truck within reasonable time period | Requires 3-5 hrs of operation to transfer one week of current solids production at 3% | No redundancy |
| Ohio Gulch Drying Beds | Lined Cells - 6<br>Size - 2.65 ac, 1.85 ac, 1.57 ac, 1.33 ac, 1.20 ac, 1.16 ac<br>Total - 9.76 ac | Maximum sludge depth: 8 inches<br>Net evaporation: 30 inches per year | 6,800 GPD (avg.) @ 2.5% solids. 1.5 cells dedicated. Load one cell per year, other cell dries for year. | Drying beds are shared with City of Hailey, City of Bellevue, and The Meadows LLC. |

gal=gallons; HRT=hydraulic retention time; °C=degrees Celsius; VSS=volatile suspended solids; lbs/$ft^3$/d=pounds per cubic foot per day; gpd=gallons per day; SCFM=standard cubic feet per minute; mg/L=milligrams per liter; $ft^3$=cubic feet; sf=square feet; WAS=waste-activated sludge; TSS=total suspended solids; GPM=gallons per minute; ac=acre; D.O.=dissolved oxygen; lbs/sf/d=pounds per square foot per day; ac=acres

## 3.8.1 Biosolids Handling and End-Uses

The WRF's biosolids handling system provides a large amount of operational flexibility. Currently, the WRF wastes directly to the digester and thickens solids prior to hauling. Figure 3-18 outlines the solids handling system with all possible operational conditions.

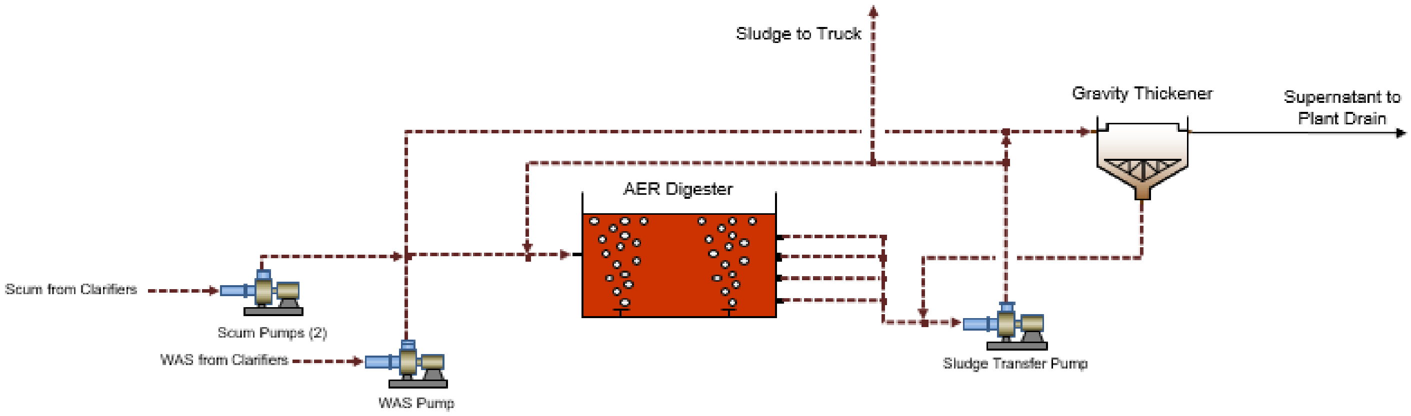



**Figure 3-18. Current solids handling schematic**

Hauling occurred approximately 3 to 5 times per week from January 2021 through mid-September 2021. After mid-September, hauling decreased to 1 to 3 times per week, attributed to both lower WAS flows and wintertime conditions. The operators generally hauled three tanker loads per day.

**Table 3-10. Summary of estimated 2021 biosolids hauling**

| Hauling Frequency | Average Month | | | Peak Month | | |
|---|---|---|---|---|---|---|
| | Level Removed (inches) | Tanker loads (5,700 gal/load) | Volume (gal)[1] | Level Removed (inches) | Tanker loads (5,700 gal/load) | Volume (gal)[1] |
| Daily | 2.9 | 1.0 | 5,498 | 12.8 | 4.2 | 24,150 |
| Every Two Days | 5.8 | 1.9 | 10,995 | 25.6 | 8.5 | 48,300 |
| Every Three Days | 8.8 | 2.9 | 16,493 | 38.5 | 12.7 | 72,450 |
| Every Four Days | 11.7 | 3.9 | 21,990 | 51.3 | 16.9 | 96,600 |

[1] Hauled at approximately 3% solids

## 3.8.2 Aerobic Digester

The existing digester provides 301,000 gallons of capacity for aerobically digesting and storing WAS and scum. Sludge was typically wasted at a concentration of approximately 20,000 mg/L, or 2 percent solids, during 2021. At this concentration the digester provided a hydraulic retention time (HRT) of approximately 40 days at average annual production. However, the digester provided an HRT of only approximately 10 days at peak month production.

The WRF currently operates the digester at less than full volume to allow space for foaming and to provide hauling flexibility. Normally, the level is maintained at less than 10 feet (4 feet freeboard). Winter operations strive to keep the level lower for hauling flexibility in case of poor road conditions.

Past Planning Studies have suggested building additional digestion capacity when an HRT of about 25 days at peak month generation was met. This hydraulic retention time was set to reduce volatile suspended solids (VSS) thereby producing solids with less potential for odors in the drying beds.

The peak month WAS rate for this condition was 12,800 GPD (2009). The plant peak month WAS rate was 24,150 GPD in December 2020 and January 2021, providing a digester HRT of about 13 days. With the existing tank and this load, 12.8 inches must be removed daily and sent to the drying beds, or 25.6 inches every two days, or 38.5 inches every four days, etc.

### 3.8.3 Digester Blowers

The aeration system consists of two centrifugal blowers and grids of fine bubble membrane diffusers covering the digester basin floor. New aerobic digesters will use similar fine bubble diffusers. The current system consists of two 100-hp blowers capable of 1,600 SCFM each. The digester blowers can be seen in Figure 3-19. The HSi turbo blower in the foreground of Figure 3-19 failed and was not replaced.


**Figure 3-19. Digester blower room**

The aeration system is adequately sized for current conditions based on the minimum-required 30 SCFM per 1,000 cubic feet ($ft^3$) of digester volume[21]. The digester requires 1,300 SCFM if full, but the operators typically operate the digester at approximately 9 feet of liquid depth to provide storage flexibility for winter-weather events and excess freeboard for foaming. The digester requires approximately 820 SCFM at this depth.

[21] Health Research, Inc. (n.d.). *Recommended Standards for Wastewater Facilities, 2014 Edition*. Retrieved March 14, 2022, from https://www.broward.org/WaterServices/Engineering/Documents/WWSTenStateStandardsWastewater.pdf

### 3.8.4 Biosolids Transfer Pump

The current transfer pump is a positive displacement double-diaphragm pump that pumps solids at 200 GPM (288,000 GPD). This rate is acceptable; however, the pump is 10 years old and diaphragm replacement is an on-going maintenance activity. In this location, the transfer pump has a large suction head required and this makes it a challenge to use other types of pumps. An option to address this concern is to place the pump in a basement to lower the transfer pump to reduce the suction head. This could be done concurrent with dewatering upgrades. A picture of the existing transfer building and pump is shown in Figure 3-20**Error! Reference source not found.**.

**Figure 3-20. Biosolids transfer pump room**

### 3.8.5 Gravity Sludge Thickener

The gravity sludge thickener aids in further separation of water from the biosolids. If used to directly receive WAS prior to digestion in the gravity sludge thickener (GST), input is at 0.75 to 1.0 percent solids and discharges at about 2 percent solids. When used after digestion the GST thickens solids to a concentration of about 2.5 to 3 percent. This second mode of operation is currently used. Thickening of WAS to about 2 to 3 percent is the normal limit of the gravity biosolids thickening process. The digested/thickened solids are discharged to the tanker for hauling.

The sludge thickener is currently over 30 years old. The mechanism of the thickener is corroded. The other downside to GST is the holding time for settling creates anaerobic conditions in the liquid and odors. Due to age and process limitations, the GST should be removed from service and replaced with current technology.

### 3.8.6 Biosolids Disposal

#### Landfilling

Current biosolids disposal for the Ketchum / SVWSD WRF consist of hauling the liquid solids to the Ohio Gulch Transfer Station for drying bed dewatering. The beds are shared with Hailey, Bellevue, and Mid-Valley Sewer. Blaine County has dedicated six sludge drying beds  where the biosolids are stored for about 12 months to reach a solids content of 75 to 90 percent (the solids cannot be left in the drying beds more than 24 months or the beds are considered storage). Once the biosolids are adequately dried, they are transferred through the Ohio Gulch trash transfer station to the Milner Butte Landfill near Burley, Idaho. The landfill requires the solids to meet the paint-filter test (approximately 15 percent solids).

Since landfills charge by weight, it is most ideal from a cost perspective for the WRF to dewater biosolids to the driest possible to reduce weight. Drying solids to 75 to 90 percent using sludge drying beds keeps the disposal cost as low as possible. This method of disposal is a viable method currently and into the future. Although the agreement with Blaine County to continue using the landfill drying beds requires renewal.

#### Composting

Biosolids disposal via composting is an alternative that is currently being pilot tested using a local composter, Winn's Compost. Winn's has moved some of the WRF's dried biosolids to the nearby composting site for blending with green waste. Likewise, the City of Hailey has directly delivered dewatered biosolids to Winn's facility for combining with woody waste and composted in windrows. Composting is a disposal method that achieves compliance with regulations by maintaining high temperatures (131 °F.) for extended period of time (3 to 15 days) to remove pathogens and stabilize the organics. The nature of creating compost adequately addresses constituent and vector attraction destruction. The compost is considered Class A, Exceptional Quality (EQ) upon passing tests showing low bacteria counts and metals content. Once the Class A, EQ criteria is satisfied, the compost can be used without restriction.

The compost pilot study being performed by Winn's Compost has been showing that mechanically dewatered biosolids compost more effectively than liquid or solar dried biosolids. Solids dried at Ohio Gulch are too dry to be used for composting, while the biosolids hauled at 3 percent has too much water for windrow composting. Winn's Compost has found that the Hailey biosolids concentration at around 15 percent has composted very well with temperatures easily meeting Class A EQ. The City of Hailey's Woodside WRF dewaters their biosolids to using a screw press. The primary concern for the Ketchum / SVWSD WRF moving towards biosolids disposal via composting is the lack of similar dewatering capabilities.

#### Land Application

Biosolids disposal via land application is very similar to composting in that the treatment processes produce a salable end-use product to be used to supplement crops with nutrients. The land application sites are highly regulated and require extensive monitoring. To avoid disruption and have a stable long-term disposal outlet, dedicated fields are normally owned by the city. The availability of fields without extensive trucking does not exist. Secondarily, the Ketchum / SVWSD WRF currently does not have sufficient digester capacity and dewatering capabilities to produce reuse-quality biosolids. Future upgrades may make this alternative possible.

## 3.9 Electrical and Controls

### 3.9.1 Electrical

The WRF is primary metered and is served from Idaho Power under the Large General Service Schedule Rate 9P tariff. Idaho Power supplies 12,470-volt (V) electrical power to the Ketchum-owned 2,500-kVA transformer located adjacent to the Operations Building. This transformer supplies main switchgear in the Operations Building main electrical room via 2,500-amp service. The main switchgear service entrance consists of an integral automatic transfer system via the switchgear power circuit breakers that provide automatic transfer switching between the Idaho Power source and a 700-kW legally required standby engine-generator that provides standby power to the entire plant.

The main switchgear is rated 3000-amps and services the entire plant via three distribution feeders as follows:

- Feeder 1 (1000-amp) – Serves MCC-2 located in the Aeration Blower Building. MCC-2 contains motor starters (no VFD’s) and fused switches. MCC-2 provides feeders to three externally mounted VFD’s for the Return Sludge Pumps.
- Feeder 2 (800-amp) – Serves MCC-3 in the Digester Blower Building. MCC-3 contains motor starters (no VFD’s) and circuit breakers. MCC-3 provides feeders to three externally mounted VFD’s for the Digester Blowers.
- Feeder 3 (1200-amp) – Services MCC-4 in the main electrical room. MCC-4 contains motor starters (no VFD’s) and circuit breakers. MCC-4 provides feeders to eight externally mounted VFD’s for UV Feed Pumps, Influent Pumps, and Headworks Filter Fans.
- There is space in the main switchgear for an additional circuit breaker to address future load growth.

The City provided 2 years of metering data (2019-2020) in 2021. From review of this data the plant peak electrical demand is approximately 350-kW. Plant peak electrical demand has a direct correlation to BOD and plant flow to a lesser extent. The peak electrical demand is anticipated to increase to approximately 500-kW by 2042.

Electrical system elements are required to be reliable, available, maintainable, and safe to meet the EPA and IDAPA reliability requirements. To meet these requirements, there needs to be a systematic process to maintain both the individual equipment components and the electrical equipment system. Wastewater facility electrical equipment require replacement due to degraded condition (i.e. corrosion, etc.), renovation to address plant evolution needs (i.e. increased process equipment sizing, electric utility short circuit current changes, etc.), or to manage equipment obsolescence. General guidelines for electrical asset life cycle are as follows:

- Power transformer (installed in 2004): 30-40 years; however, some transformers that are regularly tested/maintained and are not heavily loaded can last 50-60 years.
- Switchgear (installed in 2004): 35-40 years
- Engine-Generator (installed in 2004): Life expectancy is dependent on preventative maintenance practices and the number of running hours per year. The Ketchum WRF generator likely has a lifespan of 20-25 years.
- MCC’s (MCC-2 installed in 1984, MCC-3 installed in 1998, and MCC-4 installed in 2004): 30-35 years.
- Variable Frequency Drives (VFD’s): 10-15 years. The Headworks VFD’s were installed in 2019; however, the age of the other WRF VFD’s are presently unknown.

The electrical equipment at the Ketchum WRF is well maintained and the condition is generally good. However, the asset life of the generator, MCC’s, and VFD’s will need to be addressed within the 2042 planning period.

### 3.9.2 Controls

The original equipment manufacturer (OEM) for the Ketchum WRF SCADA control platform is Rockwell Automation. The SCADA control platform is distributed across the project site at eight locations and uses the 1756 ControlLogix PLC platform which was installed between 2018 and 2019.

Four PLC controllers are connected to the Operations Building Control Panel managed Ethernet switch and located in the following control panels:

- Operations Building Control Panel
- Reuse Building Control Panel
- UV Building Control Panel
- Digester Blower Building Control Panel

The Operation Building Control Panel managed Ethernet switch also connects to the Aeration Blower Building Control Panel managed Ethernet switch. Two PLC controllers are connected to the Aeration Blower Building Control Panel managed Ethernet switch and located in the following control panels:

- Aeration Blower Building Control Panel
- Alum Building Control Panel

The Aeration Blower Building Control Panel managed Ethernet switch also connects to the Grit Building Control Panel managed Ethernet switch. Two PLC controllers are connected to the Grit Building Control Panel managed Ethernet switch and located in the following control panels:

- Grit Building Control Panel
- Headworks Control Panel

One of the biggest challenges associated with all digital control systems (e.g., SCADA, VFDs, etc.) is technological obsolescence in parts, services, and resources when they are no longer provided by the original equipment manufacturer (OEM), even though the equipment may still be in working order. The costs for maintenance, repairs, and replacements often skyrocket when using obsolete parts, services, or resources. These costs often result from challenges associated with customization, user licenses, data migration, user training, integrating third-party systems, replacement parts, software and firmware maintenance and support, integrations, electronic security, and added emergency response associated downtime.

Technological obsolescence typically occurs when:

- The OEM either only offers and supports new equipment/services, or the OEM goes out of business.
- The details of how a custom system works is no longer understood – the original developer has moved on (i.e., retired, changed companies, etc.).
- When software (including security software) is updated to a new iteration where it reduces its overall relevance or utility with legacy systems. Updates like this can range from almost undetectable, to annoying, to seriously damaging to operations.

The technology lifecycle for most digital control systems is generally 7 to 10 years, so managing it is an endless process. Technology that is left running too long without a migration path complicates future upgrades. Technology obsolescence is a problem for nearly every organization and municipality, as the process to address it includes proactive near-term plans to migrate and modernize platforms and long-term plans to stay ahead of the ongoing obsolescence curve.

# 4 Liquid Stream Upgrades and Reuse

## 4.1 Introduction

Section 3 discussed the current capacity and condition of the WRF, including several areas of the plant that need upgrades. This section further defines the problems at each location and discusses upgrade options/solutions. Cost estimates and an improvements schedule are also included. For cost estimate details, see Appendix D. Table 4-1 shows the estimated planning period flows and loads that are used to determine the needed future capacity of the plant.

**Table 4-1. Planning period (2042) flows and loads summary**

| Parameter | Average Annual | Peak Month | Peak Day | Peak Hour |
|---|---|---|---|---|
| Flow (MGD) | 1.73 | 2.57 | 3.47 | 5.96 |
| BOD (lbs/d) | 3,890 | 5,760 | 7,750 | 13,330 |
| TSS (lbs/d) | 2,900 | 4,300 | 5,780 | 9,950 |
| TP (lbs/d) | 58 | 86 | 120 | 200 |
| TKN (lbs/d) | 580 | 860 | 1,160 | 1,990 |

BOD=biochemical oxygen demand; TSS=total suspended solids; TP=total phosphorus; TKN=total Kjeldahl nitrogen; MGD=million gallons per day; lbs/d=pounds per day

The cost estimates outlined in Chapters 4 and Chapter 5 are presented in 2022 dollars. Cost escalations to the year of construction (inflation) are presented separately in Chapter 7. These capital costs include estimates of electrical, instrumentation/controls, sales tax, contractor fee, contractor overhead, contractor bonds and insurance, contingency, and engineering. The annualized costs are based on a 20-year period and an assumed inflation rate of 3.0 percent.

Improvements are assumed to be funded by user rates with revenue generated to balance costs within the 20-year planning period. Borrowing may be required to bridge revenue gaps within the planning period. Current interest rates for loans from State Revolving Programs or United States Department of Agriculture – Rural Development (USDA-RD) are about 2.5 percent. Details concerning implementation schedule and user rates are further discussed in Chapter 7.

## 4.2 Pumps

All pumps will require replacement by the end of the 20-year planning period. When replaced, the pump capacity will be increased (if necessary) to convey peak hourly flow. Given that the pumps within the facility vary widely in condition, this FPS will not determine when each specific pump group should be replaced. Instead, this FPS estimates the cost to replace all pumps, in 2022 dollars, and divides the cost evenly among replacements in years 5, 10, 15, and 20. Facility operators should drive what groups of pumps are upgraded in each window. For example, the effluent pumps require excessive maintenance and should be upgraded soon. Table 4-2 outlines the costs to replace the process pumps at the Ketchum / SVWSD WRF.

**Table 4-2. Pump upgrades cost estimation**

| Parameter | Cost[1] | Annualized Cost[2] |
|---|---|---|
| Influent Pumps (3) | $177,208 | $8,860 |
| Effluent Pumps (3) | $162,025 | $8,101 |
| RAS Pumps (3) | $197,820 | $9,891 |
| WAS Pump (1) | $17,346 | $867 |
| Scum Pumps (2) | $31,565 | $1,578 |
| Plant Drain Pumps (2) | $105,218 | $5,261 |
| Alum & Polymer Pumps (2) | $63,131 | $3,157 |
| Reuse Pumps (3) | $658,687 | $32,934 |
| **Total** | $1,413,000 | $70,650 |

[1] Costs are presented in 2022 dollars and are not escalated to year of construction. Also includes contingency.
[2] Based on 20-year period and assumed 3.0% inflation rate.
RAS=return-activated sludge; WAS=waste-activated sludge

# 4.3 Headworks

The headworks consist of the influent pumps, mechanical perforated screen, and the grit removal and cleaning system. The headworks screen and screening building were replaced in 2018 and are in good condition. The grit removal system on the other hand is more than 20 years old and in need of equipment replacement and building upgrades.

Table 4-3 shows the required improvements and the associated costs for the headworks improvements during the planning period, and the following sections provide more detail about requirements of each piece of equipment and operation. The costs are broken down in detail in Appendix D.

**Table 4-3. Headworks improvements cost estimation**

| Project | Cost[1] | Annualized Cost[2] |
|---|---|---|
| Misc. Headworks Improvements | $271,000 | $13,550 |
| Grit Removal System | $1,015,000 | $50,750 |
| **Total** | $1,286,000 | $64,300 |

[1] Costs are presented in 2022 dollars and are not escalated to year of construction. Also includes contingency.
[2] Based on 20-year period and assumed 3.0% inflation rate.

## 4.3.1 Screens

The perforated screen was installed to remove stringy solids to protect downstream equipment. The mechanical perforated screen installed in 2018 is designed to pass 4.0 MGD, the peak hour flow of 6.0 MGD will pass with some flow backup into the influent flume. The backup mechanical bar screen is capable of passing 7.5 MGD. When flows consistently exceed 4.0 MGD, the upgrade will replace the screening surface with larger opening perforations to minimize backup into the flume. The upgrade is expected to be required around 2038. At this point in time the screen will be approximately 20 years old and require upgrading.

### 4.3.2 Grit Chamber, Conveyor, and Washer

The grit chamber was sized to handle up to 12 MGD, so it will be able to handle projected peak flows. The grit conveyor and washer were designed to handle 7 cf/hr of grit. Using a typical grit production value of 2 cf/MG, the plant would produce about 0.63 cf/hr at projected peak-hour flows. Therefore, the system is adequately sized to handle plant buildout conditions.

Although the chamber is adequately sized, it is around 30 years old and should be upgraded to improve operation. As previously seen in Figure 3-5, approximately 1.5 feet of grit built up in aeration basins 3 and 4 over 15 years.

Grit chambers that are drastically oversized typically struggle to remove grit effectively, which is the case at the WRF. It is recommended that a baffle system retrofit be installed to increase grit removal efficiency. The existing air lift pump used to transport the collected grit should be replaced with a grit pump.

The existing grit concentrator, conveyor, and washer can all be replaced at the same time. The WRF currently uses a grit conveyor and grit washer because using only one unit does not adequately dewater the grit. Replacing the air lift pump with a grit pump will help. Grit concentrators designed for use with air lift pumps are not as effective as grit concentrators designed for use with grit pumps. The existing grit concentrator, conveyor, and washer can be replaced with a new grit concentrator and one grit washer in about 10 years.

### 4.3.3 Odor Control

The odor control system was replaced in 2018 with the major headworks upgrades. The unit is a 2-bed carbon filter with a capacity of 5,100 cubic feet per minute (cfm). The fiberglass piping and fiberglass carbon vessel lifespan will extend well past the end of the planning period but the fans will require replacement several times. Carbon media replacement is a normal maintenance activity that occurs every 2 to 3 years.

## 4.4 Activated Sludge System

The activated sludge system basins and clarifiers are adequately sized to handle the flows and loads anticipated at the end of the planning period. The future system will be composed of four aeration basins, two clarifiers, four blowers, three RAS pumps, and two WAS pumps.

Table 4-4 shows the needed improvements and costs for the aeration basin improvements. The aeration basin upgrades are based on projects designed to create a Modified Ludzack-Ettinger (MLE) configuration for the aeration basins. The costs are broken down in detail in Appendix D.

**Table 4-4. Activated sludge system improvements cost estimation**

| Project | Cost[1] | Annualized Cost[2] |
|---|---|---|
| Aeration Basins - Anoxic and MLR (Nos. 3 & 4) | $987,000 | $49,350 |
| Aeration Basin Blower Repair | $65,000 | $3,250 |
| Aeration Basin Upgrades (Nos. 1 & 2) | $2,140,000 | $107,000 |
| Clarifier No. 1 HVAC and Roof Repair | $183,000 | $9,150 |
| Replace Existing Aeration Basin Turbo Blowers | $6,626,000 | $331,300 |
| Clarifier Mechanism No. 1 Replacement | $553,000 | $27,650 |
| Clarifier Mechanism No. 2 Replacement | $454,000 | $22,700 |
| **Total** | $11,008,000 | $550,400 |

[1] Costs are presented in 2022 dollars and are not escalated to year of construction. Also includes contingency.
[2] Based on 20-year period and assumed 3.0% inflation rate.
MLR=mixed liquor recycle; HVAC=heating, ventilation, and air conditioning

### 4.4.1 MLE Alternative

The activated sludge basins at Ketchum should be configured in a Modified Ludzack-Ettinger (MLE) process configuration to achieve improved total nitrogen removal (via denitrification) and selection of well-settling sludge.

The process configuration for MLE is shown in Figure 4-1**Error! Reference source not found.**. Zones 1, 2, and 3 refer to separate zones within each train. These zones already exist in trains 3 and 4 but would need to be added into trains 1 and 2 (part of proposed upgrades for trains 1 and 2). The first of the three zones would then remain unaerated. A mixer is proposed inside each of the up-front zones to keep MLSS in suspension. This zone would exhibit anoxic conditions, which are conditions where no DO is present but nitrates are present. An MLR pump would be installed in the end of zone 3 in order to recycle nitrates back to the anoxic zone for further denitrification.

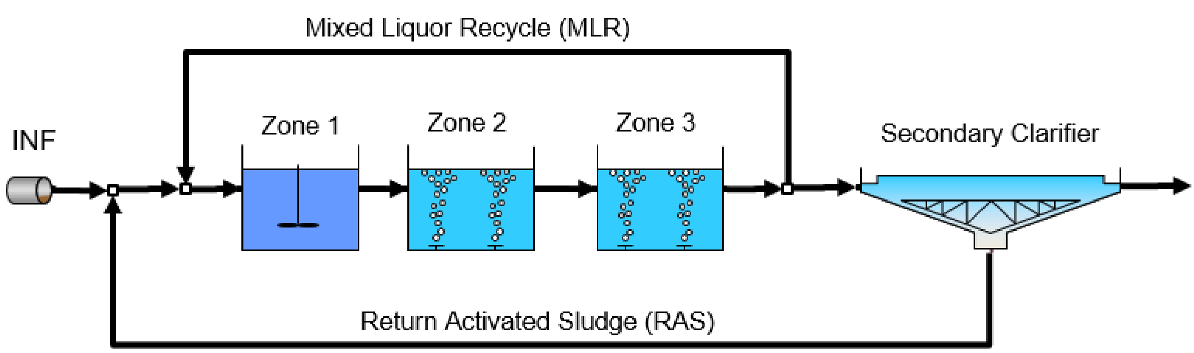



**Figure 4-1. MLE process schematic**

There are a few key benefits notable for an MLE process when compared with a simple aerobic nitrification process.

- Reduced airflow demand – the total airflow required for aerobic oxidation of BOD is diminished since a portion of incoming BOD is oxidized via the denitrification reaction, which does not require oxygen.
- Increased alkalinity in the system – when denitrification occurs, it produces alkalinity, which offsets the alkalinity depletion, which occurs during the nitrification reaction.

- Decreased sludge production – there is a small decrease in overall sludge production at a given SRT since the biological yield from BOD removal via denitrification is less than the biological yield from aerobic BOD removal.
- Selection of well-settling sludge – an anoxic zone encourages growth of specific organisms (ordinary heterotrophic organisms), which tend to exhibit better settling characteristics than a biological population without an anoxic selector.

### Estimated Process Credits

The biological process model can estimate the impact of these factors for the 2042 design conditions. It is assumed in this context that all four trains are operational since that will be the ordinary operating condition when flow and load are higher in the future.

**Table 4-5. MLE Process Comparison at 2042 conditions**

| Parameter | Unit | Full Aerobic BOD and NH3 Removal | Ludzack-Ettinger | Modified Ludzack-Ettinger (MLE) |
|---|---|---|---|---|
| Plant Flow | MGD | 1.55 | 1.55 | 1.55 |
| RAS Flow | % | 80% | 80% | 80% |
| MLR Flow | % | 0% | 0% | 200% |
| Total SRT | days | 30 | 30 | 30 |
| Aerobic SRT | days | 30 | 20 | 20 |
| MLSS | mg/L | 4,420 | 4,250 | 4,350 |
| Airflow | scfm | 1,990 | 1,540 | 1,651 |
| Effluent Total Nitrogen | mg/L | 16 | 11 | 6 |
| Effluent Ammonia | mg/L | 0.2 | 0.2 | 0.2 |
| WAS | lbs/day | 2,470 | 2,380 | 2,430 |
| Estimated Alkalinity Credit | % of Alkalinity w/out Denite | 100% | 119% | 143% |

BOD=biochemical oxygen demand; RAS=return-activated sludge; MLR=mixed liquor recycle; SRT=sludge retention time; WAS=waste-activated sludge; MGD=million gallons per day; mg/L=milligrams per liter; scfm=standard cubic feet per minute; lbs/d=pounds per day

About 20 percent airflow savings could be realized by aerating less volume and degrading carbon anoxically with an anoxic zone in the first zone of each train. Implementing an MLR system would further reduce effluent TN and provide a better settling mixed liquor. Sludge production is reduced but not significant for plant operations or solids handling processes.

The cost savings during the planning period provides a return on investment (ROI) of about 20 years at the current energy cost. The ROI will decrease as energy costs increase over the planning period. With the bonus of better settling in the clarifiers and slightly lower solids production, we recommend implementing the process change.

### Internal Mixed Liquor Recycle

The IMLR is a lever by which the nitrogen removal process could be operationally controlled to optimize plant performance. The ability of the system as a whole to remove total nitrogen depends on the IMLR rate – higher IMLR rates encourage higher TN removal rates since more nitrates are recycled back into the pre-anoxic zones. However, diminishing marginal returns are seen for the

IMLR, with higher rates resulting in DO poisoning in the anoxic zone. Figure 4-2 shows the expected relationship between effluent TN and IMLR.

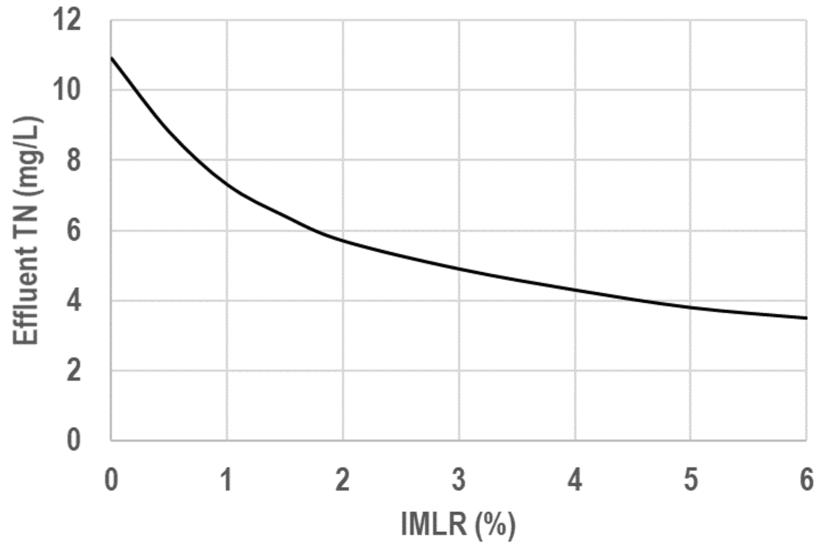



**Figure 4-2. Effect of IMLR on effluent TN**

A design incorporating an IMLR pumping system to accommodate 200 percent of incoming plant flow at max month conditions will provide a great degree of TN removal capability without excessive hydraulic designs or potential impact from recycled DO.

### 4.4.2 Aeration Basins and Diffusers

Aeration basins are the core treatment process in the WRF, providing growth conditions to allow the biomass (MLSS) to break down the soluble organics found in typical municipal waste streams. The basins at the plant were designed based on a F:M ratio of 0.10 lbs BOD/lbs MLSS, and a design SRT of approximately 15 days. The design MLSS to maintain the appropriate clarifier solids loading rate is less than 5,000 mg/L MLSS. The capacity of the aeration basins is 2.0 MG (four basins at 0.5 MG each) and meets the required volume for future plant planning conditions.

The newest aeration basins (basins 3 and 4) were constructed in 2005. These basins are baffled with two walls to create three cells in each basin. The design improves the treatment and settling characteristics of the sludge by inducing plug flow hydraulics and provides the opportunity for an initial anoxic cell. Diffusers are ceramic fine bubble diffusers provide air flow rates between 0.5 to 2.5 cfm per diffuser. The first cell has 410 diffusers installed and the second cell has 290 diffusers. The third cell is made up of 160 diffusers. Recent evaluations showed only 10 percent plugging, so they are still providing adequate aeration and mixing to the basins. Air header drops are 8-inch stainless steel (SST) pipe.

Basins 1 and 2 should be upgraded to match the plug flow characteristics by adding a similar baffle system to create three cells and a new catwalk with canopy to provide access across the basin. The baffle walls and catwalk would have the additional benefit of stabilizing the center wall in basins 1 and 2, which was not designed for one basin to be empty with the other basin full. Incorporating baffle walls in each basin will require the air manifolds and diffusers be replaced. The diffusers are over 30 years old and are no longer manufactured. Dissolved oxygen sensors are used in basins 3 and 4 in the third cell and should be mirrored in basins 1 and 2 as well. Upgrades should be completed before average flow approach 1.8 MGD since that is the approximate capacity of two basins (1.0 MG of reactor volume).

To improve biological nitrogen removal, the first cell in each basin can be converted into an anoxic environment by shutting aeration off to the first aeration cell and using mixers to maintain biological suspension without adding oxygen. This will provide the conditions for improved phosphorus uptake and establishment of bacterial denitrification. The goals are to promote denitrification that adds back oxygen and alkalinity (biologically) and improve settling characteristics of the sludge in the clarifiers. In addition to mixing, mixed liquor recycle (MLR) pumps transfer nitrate rich mixed liquor from the end of the aeration basins (cell #3) to the first cell (anoxic basin). This provides a nitrate rich environment further promoting conversion of nitrate to nitrogen gas (denitrification). Besides the oxygen and alkalinity benefit, denitrification reduces total nitrogen discharge into the river by removing most of the nitrate.

The current discharge permit does not have nitrogen limits, but the Class A reuse permit does require total nitrogen (TN)—nitrate-N + nitrite-N + TKN—be less than 30 mg/L. The 2020 annual average discharge concentration was 15.3 mg/L, with a peak month discharge concentration of 20.05 mg/L. With anoxic conditions and MLR, a TN of less than 10 mg/L is expected. Converting basins 1 and 2 into three cells each with an anoxic cell and MLR will keep the overall activated sludge system meeting reuse permit TN limits in the future.

The activated sludge process biologically removes phosphorus in the waste sludge biomass. But the original design and future design continues to rely on chemical phosphorus removal using alum to achieve the discharge limit. At daily maximum flows the phosphorus concentration will be 0.46 mg/L TP and easily achievable with the current chemical phosphorus removal system. Configuration changes discussed in section 4.4.1 (mixed liquor recycle) should promote additional phosphorus uptake (luxury uptake) in the initial anoxic zone. This in turn will reduce the chemical demand and chemical sludge in the WAS.

### 4.4.3 Blowers

Extending the future design basis to a projected 2042 BOD loading condition of 3,900 lbs/d (average annual), the process modeling indicates an expected average air demand of about 4,100 SCFM. Assuming a similar peak-to-average airflow ratio of 1.76, the maximum expected airflow air demand at the end of the planning period will be approximately 7,200 SCFM. The blower design requires a daily peaking factor of 1.2, resulting in a minimum requirement of 8,600 SCFM at the end of the planning period.

Two 160-hp turbo blowers provide up to 4,800 SCFM (2,400 SCFM each) of air to the aeration basins and are approximately 10 years old. The current firm capacity is 4,500 SCFM (2,100 SCFM + 2,400 SCFM) with the largest unit out of service. Four new 200-hp blowers will supply approximately 3,000 SCFM each. The first unit will replace the existing 125-hp blower and provide a total firm capacity of 4,800 SCFM (2,400 SCFM + 2,400 SCFM). The second 3,000 SCFM blower provides a total firm capacity of 5,400 SCFM (2,400 SCFM + 3,000 SCFM). The third 3,000 SCFM blower provides a total firm capacity of 6,000 SCFM (3,000 SCFM + 3,000 SCFM). The fourth 3,000 SCFM blower provides a total firm capacity of 9,000 SCFM (3,000 SCFM x 3). A blower building expansion to the east and south will be required with the second new 200-hp blower, as shown in Figure 4-3.

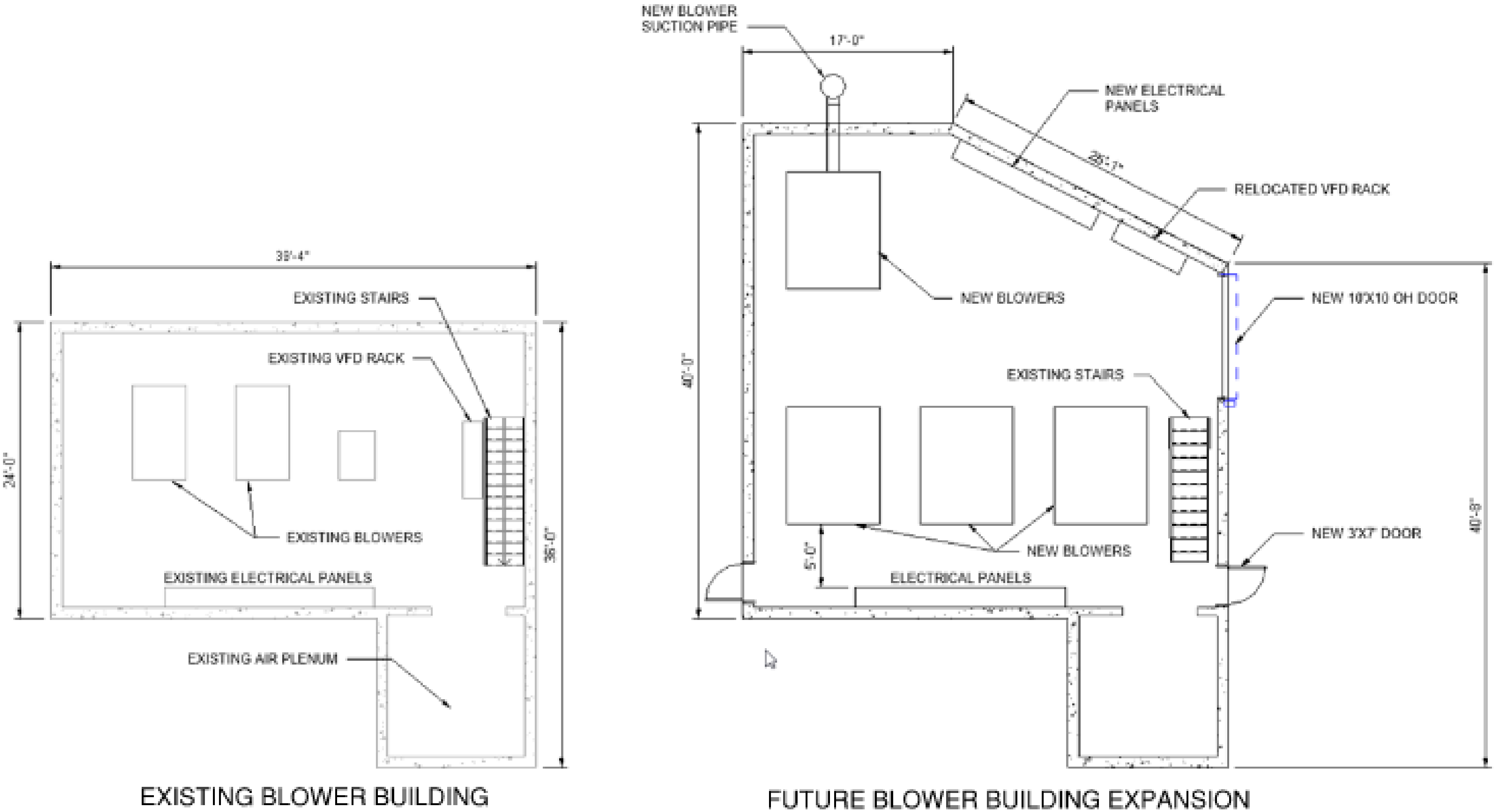



**Figure 4-3. Aeration Building Expansion**

## Blower Technology

The Ketchum / SVWSD WRF will need to add a third aeration basin blower in the next few years and will need to replace their existing turbo blowers within the next 10 years. Aeration is typically one of the most power-intensive operations at WRFs. Blower lifespan costs are commonly affected more by power consumption than base cost and efficiency is vital in reducing operating costs. This section outlines the different technologies that are commonly used for aeration in WRFs.

### *Centrifugal*

Multi-stage centrifugal blowers, like the blowers found in the background of Figure 3-19, have been used for wastewater aeration since the beginning of activated sludge treatment. These blowers use multiple stages of impellers to convert rotational energy into pressure head as shown in Figure 4-4. These blowers typically operate with the impeller shaft direct coupled to the motor, so they run up to 3,600 revolutions per minute (RPM). Centrifugal blower energy demand is generally the basis of “energy savings” comparisons by other technologies since centrifugal blowers have been the standard aeration technology for decades.

**Figure 4-4. Typical centrifugal blower cross-section**

These blowers operate similar to a pump where the air pressure in the pipe is reduced when the airflow is turned down. Centrifugal blowers have great functionality for flows and pressures as high as 10,000 SCFM and 15 pounds per square inch gauge (psig).

### *Positive Displacement*

Positive displacement (PD), or rotary lobe, blowers typically use bi- or tri-lobe blower configurations to push air, as seen in Figure 4-5. PD blowers compress air in the pockets between each lobe and deliver constant-pressure flow. Since PD blowers deliver constant pressure, air flow is directly correlated to the operating speed of the motor and the lobes.

They are simple and easier to maintain than other blower technologies but do not offer significant energy savings. There are small gaps between the lobes that prevent the lobes from damaging each other from which air can escape and limit the efficiency. The lobes are often geared such that they spin at a faster rate than the motor shaft, as high as 5,000 RPM or more with a motor rated for 3,600 RPM.

**Figure 4-5. Typical PD blower cross-section**

PD blowers are ideal for systems with lower flow requirements and medium pressures, up to 1,000 SCFM and 15 psig. PD blowers can operate at higher flow conditions but generally require significantly more energy than other technologies.

*Hybrid*

Hybrid blowers, commonly referred to as twisted tri-lobe blowers, are a specialized type of PD blower. It combines the basic lobe-style compression with the twisted rotor style of screw compressors. The twisted lobes reduce the air slipping problems associated with PD blowers, greatly increasing efficiency. This allows hybrid blowers to take advantage of constant-pressure flow without the energy loss. The twisted lobe cross-section can be seen in Figure 4-6**Error! Reference source not found.**.

Since hybrid blowers take most of its functional design from PD blowers, the lobes spin at the same rates as PD – as high as 5,000 RPM or more with a motor rated for 3,600 RPM.

**Figure 4-6. Typical hybrid blower cross-section**

Hybrid blowers can handle a wide variety of airflows. Generally, this technology is used when the application needs air to be compressed between 10 to 15 psig. Hybrid blowers are generally too expensive at pressures below 10 psig and screw compressors are more efficient at pressures above 15 psig. Hybrid blowers used in these pressure ranges are incredibly efficient, up to 15 percent more efficient than a centrifugal blower, with maintenance ease similar to PD blowers. Activated sludge system blowers commonly require air pressures around 10 psig. This makes hybrid blowers a strong contender for wastewater aeration.

Hybrid blower packages are designed with motor-isolation features to eliminate vibration and “harmonization” problems while the motors run at the same time, which has been a problem with blowers at the Ketchum / SVWSD WRF in the past.

*Turbo*

Turbo blowers are the most advanced compression technology available for wastewater aeration. While the other technologies use motor shafts and bearings to turn the impellers or lobes, turbos use either the incoming air or a magnetic bearing to suspend the impeller. This allows turbos to use small impellers at incredibly high rotational speeds (often up to 24,000 RPM). This is possible because the impeller does not touch any other mechanical parts during typical operation. Turbo blowers realize their energy efficiency, up to 25 percent more efficient than a centrifugal blower, from the lack of friction along a motor shaft.

Because turbos are so technologically advanced, it is not advised that the WRF operators perform maintenance on the equipment. There are also concerns with blower shutdowns as sacrificial bearings are used in the event that the blower loses power or is shut off. Figure 4-7**Error! Reference source not found.** depicts a turbo blower impeller.

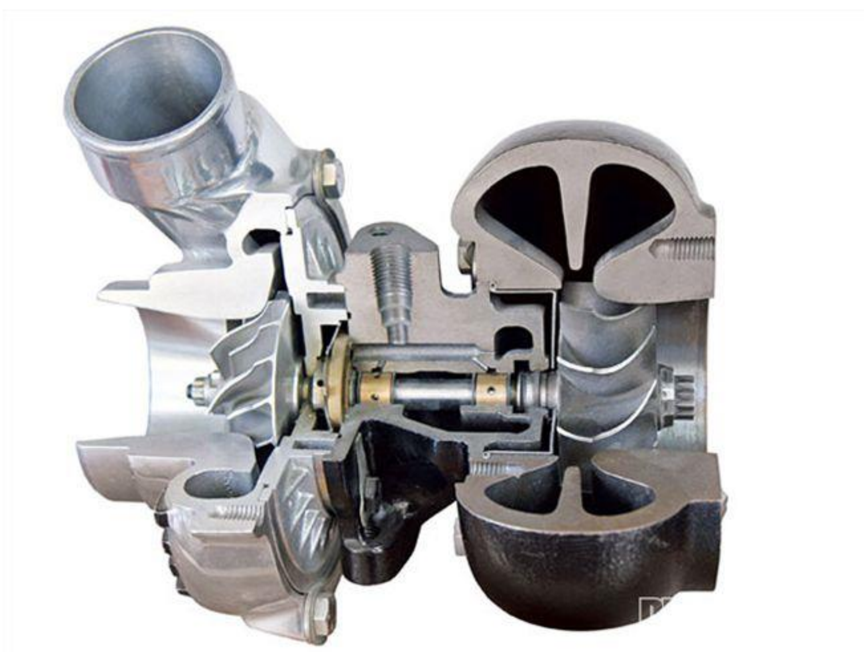


**Figure 4-7. Typical turbo blower cross-section**

Turbo blowers are the most efficient technology at pressures between 7 to 10 psig. They turn rotational energy into pressure head, like centrifugal blowers, and do not provide constant-pressure flow. These blowers can handle flows as high as 7,500 SCFM per unit. At around 10 psig, they begin to lose efficiency and hybrid blowers are more efficient.  Selection between these two technologies at this in-between range depends on the system, the manufacturer, and operator preferences.

### Technology Recommendation

When the current turbo blowers are at the end of their useful lifespan, they should be replaced with 200-hp blowers that are capable of 3,000 SCFM. Using blowers of this size will require three duty blowers and one standby blower at the end of the planning period. The air pressure required for the system is between the ranges of peak efficiency for both turbo and hybrid blowers, and both technologies have an approximately equal power consumption at the duty point. It is recommended that the WRF switch to hybrid blowers from turbo blowers. The WRF's experience with turbo blowers has not been good due to maintenance problems. This can largely be addressed by using the hybrid technology as more maintenance can be performed in-house, which is not possible for turbo blowers.

The 125-hp centrifugal blower should be the first replaced in 2023 due to age and size with the first larger 200-hp hybrid blower. This will provide improved redundancy in the aeration system and provide the WRF with time to purchase the second and third 200-hp hybrid blowers to replace the existing 160-hp turbo blowers (years 2025 and 2027). The fourth blower should be purchased for blower redundancy when required operating blower air demand exceeds two 200 hp units (estimated to be year 2032).

## 4.4.4 Clarifiers

The clarifiers are adequately sized to meet the plant buildout flows and last the entire planning period without replacement. The clarifiers can hydraulically treat to planning period flows and solids loadings can be maintained at less than 25 lbs MLSS/sf/d, according to modeling.

The cover on clarifier #2 uses a sandwich design with insulation between the panels. The cover on clarifier #1 was purchased uninsulated, typical for most clarifiers in colder climates to prevent freezing. The exterior insulation was placed on the clarifier #1 cover after installation to retain heat and minimize condensation inside the tank. The cover exterior insulation on clarifier #1 has been damaged from snow and ice. Normally clarifier #2 is used in the winter due to low flow and condensation is not a problem. If clarifier #1 cover insulation repair is not feasible, insulation removal may be the best solution.

## 4.4.5 RAS Pumps

At future 2042 conditions, the peak day flow will be 3.1 MGD. RAS flow rates are commonly in the range between 50 and 80 percent of incoming plant flow. For the 2042 conditions, this means the design peak-day RAS flow will range between 1.55 and 2.48 MGD. There are three 20-year-old, 25-hp RAS pumps. They can move between 520 and 1,560 GPM, or 4.49 MGD with one pump on standby. These pumps are adequately sized for the planning period with one pump on standby.

Since the treatment system does not have primary clarification, fine screening is required to minimize debris from passing into the aeration basins, secondary clarifiers, and clogging downstream RAS pumps. This was partially addressed by installing the perforated screen in 2018.

When the current RAS pumps need to be replaced, chopper pumps are recommended. The current pumps require operators to reach into the pump to blindly pull debris from the pump internals, putting them at risk of contact with sharp objects and pathogens. Chopper pumps would cut and grind any of these materials that make it past screening and settle in the clarifiers. This would also reduce maintenance time and costs associated with the RAS pumps.

The pumps will need to be replaced during the planning period (see Section 4.2 for timing). Since they are sized properly for planning period buildout with a redundant pump, the chopper pumps should be sized to match the existing RAS pumps.

### 4.4.6 WAS System

The current WAS system runs by the operator inputting a target WAS gallon volume for the day. The plant SCADA then monitors the WAS volume wasted through the flow meter as time goes on, and when the volume target is reached, the WAS pump turns off. Figure 4-8**Error! Reference source not found.** shows historical data for sludge wasting in units of gallons per day.

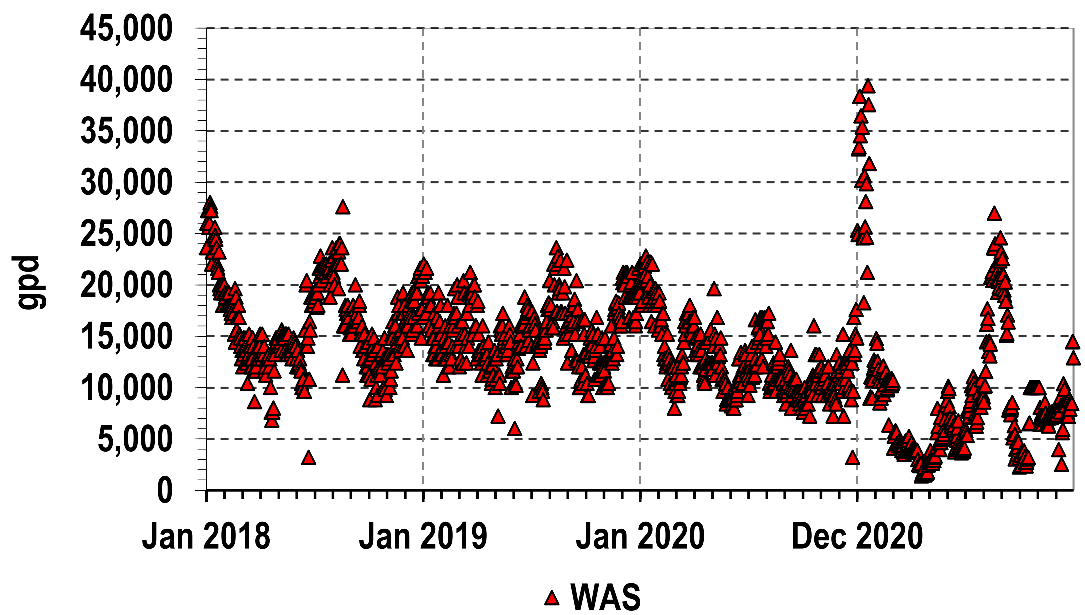



**Figure 4-8. Historical WAS rates**

During the data period shown above, the average WAS rate was about 13,400 GPD. The wastage profile shown has maintained an SRT of approximately 35 days, as evidenced by the calibrated model estimation shown below in Figure 4-9.

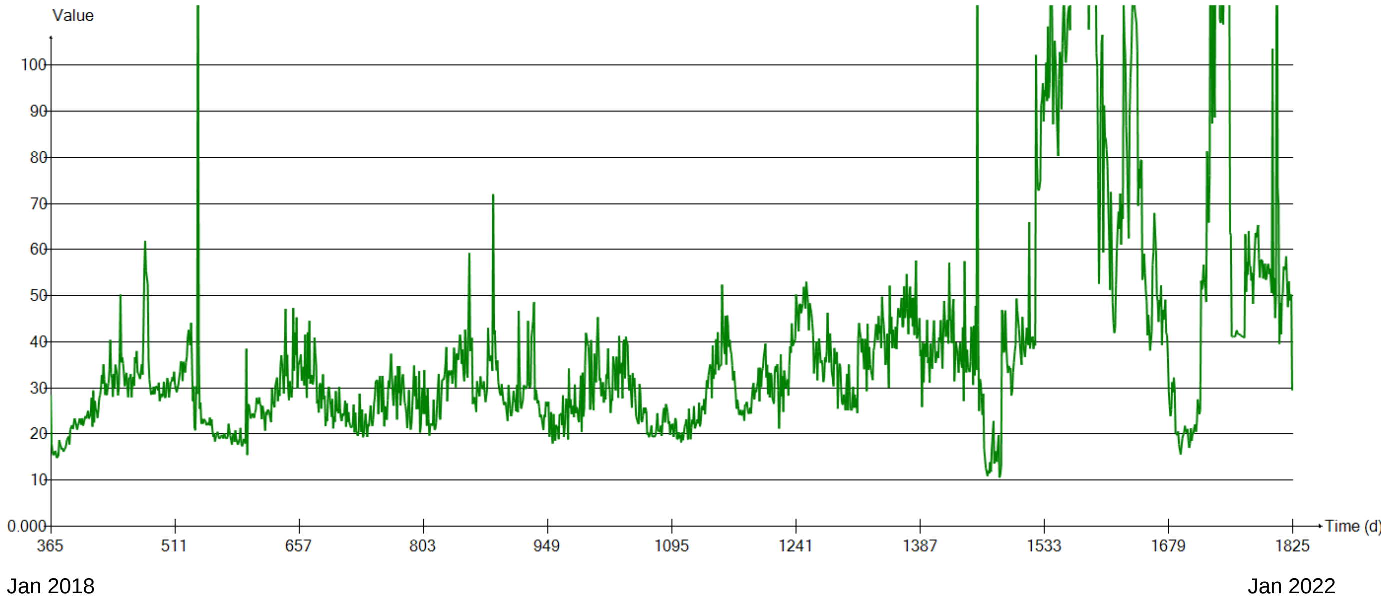



**Figure 4-9. Historical SRT model output**

The historical SRT values are very high relative to conventional operation of activated sludge systems. Lower SRT values correspond with higher WAS rate values, so for future planning purposes the WAS system should be designed to accommodate a more typical operational to ensure proper flexibility in the range of operable conditions. The minimum SRT required for nitrification depends on the desired effluent ammonia target and the temperature of the wastewater. In Ketchum, the key parameter is temperature because the wintertime condition dominates plant performance. The annual wastewater temperature profile is shown in Figure 4-10**Error! Reference source not found.**.

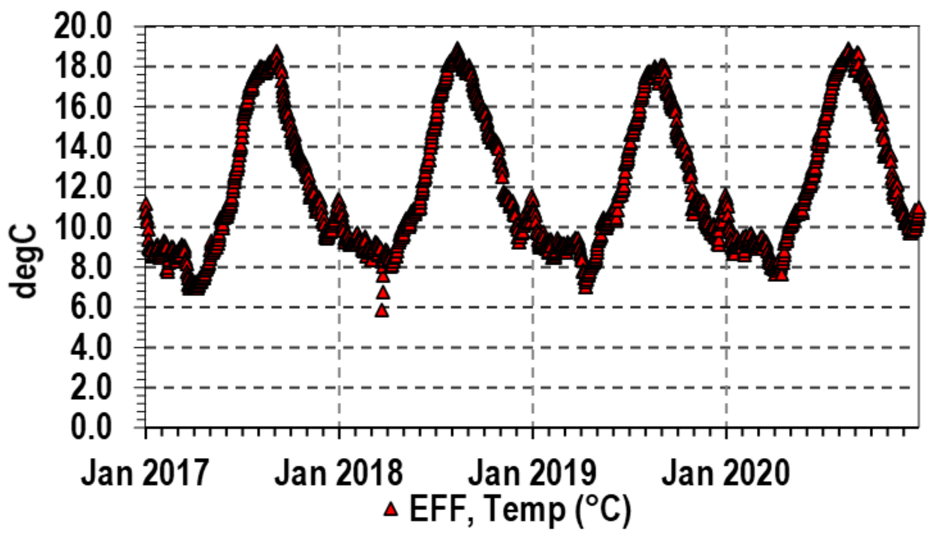



**Figure 4-10. Annual wastewater temperature profile**

The profile shows that the governing low temperature is about 45 °F. The SRT in the system needs to be long enough to allow nitrifying bacteria to grow. The SRT required for nitrification is the inverse of the ammonia oxidizers' specific growth rate, which is given by $\mu_{aob}$.

$$\mu_{aob} = \mu_{max,aob}\left(\frac{S_{NH3}}{S_{NH3} + K_{s,NH3}}\right)\left(\frac{DO}{DO + K_{O2,aob}}\right) - b_{aob}$$

In which:

$\mu_{max,aob}$ = Max Theoretical Growth Rate = 0.370 $d^{-1}$ (adjusted for cold temperature 7°C)

$b_{aob}$ = Decay Rate = 0.118 $d^{-1}$ (adjusted for winter temperature 7°C)

$S_{NH3}$ = 1.0 mg/L effluent ammonia

$K_{s,NH3}$ = Half Saturation Constant = 0.5 mg/L

DO = 2.0 mg/L dissolved oxygen level

$K_{O2,aob}$ = DO Half Saturation Constant = 0.5 mg/L

This results in a maximum specific growth rate during winter conditions of 0.0795 grams MLSS per gram ammonia per day (g/g·d). The inverse of the max growth rate is 12.6 days aerobic SRT. Applying a safety factor of 1.5 for peak-to-average TKN loading yields a minimum design SRT of 19 days. During average annual temperatures (average 12 degrees Celsius) the operational SRT could be reduced to 11 days.

The design WAS rates can be seen in Figure 4-11. At future conditions and a winter-time SRT of 20 days, the estimated WAS rate on average through the year is about 42,300 GPD (approximately 2,600 lbs/d).

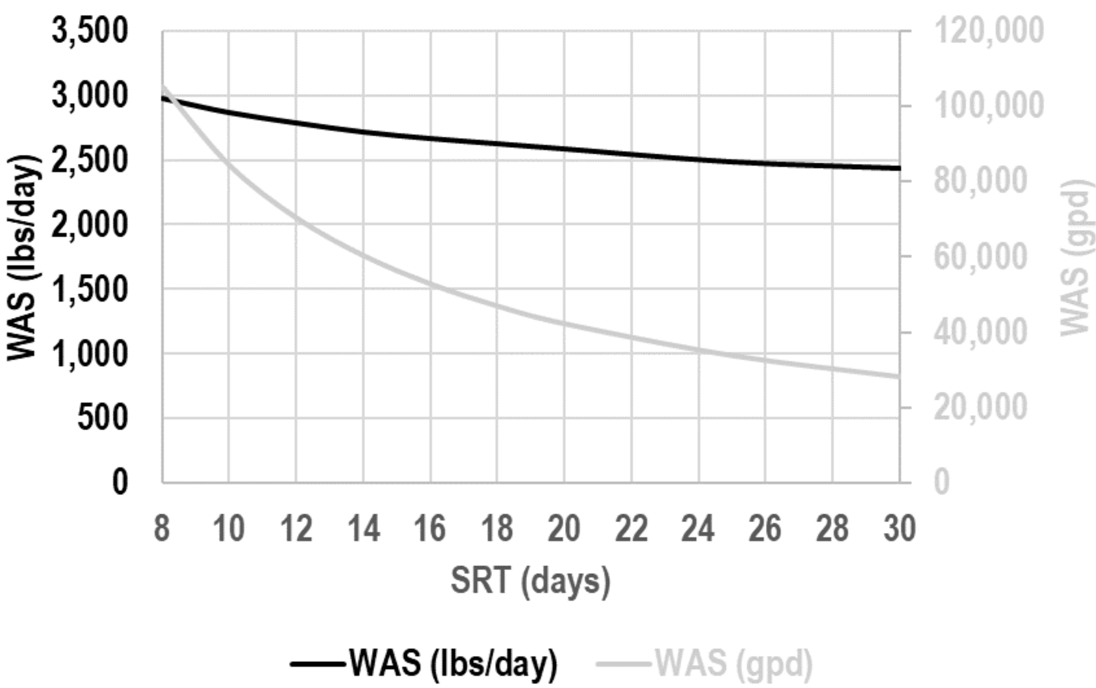



**Figure 4-11. SRT and WAS design at future conditions (2042)**

### 4.4.7 Chemical Consumption

The Ketchum WRF doses two chemicals in the process:

1) Alum (or other metal salt) for phosphorus precipitation
2) Polymer for clarifier settleability and enhanced removal of phosphorus particles at the tertiary filters

Both chemicals are dosed in the clarifier splitter box immediately after the aeration basins. Alum is dosed based on volume (GPD) and the dose is tracked as parts per million (calculated as gallons per day of alum divided by million gallons per day of plant flow). The historical alum consumption (Figure 4-12) shows that the dose rate has remained consistent, since the alum consumption aligns with plant flow. The typical dose for alum ranged between 60 and 100 parts per million volume ($ppm_v$). For future planning a dose rate of 60 $ppm_v$ at 3.1 MGD would require 186 GPD of alum consumption.

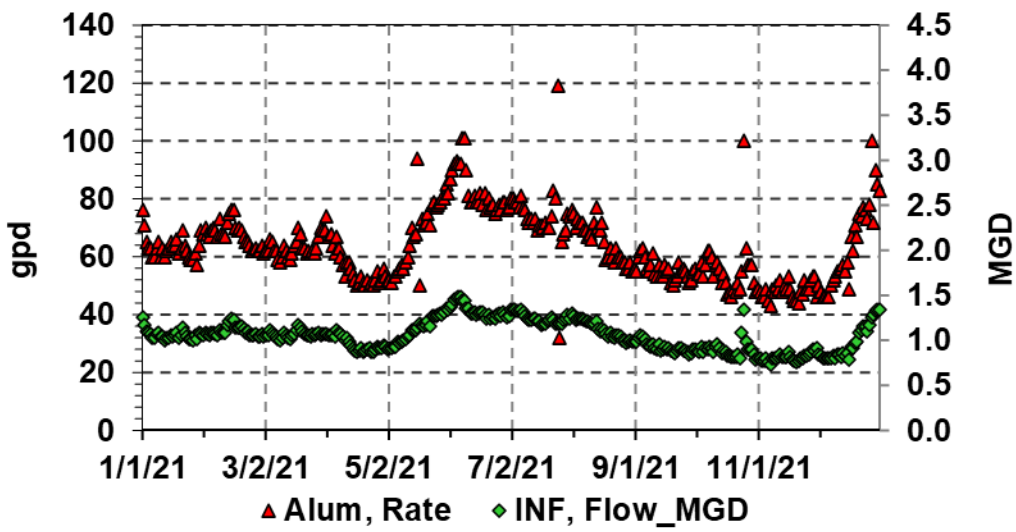



**Figure 4-12. Historical alum consumption**

Polymer consumption is tracked in pounds per day. For operational dose tracking the poundage rate is converted to a dose rate by dividing the pounds of polymer used by the plant flow, and then standardizing for the specific weight of the polymer (11.1 lbs/gal). In mathematical terms:

$$Polymer\ Dose\ (ppm) = \frac{lbs\ polymer}{Plant\ Flow * 11.1}$$

Polymer consumption was typically[22] around 30 lbs/d to 50 lbs/d, except for when a different polymer was used during about April 1 of 2021 through November 15 of 2021. This is equal to a typical dosing rate of about 2.9 to 4.5 ppm. Assuming a typical dose rate of 4.5 ppm in the future at peak day flow rate of 3.1 MGD, the polymer dosing system would require 154 lbs/d of polymer consumption capacity.

[22] The typical polymer used at the facility is by Hyperion. The plant temporarily switched to a polymer called B-164 by Beckart Environmental but observed turbidity issues and decreased phosphorus removal efficiency during that time. Typical dose rates mentioned in the body text refer to the normal Hyperion polymer.

# 4.5 Tertiary Treatment System

The tertiary treatment system is adequately sized to handle flows up to the plant buildout flows, but the equipment will require replacement before the WRF reaches these flows. The tertiary treatment system includes the cloth-media filters and the UV disinfection system. Table 4-6 outlines the planning period costs associated with the tertiary treatment system and outfall clearing, which is further discussed in Section 4.6.

**Table 4-6. Tertiary treatment system improvements cost estimation**

| Project | Cost[1] | Annualized Cost[2] |
|---|---|---|
| Replace UV Equipment | $1,694,000 | $84,700 |
| Outfall Clearing | $167,000 | $8,350 |
| **Total** | $1,861,000 | $93,050 |

[1] Costs are presented in 2022 dollars and are not escalated to year of construction. Also includes contingency.
[2] Based on 20-year period and assumed 3.0% inflation rate.
UV=ultraviolet

## 4.5.1 Polymer and Alum Addition

The polymer and alum chemical addition systems are in good condition. The polymer and alum dosing pumps will need replacement during the planning period. The alum building and storage tank is in good condition. Pumping polymer directly into the splitter box will be replaced with a polymer mixing system to provide the appropriate polymer delivery at a 1% concentration.

## 4.5.2 Cloth Filtration

The cloth media filter tanks and backwash system are in good condition structurally and will be serviceable through the planning period. The backwash pumps will require replacement during the planning period. The tanks have minor cosmetic issues that could be addressed with a coating.

Cloth filter media can be expected to last for approximately 5 years. This means that the media will need to be replaced four times over the course of the planning period and the costs are included in operations and maintenance.

Since the system was installed in 2007, the PLC is beginning to show its age and will need to be replaced. This is further discussed in Section 4.8.

## 4.5.3 UV Disinfection

The UV disinfection system is adequately sized for plant planning period peak hourly flow of 6.0 MGD (equipment is actually capable to 7.3 MGD). The system is limited for disinfection of Class A reuse-level water to 3.1 MGD. This is because the disinfection requirements for Class A reuse water is much more stringent than the disinfection requirements for discharge to Big Wood River. Class A reuse disinfection requires 100 mJ/cm$^2$ dose versus river discharge requiring only 30 mJ/cm$^2$ dose.

The UV disinfection system is currently the limiting treatment unit for reuse. The WRF currently experiences occasional peak instantaneous flows in the spring that exceeds 3.1 MGD. When this occurs, the plant must divert effluent flow from the reuse wet well to Big Wood River. The UV disinfection system should be upgraded to provide the Class A reuse-quality UV dosage of 100 mJ/cm$^2$ before the planning period peak daily flow (3.0 MGD) occurs in 2032.

UV disinfection systems reach their life-expectancy when critical components become less available or obsolete (lamps and ballasts). So far, the system continues to be supported by Wedeco (a Xylem company). We estimate the basic lamp and ballast system should be serviceable for an additional 5 years (year 2028). However, the technology limitations (controls) do not have the same life-span as the UV lamps and ballast. The control system is already beyond normal technology limitations and vulnerable to failure (replacement in year 2023).

## 4.6 Outfall

After the wastewater has been treated, it is discharged into Big Wood River. The discharge enters the river through one 24-inch pipe. The river shifted in 2006 and required excavation to uncover the outlet. Although this was the first time the river shifted since plant construction in 1968, it could happen again.

A short-term solution to this problem is to keep clearing the discharge pipe to maintain a flow into the river's main path. This clearing can be done as needed or budgeted and maintained over a fixed period, such as every 10 years. The 2006 clearing effort cost was approximately $25,000. A long-term solution is to add a diffuser system that would evenly spread the discharge across the entire river. However, a diffuser across the bottom will hinder flow and likely not survive the normal spring high flows and accompanying debris. With spring melts, the river bottom can drastically change, which creates a concern with the river bottom moving away from the diffuser system. It is not fiscally or practically reasonable to install a diffuser system with the changes to the ever-changing river bottom. The Ketchum / SVWSD WRF should budget $83,500 (2022 dollars) to excavate the outfall every 10 years.

## 4.7 Reuse

As the Ketchum and Sun Valley areas increase in population, the WRF should consider expanding its reuse water services. Growth would not only increase the available land to irrigate with the Class A reuse water, but it would also increase the amount of reuse water routed to irrigation instead of the river. Even though the water is treated to advanced levels, minor amounts of nutrients remain and are better routed to land for recycling than to the Big Wood River. The other benefit is reduced potable water demand (used for landscape irrigation).

Reuse services could be expanded to other areas for irrigation or even to producing artificial snow during the winter season to divert treated water from the river during non-irrigation seasons. Since discharge limits to the Big Wood River are anti-backsliding, mass limits on nutrients will not increase as flows to the WRF increase. This means that meeting discharge limits will become increasingly more difficult as the facility's flows increase and promoting reuse of treated effluent will become more critical to meeting the WRF's limits.

The WRF is taking advantage of its high-quality effluent and reusing the water to irrigate the Elkhorn Golf Course and the Weyyakin Subdivision. Future uses could include expanding into other private areas for irrigation. Since the reuse pumping system is less than 10 years old, it will last approximately halfway through the planning period before they need to be replaced..

### 4.7.1 Reuse Overview

The TMDLs set by DEQ are limits that establish the maximum mass of a pollutant that can be discharged by a plant into a water body, in this case Big Wood River. The WRF is limited to 26.5

tons/year of total TSS and 9.9 lbs/d of TP. Reuse provides an alternate discharge than Big Wood River and results in less mass of TSS and TP. While the temperature TMDL is not currently in the discharge permit, it will likely be in future discharge permits for the WRF. Reuse is another way to combat a future temperature discharge limit, especially in the critical fall months. The WRF is currently using a majority of the plant flow during summer months for Class A reuse at the Weyyakin subdivision and Elkhorn Golf Course. Continued and expanded reuse will provide benefit to the Big Wood River.

## 4.8 Electrical Improvements

- Recommend replacing MCC-2 (secondary treatment MCC) at the same time as the 125HP centrifugal blower is replaced in 2023.
- Install a new MCC in the Dewatering Building in 2025
- Install a new PLC in the Dewatering Building in 2025
- Recommend replacing nine VFD’s associated with the Liquid Stream (i.e. Return Sludge Pumps, UV Feed Pumps, and Influent Pumps) in year 2028 (except Influent Pumps done in 2017) and again in 2038.
- Recommend replacing MCC-3 (dewatering MCC) in 2030.
- Recommend replacing the two Headworks Filter Fan VFD’s in 2030.
- Recommend replacing MCC-4 (influent and effluent pumps, Headworks fans) by 2040
- Recommend replacing the Digester #2 Blower VFD’s in 2038.

Table 4-7 outlines the estimated costs of these improvements.

**Table 4-7. Electrical systems improvements cost estimation**

| Project | Cost[1] | Annualized Cost[2] |
|---|---|---|
| Replace Generator & MCC-3 | $1,263,000 | $63,150 |
| Upgrade PLC Hardware | $1,356,000 | $67,800 |
| Upgrade Filter PLC | $102,000 | $5,100 |
| Upgrade Dewatering PLC | $102,000 | $5,100 |
| Upgrade UV PLC | $102,000 | $5,100 |
| Replace VFD's | $1,564,000 | $78,200 |
| **Total** | $4,489,000 | $224,450 |

[1] Costs are presented in 2022 dollars and are not escalated to year of construction. Also includes contingency.
[2] Based on 20-year period and assumed 3.0% inflation rate.

# 5 Solids Handling Upgrades and Reuse

Although landfilling is used as the ultimate biosolids disposal alternative (until composting is approved), the current practice of achieving Class B quality biosolids is the operational goal. The needed HRT to reduce VSS concentrations to acceptable limits to meet 40 CFR Part 503 requirements is 60 days at winter temperatures of 15°C or 40 days at 20°C. Under peak month conditions, solids production averaged approximately 20,000 GPD at 2 percent solids.

The WRF has an aerobic digester/sludge storage tank with a volume of approximately 301,000 gallons, 12-foot depth, and 2 feet of freeboard. This produced an HRT of 13 days, which is significantly less than required for Class B solids. But the current system achieves final VSS reduction at the Ohio Gulch drying beds. The solids are not currently beneficially used; therefore, the primary purpose of the drying beds is to decrease the water volume and weight by drying (to 75 percent solids) for reduced landfill disposal costs.

**Table 5-1. Biosolids summary**

| Parameter | 2021-2022 Production | Planning Period Production (2042) |
|---|---|---|
| **Average Annual** | | |
| Total Dry Solids (lb/d) | 1,357 | 2,430 |
| Volume @ 3% Solids (gpd) | 5,425 | 10,800 |
| Volume @ 2% Solids (gpd) | 8,137 | 14,568 |
| Volume @ 1% Solids (gpd) | 16,274 | 32,400 |
| Percent Volatile Solids (%) | 70 | 70 |
| **Peak Month** | | |
| Total Dry Solids (lb/d) | 5,478 | 5,700 |
| Volume @ 3% Solids (gpd) | 21,896 | 22,800 |
| Volume @ 2% Solids (gpd) | 32,845 | 34,173 |
| Volume @ 1% Solids (gpd) | 65,689 | 68,300 |
| Percent Volatile Solids (%) | 70 | 70 |
| **Overall Production** | | |
| Annual Dry Solids Produced (tons) | 248 | 443 |

gpd=gallons per day; lbs/d=pounds per day

## 5.1 Planning Period Biosolids Alternatives

Multiple alternatives were investigated for biosolids handling for the Ketchum / SVWSD WRF. The alternatives included multiple aerobic digester arrangement, thickening for digester capacity/hauling, and dewatering. Table 5-2 outlines the cost estimates for the solids handling system improvements through the planning period.

**Table 5-2. Solids handling improvements cost estimation**

| Parameter | Cost[1] | Annualized Cost[2] |
|---|---|---|
| Rotary Drum Thickener & Dewatering Building | $7,204,000 | $360,200 |
| Remove Digester No. 1 Building and New Flat Covers | $690,000 | $34,500 |
| Gravity Thickener & Transfer Building Demo | $145,000 | $7,250 |
| Digester No. 2 | $2,648,000 | $132,400 |
| Screw Press | $1,527,000 | $76,350 |
| New & Replacement Digester Blowers | $1,829,000 | $91,450 |
| Digester No. 1 Diffusers | $250,000 | $12,500 |
| **Total** | $14,293,000 | $714,650 |

[1] Costs are presented in 2022 dollars and are not escalated to year of construction. Also includes contingency.
[2] Based on 20-year period and assumed 3.0% inflation rate.

### 5.1.1 Digester Arrangement

The WRF will require a total aerobic digester volume of 960,000 gallons sometime in the future. It was determined in previous FPSs that constructing three digesters, each at 300,000 gallons, would provide the best combination of reduced construction cost and efficient use of the land. Since the WRF is land locked, space is limited.

Although three digesters are the long-range plan for land use, only two digesters are required to provide adequate HRT at planning period conditions. The primary purpose of the second digester is to provide redundancy and operational flexibility for dewatering and hauling. For planning period flows, two digesters totaling 600,000 gallons will be sufficient volume for biosolid storage and digestion.

There are two ways to operate the digesters – in series or in parallel. Operating the digesters in parallel adds a level of redundancy that the WRF does not currently have. However, it does not provide the opportunity to thicken the sludge between digesters compared to series operation. By operating the digesters in series, effluent from the first aerobic digester can be thickened prior to transferring to the second digester. Thickeners can typically increase solids concentrations from 1 to 2 percent up to 2 to 4 percent. This effectively doubles the storage capacity of the second digester, increasing the amount of available storage time. Digesters in series can, and should, also have provisions to bypass the first digester to waste directly to the second digester in case the first digester is taken offline.

EPA regulates municipal biosolids with 40 CFR Part 503. In this regulation, meeting Class B biosolids requires a minimum aerobic digester HRT of 40 days at 20°C or 60 days at 15°C. This temperature is based on the digester temperature only, not plant influent or effluent temperatures. The average digester temperature in 2021 was 23.4°C with a minimum temperature of 12.3°C. In December and January, the digester drops below 20°C, where the WRF would have to meet 60 days HRT to meet Class B biosolid requirements. However, when the future digesters are constructed in series, these large HRT requirements are reduced[23]. Digesters in series need to provide a minimum HRT of 28 days at 20°C or 42 days at 15°C.

[23] WEF (Water Environment Federation) (2010). *Design of Municipal Wastewater Treatment Plants, Manual of Practice No. 8* (5th ed.). McGraw-Hill Education.

The WRF should construct one new digester designed for series operation. Digesters #2 and future digester #3 will operate in parallel, both downstream of digester #1 and thickening. This will allow adequate digester HRT at current peak-month conditions See Figure 3-18**Error! Reference source not found.** for the flow schematic of this process.

## 5.1.2 Solids Thickening

The planning period biosolids plan involves replacing the existing gravity thickener with a new solids thickening operation. The thickener can be used to thicken solids during transfer from the existing digester to the future digester(s). Thickening prior to the future digesters provides additional storage time for biosolids. There are several methods available for solids thickening, which are further described below.

### Gravity Thickener

The WRF currently has a gravity thickener that is used to thicken the digested solids prior to hauling. Gravity thickeners are similar in appearance and function similar to the secondary clarifiers but are better suited for thickening solids, with the solids settling at the bottom of the unit. Gravity thickeners function well for primary sludges and for combinations of primary sludge and WAS, thickening these type solids to 3 - 10 percent from an influent solids concentration of 1 to 3 percent. However, gravity thickeners perform poorly for solids that are only aerobically digested WAS, producing up to 2 - 3 percent solids. Since the WRF does not have primary sludge settling, the digester receives all aerobically digested WAS. This can be seen in the hauling data, where solids concentrations are hauled at 2 - 3 percent.

Gravity thickening is energy efficient. The thickener requires pumping energy, depending on the hydraulics of the thickener, and a small motor to run the mechanism. The existing gravity thickener is shown in Figure 5-1.

**Figure 5-1. Existing gravity thickener**

## Rotary Drum Thickener

Rotary drum thickeners (RDTs) use a polymer injection system, flocculation tank, and a cylindrical rotating drum to thicken solids. The flocculation tank accepts solids that are pre-mixed with polymer. The solids and polymer coagulate in the flocculation tank to create large flocs, or clumps, of solids before entering the drum. The drum contains small perforations to allow the water to drain out of the solids by gravity while trapping the solids in the drum. An auger located within the drum pushes the solids toward the end of the drum. With the right flocculants, RDT's can thicken biosolids up to 8 percent solids.

RDTs are great for small-to-medium sized facilities as they are relatively inexpensive and compact but are limited in their maximum capacity. RDTs also have low power requirements, low speeds, and few moving parts. The combination of these items promotes a simple piece of equipment from an operation and maintenance standpoint that has become one of the most common methods of thickening biosolids. Figure 5-2 shows a picture of an RDT.

**Figure 5-2. Rotary drum thickener**

### Dissolved Air Flotation

Dissolved air flotation (DAF) thickening is a common form of gravity thickening with additional processes. Pressurized air is introduced into the influent of the DAF and the air bubbles carry sludge to the water surface, where it is removed by skimmers. There are typically provisions for sludge draw-off from the bottom of the DAF for solids that aren't floated to the top. Typical thickened biosolids concentrations range from 4 – 6 percent solids.

DAF thickening typically uses polymer addition to promote solids coagulation. Larger coagulated particles are more efficiently floated by the dissolved air. DAFs require an air compressor and recycle pressurization pump (energy users) and occupy a larger footprint than other technologies. They require a skimmer mechanism to move the solids to a sump.

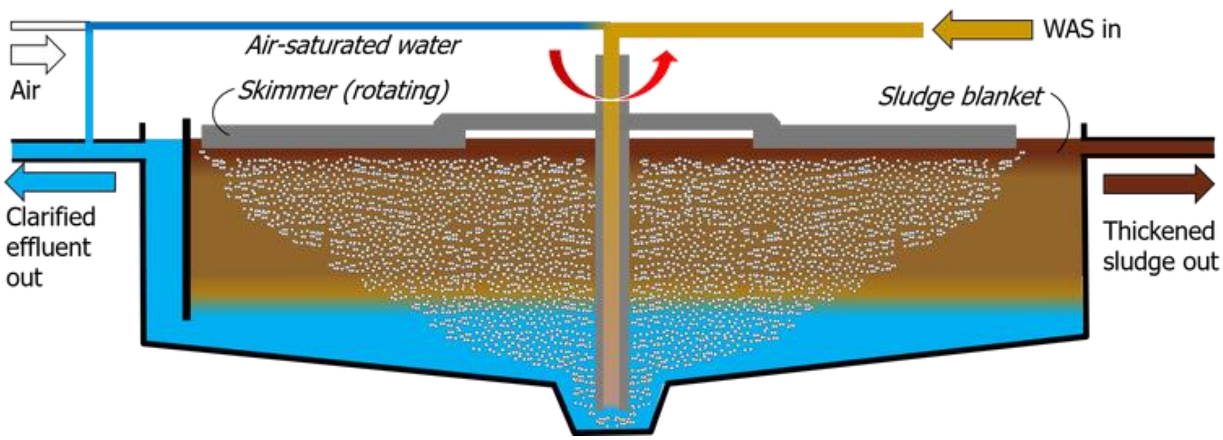



**Figure 5-3. Dissolved air flotation thickener**

### Gravity Belt Thickener

Gravity belt thickeners (GBTs) use a polymer injection system, flocculation tank, and drainage belts to thicken solids. The flocculation tank evenly mixes flocs of coagulated biosolids to evenly apply solids along the length of the belt. The solids sit on top of the belt and is ridged along the length of the belt by plow blades to encourage additional liquid drainage through the cloth belt. The solids concentration from the belt thickener is normally in the range of 5 – 8 percent.

GBTs typically require higher levels of O&M because of the large number of moving parts and maintaining proper belt tension. They also have a lower thickening capacity per square foot of floor space than other technologies. GBTs also require higher pressure water to wash the belt than required to wash the RDT drum. Figure 5-4**Error! Reference source not found.** shows typical operation of a GBT.

**Figure 5-4. Gravity belt thickener**

## Technology Recommendation

Thickening technologies were compared using a Pairwise Comparison to select the best fit for the WRF (see scoring criteria in Table 5-3). Multiple criteria are scored out of 5 possible points per category and multiplied by the scoring weight. The scoring scales shown represent the ranges in which the technology scores. As an example, no action has a capital cost of less than $300,000 so scores 5 points in the capital cost criteria.

**Table 5-3. Thickening technology comparison basis**

| Ketchum / SVWSD WRF | Treatment Confidence | Solids Content | Capital Cost | O&M Costs | Energy Efficiency | Chemical Usage |
|---|---|---|---|---|---|---|
| Scoring weight | 30% | 20% | 20% | 10% | 10% | 10% |
| Scoring scales | 1 = Low | 1 = 1-2% | 1 = > $600k | 1 = High | 1 = Low | 1 = High |
| | 3 = Medium | 3 = 3-4% | 3 = $300-600k | 3 = Medium | 3 = Medium | 3 = Medium |
| | 5 = High | 5 = 5-6% | 5 = < $300k | 5 = Low | 5 = High | 5 = Low |

As seen in Table 5-4, the RDT scored the highest in the pairwise comparison. It is recommended that the WRF utilizes an RDT for solids thickening. The RDT will be used to thicken the existing digester effluent before sending the thickened solids to the future digester(s). This will increase the maximum HRT available for aerobic digestion, increasing the amount of time required before the third digester will be required.

**Table 5-4. Thickener technology comparison**

| Ketchum / SVWSD WRF | | Treatment Confidence | Solids Content | Capital Cost | O&M Costs | Energy Efficiency | Chemical Usage | Weighted Score | Rank |
|---|---|---|---|---|---|---|---|---|---|
| No. | Activity Name | | | | | | | | |
| **1** | No Action | Low | 1-2% | < $300k | High | High | Low | **2.60** | **5** |
| **2** | New Gravity Thickener | Low-Medium | 2-3% | $400-500k | Medium | High | Low | **2.90** | **4** |
| **3** | Rotary Drum Thickener | High | 5-6% | $300-400k | Medium | Low-Medium | Medium | **4.10** | **1** |
| **4** | DAF | Medium | 4-5% | $400-500k | Medium | Medium | Medium-Low | **3.30** | **3** |
| **5** | Gravity Belt Thickener | High | 4-5% | $300-400k | Medium-High | Low-Medium | Medium | **3.80** | **2** |

DAF=dissolved air flotation; O&M=operations and maintenance

Thickening a portion of the biosolids to 5 percent before discharge to the future second aerobic digester will provide an average annual HRT of 44 days and a peak month HRT of 37 days.

Hauling of thickened solids at 6 percent will significantly reduce the trips needed to deliver the current 2 - 3 percent liquid solids to the Ohio Gulch drying beds before a dewatering unit is installed. This will also help to extend the usable life of the drying beds.

### 5.1.3 Dewatering

Solids dewatering differs from solids thickening in that it requires more advanced forms of liquid-solid separation. While thickening generally indicates solids contents of up to 6 percent, dewatering can produce solid contents from 15 up to 25 percent with the most advanced forms. Thickened solids have a sufficiently low-enough concentration that they can still be pumped, while dewatered solids are too thick and generally require mechanical conveyance, often either by belts or augers. The following sections describe methods used for dewatering biosolids.

#### Screw Press

A screw press uses a rotating cylindrical screw for the solid-liquid separation, not unlike an RDT. A major difference between an RDT and a screw press is that a screw press does not provide as much open volume as an RDT within the unit, which increases pressure and provides better hydraulics to remove the water. The downward force from both friction from the screw and weight of the biosolids on the lower levels encourages additional dewatering. The expected dewatered solids content is between 14 – 16 percent.

Similar to RDTs, screw presses are completely enclosed and require minimal operator input once stable flow conditions are met. This dewatering system is used extensively at smaller facilities where operators are not on site 24/7 and can be easily designed to operate during weekday shifts. They are also not often used in larger facilities due to throughput constraints (< 30 MGD).

Screw presses use polymer injection systems and flocculation tanks to promote solids coagulation upstream of the screw and are used with great success at smaller municipalities in various parts of the state of Idaho. Figure 5-5 shows the screw press used at the City of Hailey's Woodside WRF.

**Figure 5-5. Screw press at the City of Hailey's Woodside WRF**

### Belt Filter Press

Belt filter presses (BFPs) process sludge through drainage belts similar to GBTs. Whereas GBTs only use gravity to separate the liquid from the solids, BFPs use rollers on the top and bottom of the belt to squeeze out additional liquid, called pressate. BFPs require higher pressure water than other dewatering technologies for cleaning, similar to GBTs. The expected dewatered solids content is similar to the screw press at 14 – 16 percent solids.

BFPs can handle a wide variety of influent sludge characteristics and have a very high maximum capacity. There are many operator-controllable inputs (belt tension, belt speed, roller sizes, etc.) that provide flexibility, and BFPs are also the most energy-efficient among the dewatering technologies. The drawback of the operational flexibility is that BFPs have a high operational and maintenance demand. This high demand on operator time is not conducive to small facilities like the Ketchum / SVWSD WRF that does not have many operators. Figure 5-6**Error! Reference source not found.** shows a BFP at the Newberg WWTP in Newberg, Oregon.

**Figure 5-6. Belt filter press at the Newberg WWTP in Newberg, OR**

### Centrifuge

Dewatering centrifuges operate by forcing flocculated sludge into a rapidly spinning circular screen. The high rotational speeds in the centrifuge separate solids to the outside of the drum and centrate to the inside of the drum by centrifugal force. Centrifuges are typically used for dewatering in large treatment facilities due to larger throughput capacity, high solids content, and availability of advanced maintenance capability. The expected solids content from a centrifuge is 18 – 24 percent.

Centrifuges require greater maintenance  and have a large power draw. They also require larger amounts of polymer than other dewatering technologies. Figure 5-7 depicts a centrifuge at the Durham Advanced WWTP in Portland, Oregon.


**Figure 5-7. Centrifuge at Durham AWWTP in Portland, OR**

## Plate Filter Press

Plate filter presses (PFPs) have two typical configurations: fixed-volume and variable-volume recessed plate. Both configurations use a series of rectangular plates with recessions to hold influent sludge. Fixed-volume PFPs are covered with filter cloths and held together with hydraulic rams at pressures of 100 to 300 pounds per square inch (psi) to force liquid through the filters[24]. PFPs can dewater solids to high concentrations, up to 50 percent solids. Variable-volume PFPs use rubber diaphragms between the filter media and use compressed air to apply an initial pressure of 100 to 125 psi, then a final pressure of 200 to 300 psi.

PFPs require a large amount of energy to pressurize the system to such high pressures. PFPs also require high-pressure wash water to clean the filters, and the technology generally has high operation and maintenance requirements. Figure 5-8 presents an example of a PFP.

**Figure 5-8. Plate filter press**

## Technology Recommendation

Thickening technologies were compared using a Pairwise Comparison to select the best fit for the WRF (see scoring criteria in Table 5-5). Multiple criteria are scored out of 5 possible points per category and multiplied by the scoring weight. The scoring scales shown represent the ranges in which the technology scores. The comparison basis for dewatering is scored the same as the thickening comparison, but the ranges for solids content and capital cost are adjusted to compensate for the different process.

[24] Metcalf & Eddy, Inc., Tchobanoglous, G., Abu-Orf, M., Bowden, G., & Pfrang, W. (2014). *Wastewater Engineering: Treatment and Resource Recovery* (5th ed.). McGraw-Hill Education.

**Table 5-5. Dewatering technology comparison basis**

| Ketchum / SVWSD WRF | Treatment Confidence | Solids Content | Capital Cost | O&M Costs | Energy Efficiency | Chemical Usage |
|---|---|---|---|---|---|---|
| Scoring weight | 30% | 20% | 20% | 10% | 10% | 10% |
| Scoring scales | 1 = Low | 1 = < 12.5% | 1 = > $800k | 1 = High | 1 = Low | 1 = High |
| | 3 = Medium | 3 = 15-17.5% | 3 = $600-700k | 3 = Medium | 3 = Medium | 3 = Medium |
| | 5 = High | 5 = > 20% | 5 = < $500k | 5 = Low | 5 = High | 5 = Low |

**Table 5-6. Dewatering technology comparison**

| Ketchum / SVWSD WRF | | Treatment Confidence | Solids Content | Capital Cost | O&M Costs | Energy Efficiency | Chemical Usage | Weighted Score | Rank |
|---|---|---|---|---|---|---|---|---|---|
| No. | Activity Name | | | | | | | | |
| **1** | No Action | Low | < 12.5% | < $500k | High | High | Low | **2.60** | **5** |
| **2** | Screw Press | High | 15-17.5% | $500-600k | Low-Medium | Medium-High | Medium-High | **3.90** | **1** |
| **3** | Belt Filter Press | Medium-High | 17.5-20% | $600-700k | Medium | Medium-High | Low-Medium | **3.70** | **2** |
| **4** | Centrifuge | Medium-High | > 20% | $500-600k | High | Medium | Medium | **3.70** | **2** |
| **5** | Plate Filter Press | High | > 20% | $700-800k | High | Low-Medium | Low | **3.70** | **2** |

As seen in Table 5-6, the screw press scored the highest in the pairwise comparison. It is recommended that the WRF use a screw press for solids dewatering. The screw press will be used to dewater digested biosolids. This will further help to provide flexibility in solids hauling, as dewatered solids can be trucked in open-air trailers rather than in a tanker.

The WRF should plan on demolishing the existing gravity thickener to construct a dewatering, aeration, and pumping building in its location. This building will house the RDT, screw press, and future digester blowers on the first floor. There will be a basement that houses the sludge transfer pumps. Once this new building is constructed, the existing transfer building housing the existing sludge transfer pump can be demolished.

## 5.2 Aerobic Digester

The second digester provides redundancy so routine maintenance activities can be completed to remove sand accumulations and repair/replace diffusers. A second aerobic digester will also increase VSS destruction, which further stabilizes the biosolids and provides increased storage capacity. Increased storage volume allows a more flexible hauling schedule. More importantly, the second digester provides a level of redundancy that is currently not available at the plant.

Another benefit of having two digesters is the option to operate in series to allow for thickening solids between transferring from the first digester to the future downstream digester. Thickening in series allows for a significant increase in sludge storage capacity and increase to the HRT. Increasing the HRT can allow the WRF to produce biosolids meeting 40 CFR Part 503 criteria for Class B biosolids for beneficial reuse without using the drying beds. While the City of Ketchum and SVWSD have not explored options for beneficial reuse of Class B biosolids, it may be of interest in the future. Class B biosolids are generally safe for recycling by land application to condition soils or fertilize crops.

Due to the reduced HRT and a lack of redundancy, a new digester is required during the planning period. The existing digester provides an HRT of 40 days at the 2021 average annual conditions and an HRT of 10 days at the 2021 peak month conditions. Adding a second digester in series and downstream of an RDT will provide an annual average HRT of 88 days and a peak-month HRT of 37 days at the projected 2042 values.

The peak month HRT of 37 days with two digesters in series is not sufficient to produce Class B biosolids directly from the WRF. However, there are alternatives to produce reuse-quality biosolids after biosolids are hauled off site. These alternatives are further discussed in Section 5.5.

The new aerobic digester should be planned for construction within the next 10 years, which will provide an adequate HRT to destroy the volatile solids and meet EPA biosolids treatment criteria. The tank will be constructed to be the same volume and dimensions as the current tank. A similar aeration system can also be used. By adding a new aerobic digester, the residence time will increase and more volatile solids will be destroyed before the solids are trucked to the Ohio Gulch drying beds. Greater storage volume accompanying the second tank would also provide better hauling flexibility to aid in avoiding high traffic periods or dangerous winter road conditions.

Rather than having the second digester in a building, it is recommended to use a flat insulated cover for the digester. This will remove the insulation problem with the current aerobic digester, where the digester building's roof insulation is falling off and into the digester tank. It is also recommended that the existing digester's building is removed and a flat cover is installed for the current digester to prevent more insulation from entering the tank.

## 5.3 Aerobic Digester Blowers

Two 100-hp blowers, capable of 1,600 SCFM each, handle the existing digester oxygen requirements. Current demands are at approximately 1,100 SCFM, so the blowers have full redundancy for one digester. Air demand in aerobic digesters is typically based on an airflow per volume of digester, which is a minimum of 30 SCFM per 1,000 $ft^3$ of digester volume[25]. The blowers, at 1,600 SCFM, are conservatively sized to provide 37 SCFM per 1,000 $ft^3$ of digester volume. Current air demands are less than this value because the WRF does not operate its digester at full volume.

When the existing blowers are due for replacement, they should be replaced with hybrid blowers. It is recommended that the Ketchum / SVWSD WRF replace the existing digester blowers with hybrid blowers instead of turbo blowers to standardize around one blower technology for the facility. This will help to reduce costs associated with operating and maintaining vastly different systems. Since the aeration basin blowers are much bigger and more expensive, the final blower technology use should be standardized on the selection for the aeration basin blowers.

The variable pressure requirements of aerobic digesters can also be problematic for blowers that do not generate constant-pressure flow like turbos. Turbos struggle to compensate from large pressure swings associated with decanting the digesters, while hybrid blowers have no issues with these pressure swings. Similar to the aeration basin blowers, hybrid blowers have a nearly identical energy consumption at the flow and pressure required for the digesters as turbo blowers.

The blowers for the existing digester will remain located in the existing digester blower building. The future digester blowers will be located in the future dewatering, aeration, and pumping building.

[25] Health Research, Inc. (n.d.). *Recommended Standards for Wastewater Facilities, 2014 Edition*. Retrieved March 14, 2022, from https://www.broward.org/WaterServices/Engineering/Documents/WWSTenStateStandardsWastewater.pdf

The future digester will be aerated by two duty blowers and one redundant blower. These blowers will be identical to the replacement blowers for the existing digester. The three future digester blowers will be 100-HP hybrid blowers capable of 1,600 SCFM each. Only two blowers will be needed for digester #2.

## 5.4 Sludge Transfer Pump

The sludge transfer pump is a double-diaphragm pump capable of 200 GPM (288,000 GPD). It is adequately sized for plant buildout conditions and is approximately 10 years old. While double-diaphragm pumps are a reliable technology for suction lifting, especially with sludge and slurry pumping, the lift required for this pump is too great for reliable operation.

When the gravity thickener is demolished, it is recommended that the existing digester blower building is renovated. A new dewatering/blower building will be constructed with a basement. The basement will house a new progressive cavity sludge transfer pump for the existing digester. Progressive cavity pumps are more resistant to wear from pumping solids than other types of positive displacement pumps. Lowering the pump to a basement will aid in reducing the problems associated with the large suction lift.

The future digesters will have progressive cavity sludge transfer pumps in the basement of the future building that will house the future digester blowers. There will be two sludge transfer pumps for the future digesters to provide dedicated pumps to each during normal operation and provide redundancy if one needs to be taken offline.

## 5.5 Sludge Hauling and Disposal Opportunities

Biosolids management at municipal treatment facilities is regulated by 40 CFR Part 503. This standard establishes pollutant limits, identifies management and monitoring requirements, and outlines operational standards “for the final use or disposal of sewage sludge generated during the treatment of domestic sewage in a treatment works.” These standards include multiple methods to meet pathogen and vector attraction reduction requirements for sludge to be land-applied or placed on a surface-level disposal site.

The WRF has two potential methods for final disposal of biosolids. These include continued use of the Ohio Gulch Transfer Station drying beds with final disposal at the Milner Butte Landfill and the operation of a new pilot composting program.

As outlined in 40 CFR Part 503, the primary concerns regarding final biosolid disposal and/or use are as follows:

- Minimizing pathogen content,
- Reducing vector attraction, and
- Minimizing metals content

### 5.5.1 Ohio Gulch Drying Beds

Sludge drying beds were developed at the Ohio Gulch Landfill for the purpose of dewatering of liquid municipal biosolids from the Ketchum / SVWSD WRF and the City of Hailey’s Woodside WRF. The sludge drying beds are used to naturally dewater solids by the treatment facilities of Ketchum and SVWSD, Hailey, Bellevue, and The Meadows. The remote location of Ohio Gulch provides adequate sunlight, heat, and space to prevent odor problems for drying beds. The landfill was decommissioned in 2019 and has become the Ohio Gulch Transfer Station. The dewatered biosolids are taken to the Milner Butte Landfill, approximately 115 miles southeast of Ketchum in Burley, Idaho, when the solids reach an adequate level of dryness.

The biosolids are typically dried for up to 8 months in the beds, which result in a solids concentration of 75 to 90 percent. When the solids pass the “paint filter liquids test” (Method 9095B), they are eligible for final landfill disposal. This test method determines the presence of free liquids in a representative sample of waste.

In 2021, the Ketchum / SVWSD WRF reported delivering approximately 248 dry tons of dewatered biosolids to the drying beds at Ohio Gulch. After drying for a year, these biosolids can be expected to be at least 75 percent solids. This equates to approximately 331 tons of solids that would require hauling to final disposal after one year. Table 5-7 provides an estimate on the cost to transfer dried biosolids at the Ohio Gulch Transfer Station to final disposal at the Milner Butte Landfill if the WRF was required to haul the dried biosolids to the landfill. The WRF currently pays Ohio Gulch to transport dried biosolids to Milner Butte at $65/ton. While it would be more economical for the WRF to transport themselves, there are currently not enough employees to take on the additional workload.

**Table 5-7. Estimated cost to transfer from Ohio Gulch to Milner Butte in 2021**

| Parameter | Value | Units |
|---|---|---|
| Dry Weight | 248 | tons |
| Total Weight (75% Solids) | 331 | tons |
| Trips per Year | 17 | trips |
| Round-Trip Distance | 200 | miles |
| Labor and Truck Maintenance | $3 | per mile |
| Annual Labor and Truck Cost | $10,200 | per year |
| Tipping Cost ($16/ton) | $5,291 | per year |
| Total Annual Cost[1] | $15,491 | per year |

[1] Approximately $50/ton

## 5.5.2 Composting Pilot Study

Composting is the biological breakdown of organic matter, typically under aerobic conditions, by thermophilic microorganisms. It occurs when the appropriate carbon-to-nitrogen ratio is mixed with an adequate moisture content to encourage microbial growth. These thermophilic bacteria decompose the organic matter in reactions that produce heat, further promoting organic material breakdown. Aerobic conditions are vital to composting to prevent odor generation. Anaerobic conditions promote biological reactions that produce gases such as methane and hydrogen sulfide and create the typical “rotten eggs” odor often associated with raw sewage.

The final composted material can be used for land application as a soil conditioner, nutrient source, natural pesticide, moisture retention additive, and source of humic acids. Compost product can be generated from biosolids, green waste, food waste, or other organic-based wastes. Commercial composting operations typically operate in windrows, static aerated piles, or in-vessel. Figure 5-9 is a picture of a windrow turner in operation provided by Winn’s Compost.

**Figure 5-9. Windrow turning at Winn's Compost**

To understand the feasibility and operating cost and effort of composting biosolids produced by the treatment facilities that use the Ohio Gulch drying beds, the cities of Hailey and Ketchum/SVWSD are participating in a composting pilot study with Winn's Compost, a local Wood River Valley composting company, to produce compost that meets Class A EQ standards, as outlined in 40 CFR Part 503. EQ is used to describe biosolids that meet low-pollutant and Class A pathogen reduction limits and that have a reduced level of degradable compounds to attract vectors. This goal of this pilot study is to provide an alternative biosolid end-use to the Ohio Gulch drying beds and the Milner Butte Landfill for the treatment facilities that provides a beneficial use.

Pathogens are generally described as organisms that can directly or could indirectly cause "death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, or physical deformations" in organisms. Pathogens in municipal biosolids can commonly be total coliforms, viruses, and other similar organisms. Vector attraction is a characteristic of sludge that can attract organisms capable of carrying pathogens, such as rodents, flies, and mosquitoes.

Once the regulations are met, EQ biosolids are considered a product that has very few restrictions on its use. However, until the EQ quality is achieved, each facility is liable for proper management and monitoring of the biosolids. Biosolids produced to meet Class A EQ standards must meet the ceiling concentration limits and the pollutant concentration limits as shown in Table 5-8.

**Table 5-8. Class A EQ biosolid pollutant limits**

| Pollutant | Ceiling Concentration Limits for All Land-Applied Biosolids (mg/kg)[1] | Pollutant Concentration Limits for EQ Biosolids (mg/kg)[1] |
|---|---|---|
| Arsenic | 75 | 41 |
| Cadmium | 85 | 39 |
| Copper | 4,300 | 1,500 |
| Lead | 840 | 300 |
| Mercury | 57 | 17 |
| Molybdenum | 75 | - |
| Nickel | 420 | 420 |
| Selenium | 100 | 100 |
| Zinc | 7,500 | 2,800 |
| Applies to: | All biosolids that are land-applied | Bulk biosolids and bagged biosolids |
| From Part 503 | Table 1, Section 503.13 | Table 3, Section 503.13 |

mg/kg = milligrams per kilogram, EQ = exceptional quality
[1] dry weight. Source: EPA 1994.

To be considered Class A compost, the product must meet the following criteria for pathogen reduction at the time of preparation for sale or final disposal:

- The density of fecal coliforms must be less than 1,000 most probable number (MPN) per gram of total solids (dry-weight basis), OR
- The density of *Salmonella* sp. Bacteria in the biosolids must be less than 3 MPN per 4 grams of total solids (dry-weight basis)

These pathogen requirements must meet or exceed the milestones outlined in 40 CFR Part 503. Using the windrow composting method, which is currently being used at Winn's Compost for the City of Hailey's composting pilot study, the temperature of the biosolids must be maintained at 55°C or higher for at least 15 days if using windrows. The windrow must be turned at least five times during this span. The 15-day detention time at temperature can be reduced to 3 days with a static aerated pile.

Composting requirements outlined above are put in place to provide adequate pathogen reduction. Part 503 also requires adequate vector attraction reduction and presents 12 options to do this. The first eight alternatives provide adequate vector attraction reduction for Class A EQ standards and must be must concurrently with the pathogen reduction requirements. Composting operations typically adhere to Option 5, which requires the use of aerobic processes at greater than 40°C for at least 14 days, since using the windrow composting method provides the vector attraction reduction requirements without additional labor. Figure 5-10 provides a process flow diagram for the pilot study.

### 5.5.3 Land Application

The third alternative biosolid disposal opportunity the Ketchum / SVWSD WRF could take advantage of is disposal via land application. As discussed in Section 3.8.6, land application essentially only varies from composting in that the biosolids treatment occurs on-site at the WRF rather than at a composting facility.

The WRF does not have the capacity or dewatering equipment available currently to produce biosolids capable of meeting beneficial reuse requirements. The facility will have sufficient capacity to produce Class B biosolids on-site during average annual conditions, but not at peak month conditions by the end of the planning period.

### 5.5.4 Biosolids End-Use Recommendation

High-quality beneficial biosolids reuse by composting is recommended. It is a low-cost method of disposal with minimum investment. The results of the composting pilot study will further determine the feasibility. Once the WRF upgrades its dewatering system, Winn's Compost will be able to efficiently handle the biosolids produced at the WRF.

The Ohio Gulch drying beds, with disposal at the Milner Butte Landfill, will remain as the primary disposal method for biosolids until composting is proven to be successful. The drying beds will remain available to the WRF in the event that either the composting pilot study fails or Winn's Compost operations must be taken offline for any reason.

As discussed in Section 1.4.7, the one caveat to beneficial use of biosolids by composting is the emerging constituents of concern, perfluoroalkyl and polyfluoroalkyl substances (PFAS). The chemicals are currently still under investigation with regards to exposure risks, harm to the environment, how to treat the chemicals, and how to regulate the chemicals.

Until more research and a final determination is made by EPA the composting alternative should be advanced. The composting alternative does not have a substantial capital investment (none is included in this FPS). As composting is further considered and any agreements are developed with the composter, the potential for discontinuing should be understood by all parties.

## 5.6 Upgrades Summary

Figure 5-11 shows the plant buildout layout and Figure 5-12 shows the buildout process flow schematic.

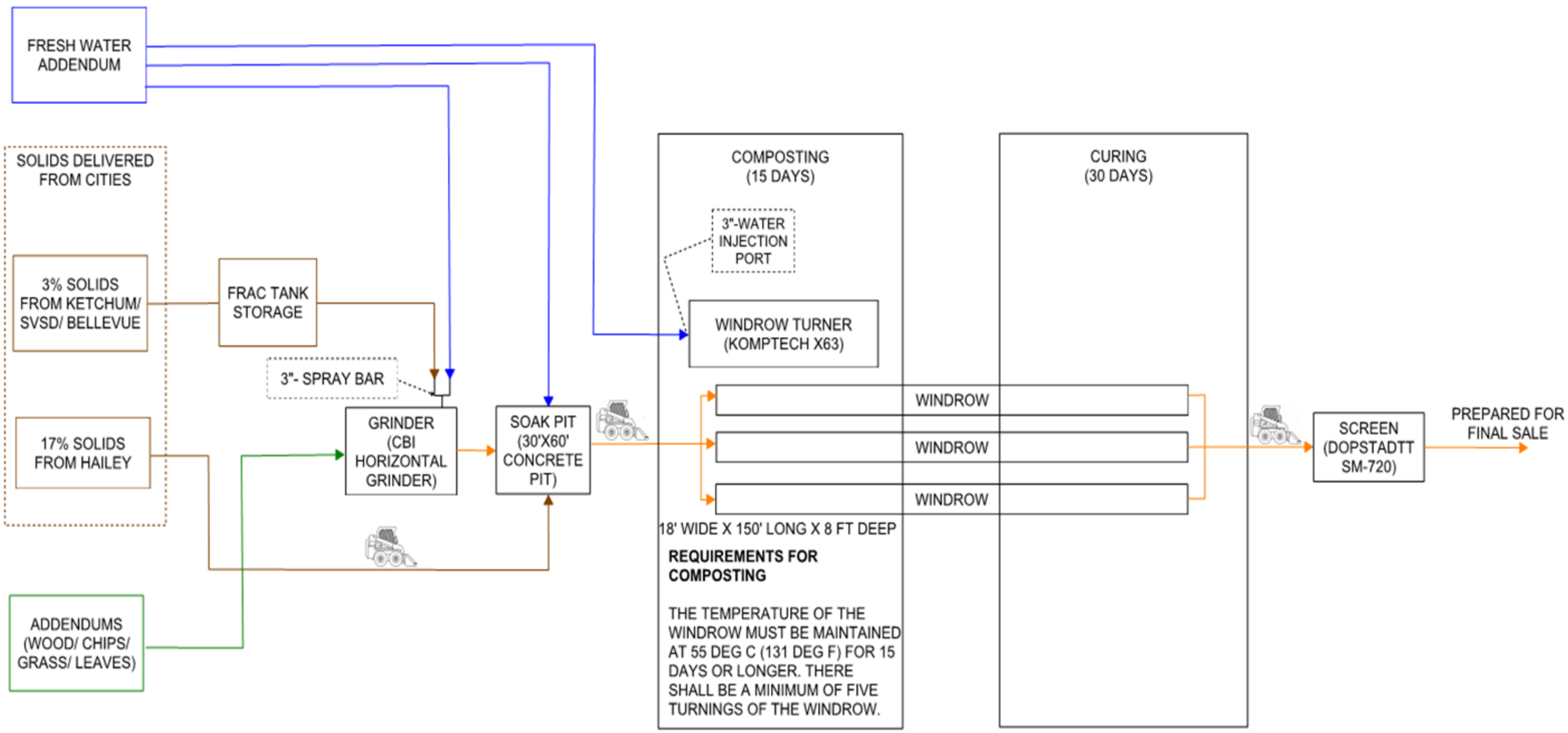



**Figure 5-10. Composting pilot study process flow diagram**

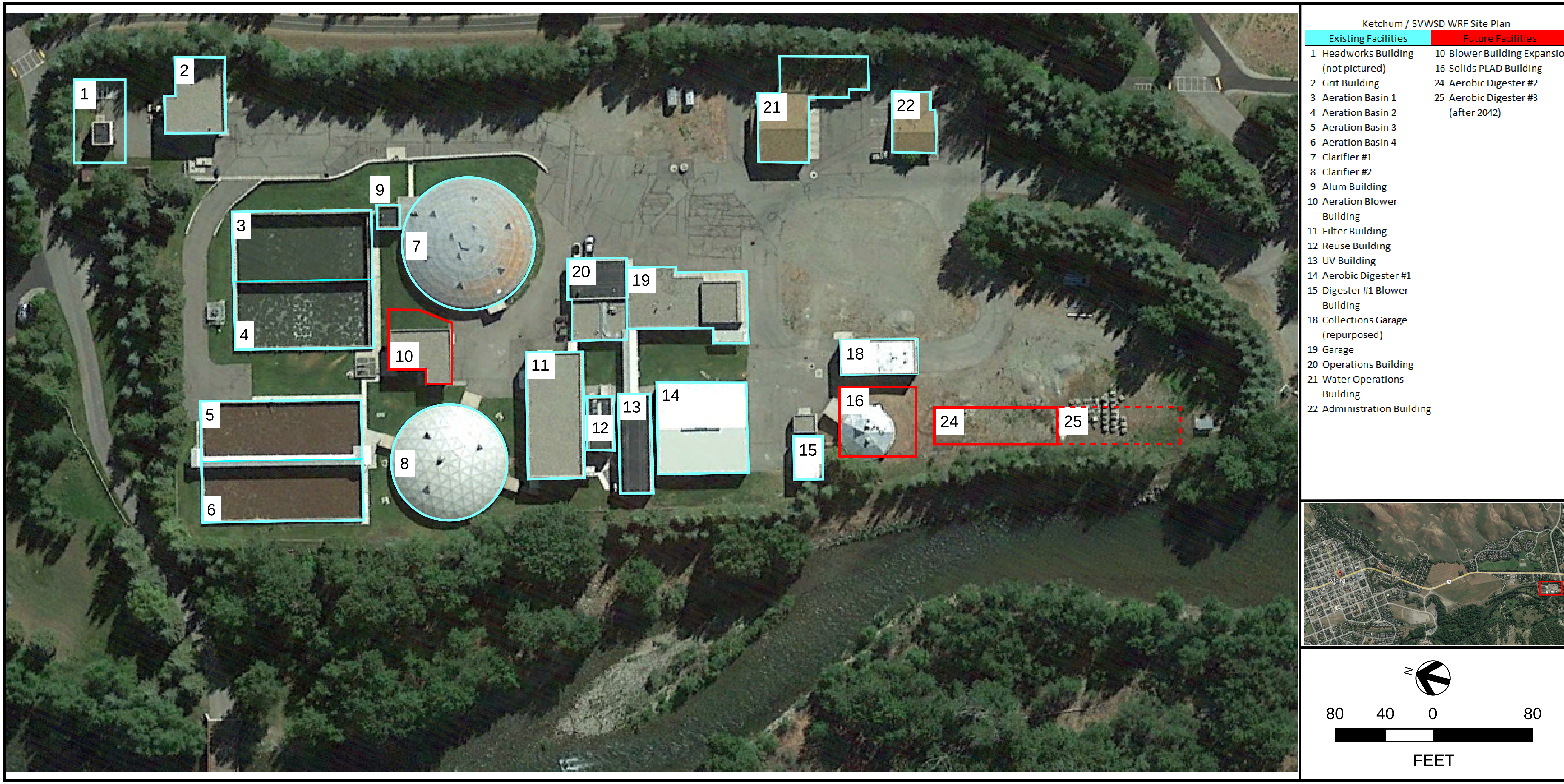



**FIGURE 5-11. FUTURE PLANT LAYOUT**

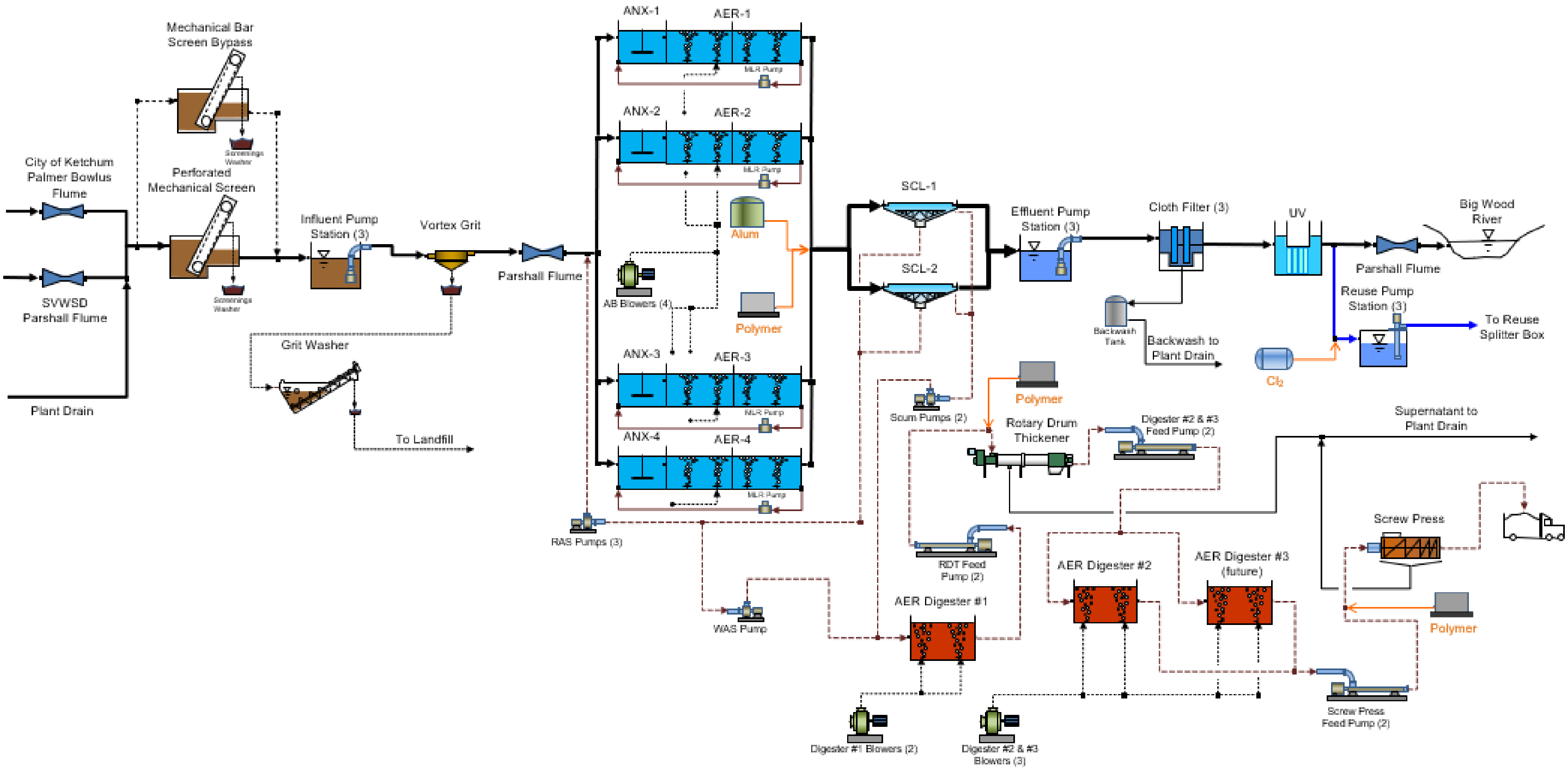



**Figure 5-12. Future flow schematic**

ANX= anoxic basin; AER=aerobic basin; SCL=secondary clarifier; UV=ultraviolet; RDT=rotary drum thickener

# 6 Electrical Infrastructure, Support Facilities, and Staffing

## 6.1 Introduction

There are three primary support functions for the WRF:

- Sustainability
- Electrical Infrastructure
- Administration/Laboratory services
- Maintenance services

The purpose of this section is to evaluate the existing facilities and provide a plan to meet current and future needs.

The existing facilities do not provide adequate working space for the staff's present workload, and sections of the facilities need to be updated to meet staff needs and improve working conditions. Moreover, the WRF will continue to expand to meet the wastewater demands of the community. To accommodate the growth of the plant, the support services will also require expansion.

The DEQ plant classification worksheet is used to determine the required level of training needed to operate the plant. The worksheet is located in Appendix C. For this WRF, the required staff, based on EPA and DEQ requirements, is a core staff of a Class IV operator and Class IV backup operator. Total staffing should include a superintendent certified at Wastewater Class IV, one lead operator certified at Wastewater Class IV, one operator certified at Wastewater Class II or II, two assistant operators certified at Class I or higher, one person able to perform normal mechanical and/or electrical maintenance, one lab technician, and a part-time administrative assistant.

## 6.2 Electrical and Controls Infrastructure

The following improvements are recommended in addition to those identified in Sections 4 and 5 above:

### 6.2.1 Electrical

The existing engine-generator was installed in 2004 and has an asset life of approximately 20-25 years. The engine-generator should be replaced by 2029. Note, the increased load associated with the recommended process improvements (particularly aeration) can create generator loading concerns unless the aeration blowers (and other new motor loads) can be controlled via VFD with appropriate harmonic filtering to limit motor starting voltage transients.

As of June 2022, the delivery time for a pad mounted transformer is up to 52 weeks, which would put the WRF in an untenable position should the existing 2,500-kVA transformer unexpectedly fail. It is recommended the City immediately purchase a spare transformer to have readily available. Note, a considerably smaller (and less expensive) transformer can be purchased based on the expected peak electrical demand of 500-kW. It is recommended that either a 750-kVA or 1000-kVA (whichever is most available during time of purchase) be immediately purchased and stored at a non-corrosive location within the WRF plant.

### 6.2.2 Controls

Recommend continuing monitoring the lifecycle status of the 1756 ControlLogix PLC platform but expect that it will need to be replaced two times within the 2042 planning period (between years 2025-2030 and again between 2035-2040).

## 6.3 Staffing and Administrative Services

Table 6-1 presents the current wastewater staff and an estimate of the staff required at plant buildout. The current operations staff provides many services besides operating the plant. For example, an operator often must also be an electrician, maintenance person, or laborer. As the plant grows, there will be a higher demand on the operators' skills and a higher demand for electrician, maintenance, and laborer skills. Thus, it will be beneficial and cost-effective to add staff whose jobs are more specialized in these areas of expertise, allowing the operators to better focus their attention on producing high-quality effluent.

### 6.3.1 Standby/Emergency Staffing

DEQ requires that a certified operator must always be the responsible charge (RC) of the system while the system is in operation. The RC is an operator who is certified at a class equal to or greater than the classification of the wastewater system. The RC must be actively on site and/or on call daily. The RC takes responsibility for decisions about operations, maintenance, water quality, and public health issues. The WRF currently has three Class IV or higher operators.

**Table 6-1. Staffing estimates for the wastewater department**

| Wastewater Staff | Current | Plant Buildout |
|---|---|---|
| Superintendent | 1 | 1 |
| Lab Technician[1] | 1 | 1 |
| Operators | 2 | 2 |
| Operator/Maintenance | 2 | 3 |
| Electrician/Controls | 0 | 1 |
| Front Office | 0.5 | 0.5 |
| Summer Maintenance Assistant | 0 | 0.5 |
| Collections[2] | 0.5 | 1 |
| Total | 7 | 10 |

[1] Also a Class III or higher operator
[2] Ketchum and SVWSD collections are separate

There is one employee dedicated to maintaining the Ketchum sanitary collection system. However, regarding both safety and efficiency, many of the maintenance and inspection tasks on the collection system require two people. As such, a second employee is assigned during summer and special maintenance activities. The second employee will be required as the plant grows and for the safety and efficiency of the collection crew.

The plant is currently manned approximately 8 hours per day. It is not anticipated that additional shifts would be required in the future to operate the processes selected. The design of the alarm system considers the plant does not always have an operator onsite during the night.

The WRF standby system operates with one wastewater operator on call from 3:30 PM to 7:30 AM, Monday through Friday. During weekend operation, an operator will perform daily testing and complete a full plant walkthrough from 7:00 AM to 10:00 AM. One of the Class IV operators is always available to act as the RC when needed.

## 6.4 Site Buildings

The existing facilities provide adequate working space for the staff's present workload. But as upgrades are incorporated into the WRF, sections of the facilities will need to be updated to meet staff needs.

### 6.4.1 Collections Jet Truck and Maintenance Garage

The Ketchum collection staff person is based alongside the wastewater staff. Ketchum and SVWSD share a sewer jet truck for collection system maintenance. The jet truck is a substantial investment and frequently is required for emergency collections situations that can occur in the winter. Therefore, it is necessary to provide indoor heated storage. The current jet truck uses a garage stall in the operations building but the recently purchased jet truck will not fit in this space.

To solve the jet truck storage problem, it is recommended to move the truck to the current sludge loading building once a new dewatering building is constructed. This will open the space in the operations building for additional maintenance area. The WRF also recently purchased a utility tractor to be used for miscellaneous work across the facility. The primary function of the tractor during the winter is snow removal. This is another vehicle that will take up space in the operations building garage.

### 6.4.2 Locker Room

There is currently one locker room/restroom that is shared by male and female employees. A second restroom with shower can be constructed in the operations building once the jet truck is moved and the maintenance area is expanded into the garage stall.

### 6.4.3 Laboratory Services

The existing laboratory has the necessary equipment and storage to perform routine analysis required by the current permits. There are some specialized procedures, such as bioassays, that are typically sent to laboratories suited for this purpose.

## 6.5 Miscellaneous Building Improvements

Besides increasing the working area of the plant, the current buildings also require maintenance. Exterior Finish Insulation System (stucco) repair is needed as the buildings age (screening building, grit building, aeration blower building, alum building, filter building, UV disinfection building, reuse pump building, digester blower building, sludge loadout building, and office/lab building). These buildings require regular maintenance to maintain outward appearance conforming to an agreement with neighbors.

The current central administration building located at the plant entrance gate is not connected to the standby power system. This building should be electrically connected to keep the full plant facility operational during emergency situations.

After the buildings have been upgraded, the parking lot needs to be resurfaced. Since the parking lot is made of asphalt, resurfacing is required occasionally to repair weather damage and normal wear and tear. It is also necessary to separate the storm water system flowing through the plant grounds from WRF stormwater. Table 6-2 provides an estimate on the cost of building improvements.

**Table 6-2. Building and vehicle improvements cost estimation**

| Project | Cost[1] | Annualized Cost[2] |
|---|---|---|
| Parking Lot Repaving | $1,330,000 | $66,500 |
| Lab/Ops/Maintenance Remodel | $1,010,000 | $50,500 |
| Utility Tractor | $67,000 | $3,350 |
| Sewer Cleaning "Vac" Truck | $450,000 | $22,500 |
| **Total** | $2,857,000 | $142,850 |

[1] Costs are presented in 2022 dollars and are not escalated to year of construction. Also includes contingency.
[2] Based on 20-year period and assumed 3.0% inflation rate.

# 7 Implementation Plan

## 7.1 Cost Summary

This section summarizes the cost associated with the needed future improvements to the Ketchum / SVWSD WRF. All costs presented in this chapter are shown in 2022 dollars and include contingency costs due to the volatile nature of the market. The costs presented in Table 7-1 show the estimated capital cost of the improvements, along with the annualized costs. The annualized costs are based on a 3.0 percent inflation rate over a 20-year evaluation period, as mentioned in Section 1.5.3. The information used for cost estimates is found in Appendix D.

**Table 7-1. Improvement cost summary**

| Project | Capital Cost[1] | Annualized Cost[2] |
|---|---|---|
| Aeration Basins - Anoxic and MLR (Nos. 3 & 4) | $987,000 | $66,342 |
| Aeration Basin Blower Repair | $65,000 | $4,369 |
| Grit Removal System | $1,015,000 | $68,224 |
| Aeration Basin Upgrades (Nos. 1 & 2) | $2,140,000 | $143,842 |
| Rotary Drum Thickener & Dewatering Building | $7,204,000 | $484,222 |
| Remove Digester No. 1 Building and New Flat Covers | $690,000 | $46,379 |
| Clarifier No. 1 HVAC and Roof Repair | $183,000 | $12,300 |
| Gravity Thickener & Transfer Building Demo | $145,000 | $9,746 |
| Digester No. 2 | $2,648,000 | $177,987 |
| Screw Press | $1,527,000 | $102,638 |
| New & Replacement Digester Blowers | $1,829,000 | $122,938 |
| Aeration Basin Blowers & Updated Electrical | $6,626,000 | $445,371 |
| Replace Generator & MCC-3 | $1,263,000 | $84,893 |
| Pump Replacements | $1,413,000 | $94,976 |
| Replace UV Equipment | $1,694,000 | $113,863 |
| Upgrade PLC Hardware | $1,356,000 | $91,144 |
| Upgrade Filter PLC | $102,000 | $6,856 |
| Digester No. 1 Diffusers | $250,000 | $16,804 |
| Clarifier Mechanism No. 1 Replacement | $553,000 | $37,170 |
| Upgrade Dewatering PLC | $102,000 | $6,856 |
| Misc. Headworks Improvements | $271,000 | $18,215 |
| Upgrade UV PLC | $102,000 | $6,856 |
| Clarifier Mechanism No. 2 Replacement | $454,000 | $30,516 |
| Lab/Ops/Maintenance Remodel | $1,010,000 | $67,888 |
| Utility Tractor | $67,000 | $4,503 |
| Sewer Cleaning "Vac" Truck | $450,000 | $30,247 |
| Parking Lot Repaving | $1,330,000 | $89,397 |
| Replace VFD's | $1,564,000 | $105,125 |
| Outfall Clearing | $167,000 | $11,225 |
| **Total** | $37,207,000 | $2,500,895 |

[1] Costs are presented in 2022 dollars and are not escalated to year of construction. Also includes contingency.
[2] Based on 20-year period and assumed 3.0% inflation rate
MLR=mixed liquor recycle; HVAC=heating, ventilation, and air conditioning; UV=ultraviolet; SCADA=supervisory control and data acquisition system; PLC=programmable logic controller

### 7.1.1 Cost Breakdown

The magnitude of the improvements may require a need to prioritize. The improvements can be broken into critical process areas and non-critical infrastructure issues. If a need arises that requires tight budgeting, then the process should be considered first, as the delay of these items impacts treatment performance and possibly permit compliance. Table 7-3 separates the improvements into process “near-term” (2022-2032), process “long-term” (2032-2042), and ancillary.

### 7.1.2 Operations and Maintenance

O&M costs can make up a large part of the annual budget, making it important to plan for future increases. Summarized in Table 7-2 is the 2021-2022 O&M expenditures and costs. Also shown in the table are the estimated 2042-2043 O&M costs in 2022 dollars for purpose of comparison. The future estimates are based on staffing requirements discussed in Section 6.3 and flow, load, and maintenance requirements discussed throughout the plan.

**Table 7-2. O&M cost summary**

| Item | Unit Cost | Units | 2021-2022 | 2042-2043[1] |
|---|---|---|---|---|
| Labor (including benefits) | $51.07 | per hour | $637,354 | $1,168,482 |
| Power (including demand and basis charges) | $0.063 | per kWh | $112,562 | $236,025 |
| Alum (17% Al2O3) | $472 | per dry ton | $7,772 | $12,808 |
| Polymer | $4,900 | per ton | $24,108 | $39,727 |
| Cloth Filter Replacement | $60,000 | every 10 years | $6,000 | $6,000 |
| Sodium Hypochlorite (12.5% NaClO) | $806 | per tote (330 gal) | $6,574 | $10,833 |
| Solids Hauling to Ohio Gulch Drying Beds | $3.00 | per mile | $19,062 | $4,443 |
| Solids Disposal to Milner Butte Landfill | $65 | per ton | $21,493 | $28,826 |
| | | **Total** | $834,925 | $1,507,143 |

[1] Costs are presented in 2022 dollars to provide a comparison

## 7.2 Implementation

The timing of improvements included in this plan is based on a phased approach that has worked well for the WRF in the past. When improvements are implemented, the goal is to make updates or modifications at the timing that matches the need; be it due to permit changes, system capacity, or equipment age. The estimated timing for the improvements in 10-year increments is shown in Table 7-3. The estimated upgrades project schedule on an annual basis is shown in Table 7-4. The costs shown in Table 7-4 are escalated to the projected year of construction. The Project Cost (2022 dollars) column is shown for comparison to the previous cost tables in this FPS.

**Table 7-3. Upgrade categories**

| Project | Capital Cost[1] | Annualized Cost[2] |
|---|---|---|
| **Process Near-Term (2022-2032)** | | |
| Aeration Basins - Anoxic and MLR (Nos. 3 & 4) | $987,000 | $49,350 |
| Aeration Basin Blower Repair | $65,000 | $3,250 |
| Grit Removal System | $1,015,000 | $50,750 |
| Aeration Basin Upgrades (Nos. 1 & 2) | $2,140,000 | $107,000 |
| Rotary Drum Thickener & Dewatering Building | $7,204,000 | $360,200 |
| Remove Digester No. 1 Building and New Flat Covers | $690,000 | $34,500 |
| Clarifier No. 1 HVAC and Roof Repair | $183,000 | $9,150 |
| Gravity Thickener & Transfer Building Demo | $145,000 | $7,250 |
| Digester No. 2 | $2,648,000 | $132,400 |
| Screw Press | $1,527,000 | $76,350 |
| New & Replacement Digester Blowers | $1,829,000 | $91,450 |
| Aeration Basin Blowers & Updated Electrical | $6,626,000 | $331,300 |
| Pump Replacements[3] | $706,500 | $35,325 |
| Replace UV Equipment | $1,694,000 | $84,700 |
| Upgrade PLC Hardware | $1,356,000 | $67,800 |
| Upgrade Filter PLC | $102,000 | $5,100 |
| Digester No. 1 Diffusers | $250,000 | $12,500 |
| Clarifier Mechanism No. 1 Replacement | $553,000 | $27,650 |
| Upgrade UV PLC | $102,000 | $5,100 |
| Replace VFD's | $782,000 | $39,100 |
| Outfall Clearing[4] | $83,500 | $4,175 |
| Subtotal | $30,688,000 | $1,534,400 |
| **Process Long-Term (2033-2042)** | | |
| Replace Generator & MCC-3 | $1,263,000 | $63,150 |
| Pump Replacements[3] | $706,500 | $35,325 |
| Upgrade Dewatering PLC | $102,000 | $5,100 |
| Misc. Headworks Improvements | $271,000 | $13,550 |
| Clarifier Mechanism No. 2 Replacement | $454,000 | $22,700 |
| Replace VFD's | $782,000 | $39,100 |
| Outfall Clearing[4] | $83,500 | $4,175 |
| Subtotal | $3,662,000 | $183,100 |
| **Ancillary** | | |
| Parking Lot Repaving | $1,330,000 | $66,500 |
| Lab/Ops/Maintenance Remodel | $1,010,000 | $50,500 |
| Utility Tractor | $67,000 | $3,350 |
| Sewer Cleaning "Vac" Truck | $450,000 | $22,500 |
| Subtotal | $2,857,000 | $142,850 |
| **Total** | $37,207,000 | $1,860,350 |

[1] Costs are presented in 2022 dollars and are not escalated to year of construction. Also includes contingency.
[2] Based on 20-year period and assumed 3.0% inflation rate
[3] Pump replacements split in four installments- two short-term, two long-term.
[4] Two outfall clearings in planning period- one short-term, one long-term.
MLR=mixed liquor recycle; HVAC=heating, ventilation, and air conditioning; UV=ultraviolet; SCADA=supervisory control and data acquisition system; PLC=programmable controller logic

## Table 7-4. Upgrade project schedule

| Project | Project Cost (2022 Dollars) | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028-2032 | 2033-2037 | 2038-2042 |
|---|---|---|---|---|---|---|---|---|---|---|
| Aeration Basins - Anoxic and MLR (Nos. 3 & 4) | $987,000 | | $1,016,610 | | | | | | | |
| Aeration Basin Blower Repair | $65,000 | $65,000 | | | | | | | | |
| Grit Removal System | $1,015,000 | | | | | | | $1,324,345 | | |
| Aeration Basin Upgrades (Nos. 1 & 2) | $2,140,000 | | | | | | $1,240,423 | $1,277,636 | | |
| Rotary Drum Thickener & Dewatering Building | $7,204,000 | | | $3,821,362 | $3,936,003 | | | | | |
| Remove Digester No. 1 Building and New Flat Covers | $690,000 | | $710,700 | | | | | | | |
| Clarifier No. 1 HVAC and Roof Repair | $183,000 | | | $194,145 | | | | | | |
| Gravity Thickener & Transfer Building Demo | $145,000 | | | | $158,445 | | | | | |
| Digester No. 2 | $2,648,000 | | | | | | | $3,355,384 | | |
| Screw Press | $1,527,000 | | | | | $1,718,652 | | | | |
| New & Replacement Digester Blowers | $1,829,000 | | | | | | | $2,249,439 | | |
| Aeration Basin Blowers & Updated Electrical | $6,626,000 | | $2,185,660 | | $1,849,987 | | $1,276,361 | $2,298,097 | | |
| Replace Generator & MCC-3 | $1,263,000 | | | | | | | $1,599,931 | | |
| Pump Replacements | $1,413,000 | | | | | | $409,514 | $474,738 | $550,352 | $638,009 |
| Replace UV Equipment | $1,694,000 | | | | | | | $2,022,725 | | |
| Upgrade PLC Hardware | $1,356,000 | | | | | $1,526,190 | | | | |
| Upgrade Filter PLC | $102,000 | | $105,060 | | | | | | | |
| Digester No. 1 Diffusers | $250,000 | | | | | | | $326,193 | | |
| Clarifier Mechanism No. 1 Replacement | $553,000 | | | | | | | $743,186 | | |
| Upgrade Dewatering PLC | $102,000 | | | | | | | | $149,790 | |
| Misc. Headworks Improvements | $271,000 | | | | | | $59,123 | | | $353,035 |
| Upgrade UV PLC | $102,000 | | $105,060 | | | | | | | |
| Clarifier Mechanism No. 2 Replacement | $454,000 | | | | | | | | $666,714 | |
| Lab/Ops/Maintenance Remodel | $1,010,000 | | | | | | | | $1,398,076 | |
| Utility Tractor | $67,000 | $67,000 | | | | | | | | |
| Sewer Cleaning "Vac" Truck | $450,000 | $450,000 | | | | | | | | |
| Parking Lot Repaving | $1,330,000 | | | | | $748,463 | | | | $1,201,064 |
| Replace VFD's | $1,564,000 | | | | | | | $933,749 | | $1,254,880 |
| Outfall Clearing | $167,000 | | | | | $93,980 | | | $126,301 | |
| **Total 2022 Cost (including 3.0% inflation)[1]** | **$37,207,000** | **$582,000** | **$4,123,090** | **$4,015,507** | **$5,944,435** | **$4,087,285** | **$2,985,421** | **$16,605,423** | **$2,891,234** | **$3,446,989** |

[1] Total cost accounting for 3.0% inflation: $44,681,400

MLR=mixed liquor recycle; HVAC=heating, ventilation, and air conditioning; UV=ultraviolet; SCADA=supervisory control and data acquisition system; PLC=programmable logic controller

## 7.3 Project Financing

The City of Ketchum and the SVWSD jointly bear the cost of operation and maintenance for the WRF. The capital costs for upgrades at the WRF are split evenly between the two entities, and O&M costs are split based on the fraction of total plant hydraulic inflow contributed by each party. Currently, the flow is split approximately 55 percent from the City of Ketchum and 45 percent from the SVWSD.

The funding options that have been identified are available to cities to help pay for infrastructure improvements. In general, these options can be categorized as follows: growth fees, user rates, grants, and loan programs.

The Idaho State Legislature has developed statutes that allow communities to attach a price to new growth and development through the implementation of impact fees (Idaho Code § 67-8201). The law allows government entities to charge a developer for a “proportionate share” of the cost of public facilities impacted by residential, commercial, and industrial development. The calculation of the proportionate share must be based on a planning study that includes a comprehensive land use plan, a capital improvements plan, and a cash flow analysis. Typically, the money must be spent on the specific project it was collected for within 8 years of the collection, but wastewater facilities are allowed 20 years (Idaho Code § 67-8201).

The current sewer impact fee is $3,100 and $2,921 per residential equivalent connection for the SVWSD and City of Ketchum, respectively.

Government entities may also charge an “equity buy-in” fee for customers to connect to the system. This fee accounts for the demand the new connection will place on the system and the depreciated replacement value of the system at the time of the connection. The funds collected from this fee should be held in a separate account and can only be used for replacement of wastewater system components. The recommended charges are based on audited financial information and estimated system capacities. The methodology to calculate these charges are based on Idaho case law (*Loomis v. Hailey*).

### 7.3.1 Rate Structure

A sewer rate is based on the principle that total revenue shall be obtained from users and nonusers (properties) who use, need, and benefit from the facilities are provided in proportion to the cost. The current Ketchum and Sun Valley connections and quarterly user rates are shown in Table 7-5.

**Table 7-5. User rates summary**

| Item | Ketchum | SVWSD | Total |
|---|---|---|---|
| Connections[1] | 2,089 | 2,792 | 4,881 |
| Average Monthly Rate per Connection | $39.12 | $23.00 | - |
| Average Quarterly Revenue | $245,165 | $192,648 | $437,813 |
| Average Yearly Revenue | $980,660 | $770,592 | $1,751,252 |

[1] Total connections as of 2022

The total cost to complete the improvements at the WRF, with capital costs escalated to account for 3 percent inflation, is estimated to be $46,681,400. Based on the wastewater revenue identified in Table 7-5, and the operating costs in Table 7-2, the City of Ketchum and the SVWSD are able to fund a portion of its capital projects based on the difference between revenue and the typical operating costs (approximately $1,750,000 in revenue estimated for fiscal year 2022 with an estimated operating cost of $834,925 for fiscal year 2022). The entities will not be able to provide funds for all the capital projects identified in Chapter 7 with constant user rates and connection fees for the next 20 years. Added revenue is necessary for future projects within the planning period.

The $37.2 million (2022 dollars) identified in project cost consists of both upgrades and replacements to extend the lifespan of existing equipment and upgrades to accommodate future growth. Therefore, some project timelines are based on equipment design life, while some projects can be delayed until required by future growth. This allows the City of Ketchum and SVWSD to collect revenue through user rates, impact fees, and connections fees over time, so projects can be constructed using reserve funds instead of bonding. The growth in Ketchum is anticipated to add 540 connections, or a growth rate of 1.14 percent, by 2042. The growth in Sun Valley is anticipated to add 1,475 connections, or a growth rate of 2.14 percent, by 2042.

The structuring of sewer rates can take numerous forms. Some communities use a base rate with a demand charge. The demand charge is based on winter water usage to estimate the water entering the sewer system. Some communities base the rates completely on usage and have tiers of rates based on tiers of water use. Still other communities use a base rate without consideration of flow.

Monthly rates for several neighboring cities plus other similar sized Idaho cities are shown below:

- Hailey (water use related) - $59.37 (5,000 gallon/month), $49.11 (4,000 gallons/month)
- Bellevue - $85.86
- Jerome - $70.00
- Rupert - $56.91
- Heyburn - $65.61
- Burley - $45.50
- McCall - $60.00 (2,000 – 3,000 gallons), $70.00 (3,000 – 4,000 gallons)

The City of Ketchum can generate sufficient revenue for the capital costs and share of operating costs by increasing user rates annually at an average rate of 3.8 percent, assuming connection fees are not increased. This will also leave the City with an operating wastewater budget of approximately $1,000,000 to be used as a reserve fund for unexpected costs, such as repairs for premature equipment failure. The monthly user rate using a 3.8 percent annual increase begins at $39.12 (in 2022) and ends at $72.51 (in 2042). Figure 7-1 provides a visual representation of the planning period cash flows for the City of Ketchum.

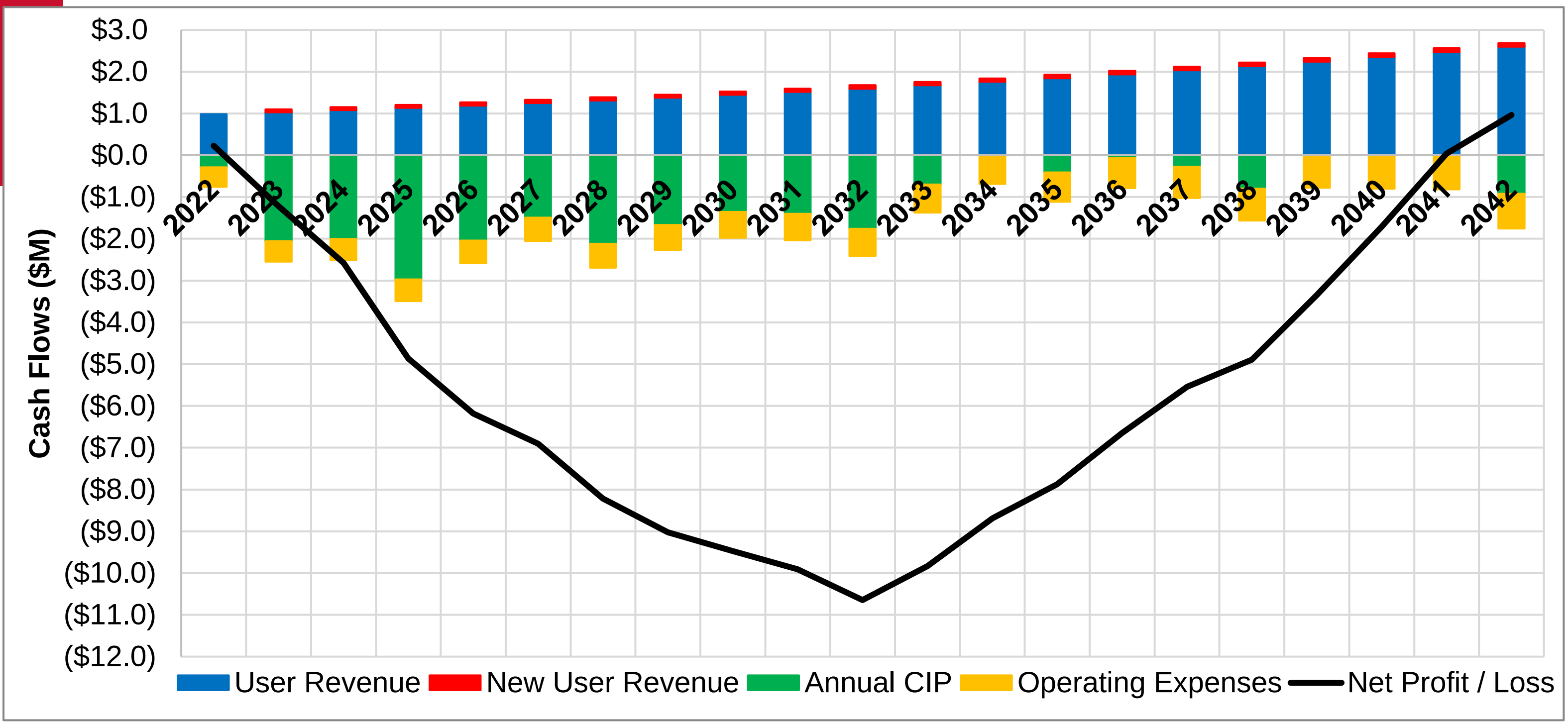



**Figure 7-1. City of Ketchum wastewater cash flows**

The SVWSD can generate sufficient revenue for the capital costs and share of operating costs by increasing user rates annually at an average rate of 3.4 percent, assuming connection fees are not increased. The SVWSD has contemplated increasing connection fees to reduce the required rate increase- if the SVWSD increases connection fees by 2.5 percent annually, then the user rates would only have to be increased at an average rate of 3.0 percent. Both alternatives will leave the SVWSD with approximately $1,000,000 in the wastewater budget for unexpected costs by the end of the planning period. The monthly user rate using a 3.0 percent annual increase begins at $23.00 (in 2022) and ends at $41.14 (in 2042). The new user connection fee using a 2.5 percent annual increase begins at $3,100 (in 2022) and ends at $5,080 (in 2042). Figure 7-2 provides a visual representation of the planning period cash flows for the SVWSD with both connection fee and user rate increases.

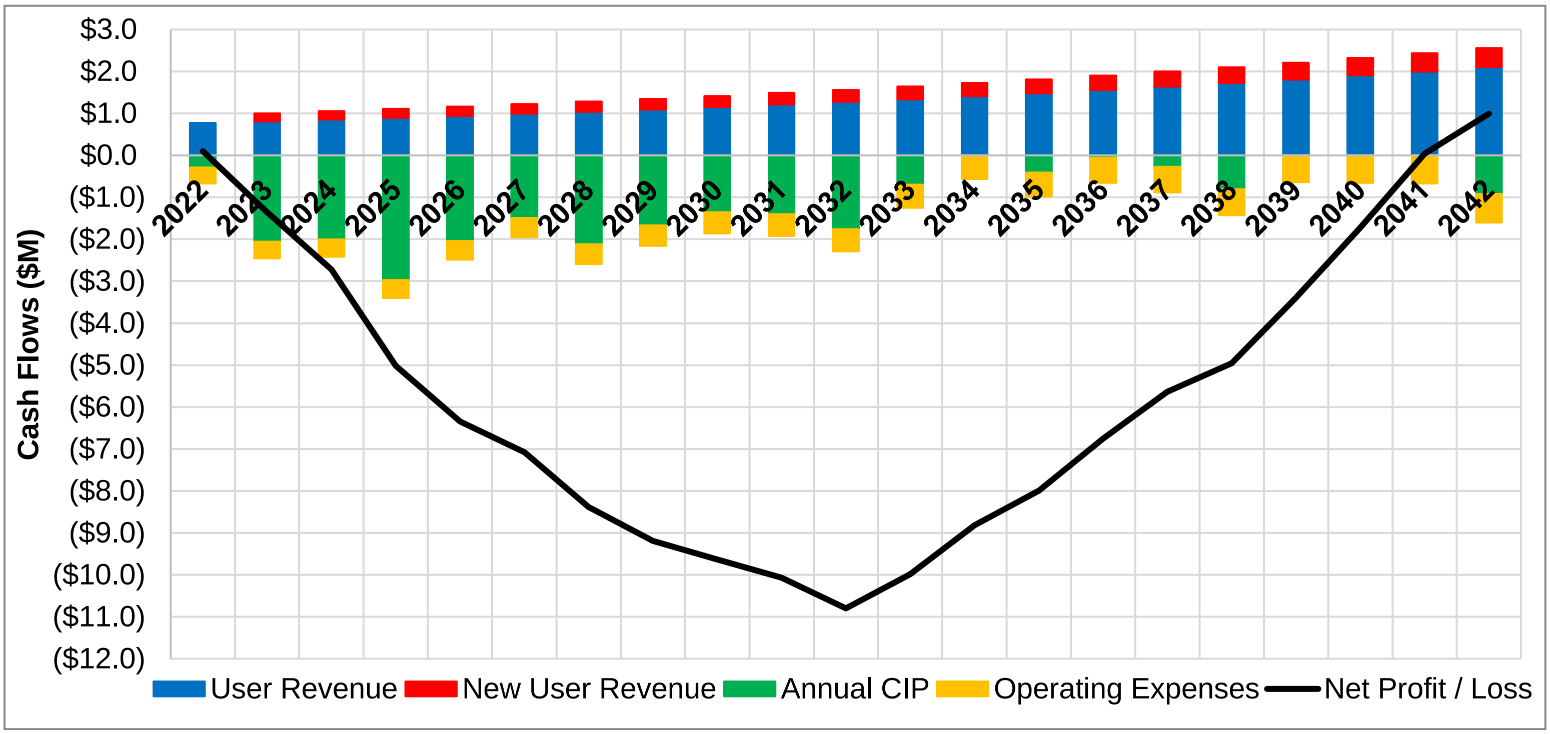



**Figure 7-2. SVWSD wastewater cash flows**

These alternatives would require both entities to take debt in 2023 to begin the substantial projects during the first 10 years. With a reasonable annual increase in rates (3-4 percent), the loans could be paid off by the end of the planning period (2042). This revenue plan is an example to illustrate the magnitude of rate increases needed to upgrade the plant through the planning period. The final financial plan will require adjustment to mesh the revenue generation with the upgrade schedule and is outside the scope of this document. A detailed rate study should be conducted to make a more accurate assessment of user rate adjustments required to fund the planning period projects.

### 7.3.2 Grant Programs

Non-growth-related costs can be financed through loans and/or grants. Ketchum and SVWSD can consider making applications for financing of the proposed improvements, including both loans and grants, to minimize the costs to the community. Potential sources of funding include the DEQ Revolving Loan Fund or U.S. Department of Commerce Economic Development Agency (USDA-RD) loans and grants, or Department of Commerce Economic Development Administration Grants.

The Idaho Community Development Block Grant program (ICDBG) assists Idaho cities and counties under 50,000 residents with the development of needed public infrastructure and housing in an effort to support local economic diversification and growth. The program is administered by the Department of Commerce and Labor Division of Community Development.

For a city to be eligible for such grants, the community must be generally economically depressed. Therefore, the communities of Ketchum and Sun Valley would not qualify for such grants.

### 7.3.3 Loan Programs

#### General Obligation Bonds

Ketchum or SVWSD can issue general obligation bonds to finance the construction of sewer system improvements. Such bonds are secured by the city and are subject to voter approval by two thirds majority. General obligation bonds are typically the strongest security that a community can offer bondholders, and consequently, result in the lowest overall interest cost.

#### Revenue Bonds

Under Idaho Code, Ketchum or SVWSD can issue revenue bonds to finance the construction of sewer system improvements. Revenue bonds are secured by a pledge of revenues collected from enterprise operations such as water or sewer utilities. These bonds are subject to voter approval by simple majority and typically require the creation of a bond reserve fund. When pursuing revenue bonds, the borrowers should be aware that covenants will be established that obligate the borrower to maintain and operate the utility system in a specified manner as long as bonds are outstanding. Interest rates on a revenue bond issue will reflect the overall financial strength of the utility.

#### State Revolving Loan Fund (SRF)

DEQ administers the State Revolving Loan Fund program. Loans are provided below market rate interest to Idaho communities to build new or repair existing wastewater treatment facilities. The loans can also be issued to help communities fund facility planning, project design, and construction.

# A

## NPDES Permit

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue Suite 900
Seattle, Washington 98101-3140

# Authorization to Discharge Under the National Pollutant Discharge Elimination System

In compliance with the provisions of the Clean Water Act, 33 U.S.C. §1251 *et seq*., as amended by the Water Quality Act of 1987, P.L. 100-4, the "Act",

**The City of Ketchum**
**110 A River Ranch Road**
**Ketchum, ID 83340**

is authorized to discharge from the Ketchum/Sun Valley Wastewater Treatment Plant located in Ketchum, Idaho, at the following location(s):

| Outfall | Receiving Water | Latitude | Longitude |
|---|---|---|---|
| 001 | Big Wood River | 43º 40' 8" | 114º 21' 7" |

in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective August 1, 2012.

This permit and the authorization to discharge shall expire at midnight, July 31, 2017.

The permittee shall reapply for a permit reissuance on or before February 1, 2017 if the permittee intends to continue operations and discharges at the facility beyond the term of this permit.

Signed this 22nd day of June 2012.

**/s/**
Michael A. Bussell, Director
Office of Water and Watersheds

## Schedule of Submissions

The following is a summary of some of the items the permittee must complete and/or submit to EPA during the term of this permit:

| Item | Due Date |
|---|---|
| 1. Discharge Monitoring Reports (DMR) | DMRs are due monthly and must be postmarked on or before the 10th day of the month following the monitoring month. |
| 2. Quality Assurance Plan (QAP) | The permittee must provide EPA and IDEQ with written notification that the Plan has been developed and implemented by January 31, 2013 (see Part II.B). The Plan must be kept on site and made available to EPA and IDEQ upon request. |
| 3. Operation and Maintenance (O&M) Plan | The permittee must provide EPA and IDEQ with written notification that the Plan has been developed and implemented by January 31, 2013 (see Part II.A). The Plan must be kept on site and made available to EPA and IDEQ upon request. |
| 4. NPDES Application Renewal | The application must be submitted by February 1, 2017 (see Part V.B). |
| 5. Surface Water Monitoring Report | For parameters for which quarterly sampling is required, surface water monitoring results must be submitted to EPA and IDEQ with the DMRs for the last month of the quarter in which the sampling occurred. For temperature, surface water monitoring results for April and May must be submitted to EPA and IDEQ with the July DMR (due August 10th), and results for June – October must be submitted to EPA and IDEQ with the December DMR (due the following January 10th) (see Part I.D.10). |
| 7. Twenty-Four Hour Notice of Noncompliance Reporting | The permittee must report certain occurrences of noncompliance by telephone within 24 hours from the time the permittee becomes aware of the circumstances. (See Parts III.G and I.B.2.) |
| 8. Emergency Response and Public Notification Plan | The permittee must develop and implement an overflow emergency response and public notification plan. The permittee must submit written notice to EPA and IDEQ that the plan has been developed and implemented by January 31, 2013 (see Part II.D). |

# Table of Contents

# I. Limitations and Monitoring Requirements

## A. Discharge Authorization

During the effective period of this permit, the permittee is authorized to discharge pollutants from the outfalls specified herein to the Big Wood River, within the limits and subject to the conditions set forth herein. This permit authorizes the discharge of only those pollutants resulting from facility processes, waste streams, and operations that have been clearly identified in the permit application process.

## B. Effluent Limitations and Monitoring

1. The permittee must limit and monitor discharges from outfall 001 as specified in Table 1, below. All figures represent maximum effluent limits unless otherwise indicated. The permittee must comply with the effluent limits in the tables at all times unless otherwise indicated, regardless of the frequency of monitoring or reporting required by other provisions of this permit.

**Table 1: Effluent Limitations and Monitoring Requirements**

| Parameter | Effluent Limitations | | | | Monitoring Requirements | | |
|---|---|---|---|---|---|---|---|
| | **Units** | **Average Monthly Limit** | **Average Weekly Limit** | **Maximum Daily Limit** | **Sample Location** | **Sample Frequency** | **Sample Type** |
| Flow | mgd | Report | — | Report | Effluent | continuous | recording |
| Temperature (April – October) | ºC | Report | — | Report | Effluent | continuous | recording |
| Temperature (November – March) | ºC | Report | — | Report | Effluent | 5/week | grab |
| Biochemical Oxygen Demand ($BOD_5$) | mg/L | 30 | 45 | — | Influent & Effluent | 1/week | 24-hr. comp. |
| | lb/day | 505 | 760 | — | | | calculation |
| | % removal | 85% (min) | — | — | % removal | 1/month | calculation[3] |
| Total Suspended Solids (TSS) | mg/L | 30 | 45 | — | Influent & Effluent | 2/week | 24-hr. comp. |
| | lb/day | 275 | 542 | — | | | calculation |
| | lb/day | Annual Average Limit: 145 lb/day[4] | | | | | calculation[4] |
| | % removal | 85% (min) | — | — | % removal | 1/month | calculation[3] |
| E. coli Bacteria[1,2] | #/100 ml | 126 (geometric mean) | — | 406 (instantaneous maximum) | Effluent | 5/month | grab |
| | CFU/day | $19.1 \times 10^9$ (geometric mean) | — | — | | | calculation |
| pH | s.u. | 6.2 – 9.0 at all times | | | Effluent | daily | grab |
| Total Phosphorus as P | mg/L | 1.0 | 1.5 | — | Effluent | 2/week | 24-hr. comp. |
| | lb/day | 9.9 | 14.9 | — | | | calculation |
| Copper, Total Recoverable[2] | µg/L | 19.2 | — | 35.1 | Effluent | 1/week | 24-hr. comp. |
| | lb/day | 0.64 | — | 1.17 | | | calculation |
| Alkalinity, Total | mg/L as $CaCO_3$ | Report | — | Report | Effluent | 1/quarter | 24-hr. comp. |
| Cadmium, Total Recoverable | µg/L | Report | — | Report | Effluent | 1/quarter | 24-hr. comp. |
| Dissolved Oxygen | mg/L | Report | — | Report | Effluent | 1/month | grab |
| Hardness | mg/L as $CaCO_3$ | Report | — | Report | Effluent | 1/quarter | 24-hr. comp. |

| Table 1: Effluent Limitations and Monitoring Requirements | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **Effluent Limitations** | | | | **Monitoring Requirements** | | |
| | **Units** | **Average Monthly Limit** | **Average Weekly Limit** | **Maximum Daily Limit** | **Sample Location** | **Sample Frequency** | **Sample Type** |
| Mercury, Total | µg/L | Report | — | Report | Effluent | 1/quarter | 24-hr. comp. |
| Nitrate plus Nitrite | mg/L | Report | — | Report | Effluent | 1/quarter | 24-hr. comp. |
| Oil and Grease | mg/L | Report | — | Report | Effluent | 1/quarter | grab |
| Orthophosphate as P | mg/L | Report | — | Report | Effluent | 1/quarter | 24-hr. comp. |
| Total Ammonia as N | mg/L | Report | — | Report | Effluent | 1/month | 24-hr. comp. |
| Total Dissolved Solids | mg/L | Report | — | Report | Effluent | 1/quarter | 24-hr. comp. |
| Total Kjeldahl Nitrogen | mg/L | Report | | Report | Effluent | 1/quarter | 24-hr. comp. |
| Zinc, Total Recoverable | µg/L | Report | — | Report | Effluent | 1/quarter | 24-hr. comp. |
| NPDES Application Form 2A Expanded Effluent Testing | — | See I.B.7. | | | Effluent | 3x/5 years | — |
| Whole Effluent Toxicity (WET) | TUc | — | — | Report | Effluent | See I.C.2. | 24-hr. comp. |

1. The average monthly E. coli bacteria counts must not exceed a geometric mean of 126/100 ml and $19.1 \times 10^9$ (19.1 billion) per day based on a minimum of five samples taken every 3-7 days within a calendar month. The number of colony forming units (CFUs) per day must be calculated by multiplying the effluent E. coli concentration (#/100 ml) by the flow rate (mgd) on the day sampling occurred and a conversion factor of 37,854,000 deciliters per million gallons. See Part VI for a definition of geometric mean.
2. Reporting is required within 24 hours of a maximum daily limit or instantaneous maximum limit violation. See Parts I.B.2. and III.G.
3. The monthly average percent removal must be calculated from the arithmetic mean of the influent concentration values and the arithmetic mean of the effluent concentration values for that month. Influent and effluent samples must be taken over approximately the same time period.
4. See I.B.8.

2. The permittee must report within 24 hours any violation of the maximum daily or instantaneous maximum limits for the following pollutants: Total recoverable copper and E. coli. Violations of all other effluent limits are to be reported at the time that discharge monitoring reports are submitted (See III.B and III.H).

3. The permittee must not discharge floating, suspended, or submerged matter of any kind in amounts causing nuisance or objectionable conditions or that may impair designated beneficial uses of the receiving water.

4. The permittee must collect effluent samples from the effluent stream after the last treatment unit prior to discharge into the receiving waters.

5. Minimum Levels. For all effluent monitoring, the permittee must use methods that can achieve a minimum level (ML) less than the effluent limitation. For parameters that do not have effluent limitations, the permittee must use methods that can achieve MLs less than or equal to those specified in Table 2, below. For purposes of reporting on the DMR for a single sample, if a value is less than the method detection limit (MDL), the permittee must report “less than {numeric value of the MDL}” and if a value is less than the ML, the permittee must report “less than {numeric value of the ML}.”

| Table 2: Maximum MLs for Pollutants Not Subject to Effluent Limitations | | |
|---|---|---|
| **Parameter** | **Units** | **Maximum ML** |
| Cadmium | µg/L | 0.1 |
| Mercury | µg/L | 0.01 |
| Nitrate + Nitrite as N | mg/L | 0.1 |
| Orthophosphate | mg/L | 0.01 |
| Total Kjeldahl Nitrogen | mg/L | 0.1 |
| Zinc | µg/L | 5 |

6. For purposes of calculating monthly averages, except for E. coli, zero may be assigned for values less than the MDL, and the {numeric value of the MDL} may be assigned for values between the MDL and the ML. If the average value is less than the MDL, the permittee must report "less than {numeric value of the MDL}" and if the average value is less than the ML, the permittee must report "less than {numeric value of the ML}." If a value is equal to or greater than the ML, the permittee must report and use the actual value. The resulting average value must be compared to the compliance level, the ML, in assessing compliance.

7. The permittee must perform the effluent testing required by Part D of NPDES application Form 2A (EPA Form 3510-2A, revised 1-99). The permittee must submit the results of this testing with its application for renewal of this NPDES permit. To the extent that effluent monitoring required by other conditions of this permit satisfies this requirement, these samples may be used to satisfy the requirements of this paragraph.

8. Annual average effluent limit for TSS:

   a) The annual average TSS load must not exceed 145 lb/day.

   b) The annual average TSS load must be calculated as the sum of all TSS daily discharges measured during a calendar year, divided by the number of TSS daily discharges measured during that year.

   c) The annual average TSS load must be reported on the December DMR, regardless of whether a discharge of pollutants occurs during the month of December.

## C. Whole Effluent Toxicity Testing Requirements

The permittee must conduct chronic toxicity tests on effluent samples from outfall 001. Testing must be conducted in accordance with subsections 1 through 7, below.

1. Toxicity testing must be conducted on 24-hour composite samples of effluent. In addition, a split of each sample collected must be analyzed for the chemical and physical parameters required in Part I.B, above, with a required sampling frequency of once per quarter or more frequently, using the sample type required in Part I.B. For parameters for which grab samples are required in Part I.B, grab samples must be taken during the same 24-hour period as the 24-hour composite sample used for the toxicity tests. When the timing of sample collection coincides

with that of the sampling required in Part I.B, analysis of the split sample will fulfill the requirements of Part I.B as well.

2. Chronic Test Species and Methods

   a) For outfall 001, chronic tests must be conducted once per quarter during calendar year 2016. Quarters are defined as January through March, April through June, July through September, and October through December.

   b) The permittee must conduct the following two chronic toxicity tests on each sample, using the species and protocols in Table 3:

**Table 3: Toxicity Test Species and Protocols**

| Freshwater Acute Toxicity Tests | Species | Method |
|---|---|---|
| Fathead minnow 96-hour larval survival and growth test (method 1000.0) | *Pimephales promelas* | EPA-821-R-02-013 |
| Daphnid 96-hour survival and reproduction test (method 1002.0) | *Ceriodaphnia dubia* | EPA-821-R-02-013 |

   c) The presence of chronic toxicity must be determined as specified in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, EPA/821-R-02-013, October 2002.

   d) Results must be reported in $TU_c$ (chronic toxic units), which is defined as follows:

      (i) For survival endpoints, $TU_c$ = 100/NOEC.

      (ii) For all other test endpoints, TUc = 100/$IC_{25}$.

      (iii) $IC_{25}$ means "25% inhibition concentration." The $IC_{25}$ is a point estimate of the toxicant concentration, expressed in percent effluent, that causes a 25% reduction in a non-quantal biological measurement (e.g., reproduction or growth) calculated from a continuous model (e.g., Interpolation Method).

      (iv) NOEC means "no observed effect concentration." The NOEC is the highest concentration of toxicant, expressed in percent effluent, to which organisms are exposed in a chronic toxicity test [full life-cycle or partial life-cycle (short term) test], that causes no observable adverse effects on the test organisms (i.e., the highest concentration of effluent in which the values for the observed responses are not statistically significantly different from the controls).

3. Quality Assurance

   a) The toxicity testing on each organism must include a series of five test dilutions and a control. The dilution series must include the receiving water concentration (RWC), which is the dilution associated with the chronic toxicity trigger, two dilutions above the RWC, and two dilutions below the RWC. The RWC is 31.4% effluent.

b) All quality assurance criteria and statistical analyses used for chronic tests and reference toxicant tests must be in accordance with *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, EPA/821-R-02-013, October 2002, and individual test protocols.

c) In addition to those quality assurance measures specified in the methodology, the following quality assurance procedures must be followed:

(i) If organisms are not cultured in-house, concurrent testing with reference toxicants must be conducted. If organisms are cultured in-house, monthly reference toxicant testing is sufficient. Reference toxicant tests must be conducted using the same test conditions as the effluent toxicity tests.

(ii) If either of the reference toxicant tests or the effluent tests do not meet all test acceptability criteria as specified in the test methods manual, the permittee must re-sample and re-test within 14 days of receipt of the test results.

(iii) Control and dilution water must be receiving water or lab water, as appropriate, as described in the manual. If the dilution water used is different from the culture water, a second control, using culture water must also be used. Receiving water may be used as control and dilution water upon notification of EPA and IDEQ. In no case shall water that has not met test acceptability criteria be used for either dilution or control.

4. Reporting

a) The permittee must submit the results of the toxicity tests with the discharge monitoring reports (DMRs). Toxicity tests taken from January 1 through March 31 must be reported on the May DMR. Toxicity tests taken from April 1 through June 30 must be reported on the August DMR. Toxicity tests taken from July 1 through September 30 must be reported on the November DMR. Toxicity tests taken from October 1 through December 31 must be reported on the DMR for the following February.

b) The report of toxicity test results must include all relevant information outlined in Section 10, Report Preparation, of *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, EPA/821-R-02-013, October 2002. In addition to toxicity test results, the permittee must report: dates of sample collection and initiation of each test; flow rate at the time of sample collection; and the results of the monitoring required in Part I.B of this permit, for parameters with a required monitoring frequency of once per quarter or more frequently.

5. Preparation of initial investigation toxicity reduction evaluation (TRE) workplan: Prior to initiation of the toxicity testing required by this permit, the permittee must submit to EPA a copy of the permittee's initial investigation TRE workplan. This

plan shall describe the steps the permittee intends to follow in the event that chronic toxicity is detected above 3.18 TUc, and must include at a minimum:

a) A description of the investigation and evaluation techniques that would be used to identify potential causes/sources of toxicity, effluent variability, treatment system efficiency;

b) A description of the facility's method of maximizing in-house treatment efficiency, good housekeeping practices, and a list of all chemicals used in operation of the facility; and

c) If a toxicity identification evaluation (TIE) is necessary, who will conduct it (i.e., in-house or other).

d) The initial investigation TRE workplan must be sent to the following address:

US EPA Region 10
Attn: NPDES WET Coordinator
1200 Sixth Avenue
Suite 900 OWW-130
Seattle, WA 98101-3140

6. Accelerated testing: If chronic toxicity is detected above 3.18 TUc, the permittee must comply with the following:

a) The permittee must implement the initial investigation TRE workplan within 48-hours of the permittee's receipt of the toxicity results demonstrating the exceedance.

b) The permittee must conduct six more bi-weekly (every two weeks) chronic toxicity tests, over a 12-week period. This accelerated testing shall be initiated within 10 calendar days of receipt of the test results indicating the initial exceedance.

c) The permittee must notify EPA of the exceedance in writing at the address in Part I.C.5.d, above, within 5 calendar days of receipt of the test results indicating the exceedance. The notification must include the following information:

(i) A status report on any actions required by the permit, with a schedule for actions not yet completed.

(ii) A description of any additional actions the permittee has taken or will take to investigate and correct the cause(s) of the toxicity.

(iii) Where no actions have been taken, a discussion of the reasons for not taking action.

d) If implementation of the initial investigation workplan clearly identifies the source of toxicity to the satisfaction of EPA (e.g., a temporary plant upset), and none of the six accelerated chronic toxicity tests required under Part I.C.6.b are above 3.18 TUc, the permittee may return to the regular chronic toxicity testing cycle specified in Part I.C.2.a.

7. Toxicity Reduction Evaluation (TRE)

   a) If implementation of the initial investigation workplan does not clearly identify the source of toxicity to the satisfaction of EPA, or any of the six accelerated chronic toxicity tests indicate toxicity above 3.18 TUc, then the permittee must begin implementation of the toxicity reduction evaluation (TRE) requirements below. Implementation of the TRE requirements shall begin within 10 calendar days of receipt of the accelerated chronic toxicity testing results demonstrating the exceedance.

   b) In accordance with the permittee's initial investigation workplan and EPA manual EPA 833-B-99-002 (*Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants*), the permittee must develop as expeditiously as possible a more detailed TRE workplan, which includes:

      (i) Further actions to investigate and identify the cause of toxicity;

      (ii) Actions the permittee will take to mitigate the impact of the discharge and to prevent the recurrence of toxicity; and

      (iii) A schedule for these actions.

   c) The permittee may initiate a TIE as part of the overall TRE process described in the EPA acute and chronic TIE manuals EPA/600/6-91/005F (Phase I), EPA/600/R-92/080 (Phase II), and EPA-600/R-92/081 (Phase III).

   d) If a TIE is initiated prior to completion of the accelerated testing, the accelerated testing schedule may be terminated, or used as necessary in performing the TIE.

## D. Surface Water Monitoring

The permittee must conduct surface water monitoring. Surface water monitoring must start by January 31, 2013 and continue for four years. The program must meet the following requirements:

1. Two monitoring station must be established in the Big Wood River at the following locations:

   a) Above the influence of the facility's discharge, and

   b) Below the facility's discharge at a point where the discharge and the receiving water are completely mixed.

2. The permittee must seek approval of the surface water monitoring stations from IDEQ.

3. A failure to obtain IDEQ approval of surface water monitoring stations does not relieve the permittee of the surface water monitoring requirements of this permit.

4. To the extent practicable, surface water sample collection must occur on the same day as effluent sample collection.

5. Cadmium and zinc must be analyzed as dissolved. Mercury must be analyzed as total recoverable.

6. The flow rate must be measured as near as practicable to the time that other ambient parameters are sampled.

7. Samples must be analyzed for the parameters listed in Table 4 and must achieve MDLs that are equivalent to or less than those listed in Table 4. The permittee may request different MDLs. The request must be in writing and must be approved by EPA.

8. Composite samples must consist of 3 grab samples, one from each side of the river, and one from the middle of the river.

**Table 4: Receiving Water Monitoring Requirements**

| Parameter (units) | Sample Frequency | Sample Locations | Sample Type | Maximum MDL |
|---|---|---|---|---|
| Alkalinity (mg/L as $CaCO_3$) | Quarterly[1] | Upstream | Composite | — |
| Cadmium (µg/L) | Quarterly[1] | Upstream and Downstream | Composite | 0.1 mg/L |
| Hardness (mg/L as $CaCO_3$) | Quarterly[1] | Upstream and Downstream | Composite | — |
| Mercury (µg/L) | Quarterly[1] | Upstream and Downstream | Composite | 0.01 µg/L |
| pH (s.u.) | Quarterly[1] | Upstream | Grab | — |
| Temperature, April – October (ºC) | Hourly | Upstream and Downstream | Recording | — |
| Total Ammonia as N (mg/L) | Quarterly[1] | Upstream and Downstream | Composite | 0.04 mg/L |
| Zinc, Dissolved (µg/L) | Quarterly[1] | Upstream and Downstream | Composite | 2 µg/L |

1. Quarters are defined as January through March, April through June, July through September and October through December.

9. Quality assurance/quality control plans for all the monitoring must be documented in the Quality Assurance Plan required under Part II.B, “Quality Assurance Plan”.

10. For parameters for which quarterly sampling is required, surface water monitoring results must be submitted to EPA and IDEQ with the DMRs for the last month of the quarter in which the sampling occurred. For temperature, surface water monitoring results for April and May must be submitted to EPA and IDEQ with the July DMR (due August 10$^{th}$), and results for June – October must be submitted to EPA and IDEQ with the December DMR (due the following January 10$^{th}$). At a minimum, the reports must include the following:

    a) Dates of sample collection and analyses.

    b) Results of sample analysis.

    c) Relevant quality assurance/quality control (QA/QC) information.

# II. Special Conditions

## A. Operation and Maintenance Plan

In addition to the requirements specified in Section IV.E of this permit (Proper Operation and Maintenance), by January 31, 2013, the permittee must provide written notice to EPA and IDEQ that an operations and maintenance plan for the current wastewater treatment facility has been developed and implemented. The plan shall be retained on site and made available on request to EPA and IDEQ. Any changes occurring in the operation of the plant shall be reflected within the Operation and Maintenance plan.

**B. Quality Assurance Plan (QAP)**

The permittee must develop a quality assurance plan (QAP) for all monitoring required by this permit. The permittee must submit written notice to EPA and IDEQ that the Plan has been developed and implemented by January 31, 2013. Any existing QAPs may be modified for compliance with this section.

1. The QAP must be designed to assist in planning for the collection and analysis of effluent and receiving water samples in support of the permit and in explaining data anomalies when they occur.
2. Throughout all sample collection and analysis activities, the permittee must use the EPA-approved QA/QC and chain-of-custody procedures described in *EPA Requirements for Quality Assurance Project Plans* (EPA/QA/R-5) and *Guidance for Quality Assurance Project Plans* (EPA/QA/G-5). The QAP must be prepared in the format that is specified in these documents.
3. At a minimum, the QAP must include the following:
   a) Details on the number of samples, type of sample containers, preservation of samples, holding times, analytical methods, analytical detection and quantitation limits for each target compound, type and number of quality assurance field samples, precision and accuracy requirements, sample preparation requirements, sample shipping methods, and laboratory data delivery requirements.
   b) Map(s) indicating the location of each sampling point.
   c) Qualification and training of personnel.
   d) Name(s), address(es) and telephone number(s) of the laboratories used by or proposed to be used by the permittee.
4. The permittee must amend the QAP whenever there is a modification in sample collection, sample analysis, or other procedure addressed by the QAP.
5. Copies of the QAP must be kept on site and made available to EPA and/or IDEQ upon request.

**C. Control of Undesirable Pollutants and Industrial Users**

1. The permittee must require any industrial user discharging to its treatment works to comply with any applicable requirements of 40 CFR 403 through 471.
2. The permittee must not allow introduction of the following pollutants into the POTW:
   a) Pollutants which create a fire or explosion hazard in the POTW, including, but not limited to, wastestreams with a closed cup flashpoint of less than 140

degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21.

b) Pollutants which will cause corrosive structural damage to the POTW, but in no case Discharges with pH lower than 5.0, unless the works is specifically designed to accommodate such Discharges.

c) Solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW resulting in Interference.

d) Any pollutant, including oxygen demanding pollutants (BOD, etc.) released in a Discharge at a flow rate and/or pollutant concentration which will cause Interference with the POTW.

e) Heat in amounts which will inhibit biological activity in the POTW resulting in Interference, but in no case heat in such quantities that the temperature at the POTW Treatment Plant exceeds 40 ºC (104 ºF) unless the Director of the Office of Water and Watersheds, upon request of the POTW, approves alternate temperature limits.

f) Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through.

g) Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems.

h) Any trucked or hauled pollutants, except at discharge points designated by the POTW.

i) Any pollutant which causes Pass Through or Interference.

**D. Emergency Response and Public Notification Plan**

1. The permittee must develop and implement an overflow emergency response and public notification plan that identifies measures to protect public health from overflows that may endanger health and unanticipated bypasses or upsets that exceed any effluent limitation in the permit. At a minimum the plan must include mechanisms to:

a) Ensure that the permittee is aware (to the greatest extent possible) of all overflows from portions of the collection system over which the permittee has ownership or operational control and unanticipated bypass or upset that exceed any effluent limitation in the permit;

b) Ensure appropriate responses including assurance that reports of an overflow or of an unanticipated bypass or upset that exceed any effluent limitation in the permit are immediately dispatched to appropriate personnel for investigation and response;

c) Ensure immediate notification to the public, health agencies, and other affected public entities (including public water systems). The overflow response plan must identify the public health and other officials who will receive immediate notification;

d) Ensure that appropriate personnel are aware of and follow the plan and are appropriately trained; and

e) Provide emergency operations.

2. The permittee must submit written notice to EPA and IDEQ that the plan has been developed and implemented by January 31, 2013. Any existing emergency response and public notification plan may be modified for compliance with this section.

# III. Monitoring, Recording and Reporting Requirements

## A. Representative Sampling (Routine and Non-Routine Discharges)

Samples and measurements must be representative of the volume and nature of the monitored discharge.

In order to ensure that the effluent limits set forth in this permit are not violated at times other than when routine samples are taken, the permittee must collect additional samples at the appropriate outfall whenever any discharge occurs that may reasonably be expected to cause or contribute to a violation that is unlikely to be detected by a routine sample. The permittee must analyze the additional samples for those parameters limited in Part I.B of this permit that are likely to be affected by the discharge.

The permittee must collect such additional samples as soon as the spill, discharge, or bypassed effluent reaches the outfall. The samples must be analyzed in accordance with paragraph III.C ("Monitoring Procedures"). The permittee must report all additional monitoring in accordance with paragraph III.D ("Additional Monitoring by Permittee").

## B. Reporting of Monitoring Results

The permittee must either submit monitoring data and other reports in paper form, or must report electronically using NetDMR, a web-based tool that allows permittees to electronically submit DMRs and other required reports via a secure internet connection. Specific requirements regarding submittal of data and reports in paper form and submittal using NetDMR are described below.

1. Paper Copy Submissions

Monitoring data must be submitted using the DMR form (EPA No. 3320-1) or equivalent and must be postmarked by the 10th day of the month following the completed reporting period. The permittee must sign and certify all DMRs, and all other reports, in accordance with the requirements of Part V.E. of this permit ("Signatory Requirements"). The permittee must submit the legible originals of these documents to the Director, Office of Compliance and Enforcement, with copies to IDEQ at the following addresses:

US EPA Region 10
Attn: ICIS Data Entry Team
1200 Sixth Avenue, Suite 900

OCE-133
Seattle, Washington 98101-3410

Idaho Department of Environmental Quality
1363 Fillmore Street
Twin Falls, ID 83301

2. Electronic submissions

Monitoring data must be submitted electronically to EPA no later than the 10th of the month following the completed reporting period. All reports required under this permit must be submitted to EPA as a legible electronic attachment to the DMR. The permittee must sign and certify all DMRs, and all other reports, in accordance with the requirements of Part V.E of this permit ("Signatory Requirements"). Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit paper copies of DMRs or other reports to EPA and IDEQ.

The permittee may use NetDMR after requesting and receiving permission from US EPA Region 10. NetDMR is accessed from http://www.epa.gov/netdmr.

## C. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR 136, unless another method is required under 40 CFR subchapters N or O, or other test procedures have been specified in this permit or approved by EPA as an alternate test procedure under 40 CFR 136.5.

## D. Additional Monitoring by Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the permittee must include the results of this monitoring in the calculation and reporting of the data submitted in the DMR.

Upon request by EPA, the permittee must submit results of any other sampling, regardless of the test method used.

## E. Records Contents

Records of monitoring information must include:

1. the date, exact place, and time of sampling or measurements;
2. the name(s) of the individual(s) who performed the sampling or measurements;
3. the date(s) analyses were performed;
4. the names of the individual(s) who performed the analyses;
5. the analytical techniques or methods used; and
6. the results of such analyses.

**F. Retention of Records**

The permittee must retain records of all monitoring information, including, all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, copies of DMRs, a copy of the NPDES permit, and records of all data used to complete the application for this permit, for a period of at least five years from the date of the sample, measurement, report or application. This period may be extended by request of EPA or IDEQ at any time.

**G. Twenty-four Hour Notice of Noncompliance Reporting**

1. The permittee must report the following occurrences of noncompliance by telephone within 24 hours from the time the permittee becomes aware of the circumstances:
   a) any noncompliance that may endanger health or the environment;
   b) any unanticipated bypass that exceeds any effluent limitation in the permit (See Part IV.F, "Bypass of Treatment Facilities");
   c) any upset that exceeds any effluent limitation in the permit (See Part IV.G, "Upset Conditions"); or
   d) any violation of a maximum daily discharge limitation for applicable pollutants identified by Part I.B.2.
   e) any overflow prior to the treatment works over which the permittee has ownership or has operational control. An overflow is any spill, release or diversion of municipal sewage including:
      (i) an overflow that results in a discharge to waters of the United States; and
      (ii) an overflow of wastewater, including a wastewater backup into a building (other than a backup caused solely by a blockage or other malfunction in a privately owned sewer or building lateral) that does not reach waters of the United States.
2. The permittee must also provide a written submission within five days of the time that the permittee becomes aware of any event required to be reported under subpart 1 above. The written submission must contain:
   a) a description of the noncompliance and its cause;
   b) the period of noncompliance, including exact dates and times;
   c) the estimated time noncompliance is expected to continue if it has not been corrected; and
   d) steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
   e) if the noncompliance involves an overflow, the written submission must contain:

(i) The location of the overflow;

(ii) The receiving water (if there is one);

(iii) An estimate of the volume of the overflow;

(iv) A description of the sewer system component from which the release occurred (e.g., manhole, constructed overflow pipe, crack in pipe);

(v) The estimated date and time when the overflow began and stopped or will be stopped;

(vi) The cause or suspected cause of the overflow;

(vii) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the overflow and a schedule of major milestones for those steps;

(viii) An estimate of the number of persons who came into contact with wastewater from the overflow; and

(ix) Steps taken or planned to mitigate the impact(s) of the overflow and a schedule of major milestones for those steps.

3. The Director of the Office of Compliance and Enforcement may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the NPDES Compliance Hotline in Seattle, Washington, by telephone, (206) 553-1846.

4. Reports must be submitted to the addresses in Part III.B ("Reporting of Monitoring Results").

## H. Other Noncompliance Reporting

The permittee must report all instances of noncompliance, not required to be reported within 24 hours, at the time that monitoring reports for Part III.B ("Reporting of Monitoring Results") are submitted. The reports must contain the information listed in Part III.G.2 of this permit ("Twenty-four Hour Notice of Noncompliance Reporting").

## I. Public Notification

The permittee must immediately notify the public, health agencies and other affected entities (e.g., public water systems) of any overflow which the permittee owns or has operational control; or any unanticipated bypass or upset that exceeds any effluent limitation in the permit in accordance with the notification procedures developed in accordance with Part II.D.

## J. Notice of New Introduction of Toxic Pollutants

The permittee must notify the Director of the Office of Water and Watersheds and IDEQ in writing of:

1. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to Sections 301 or 306 of the Act if it were directly discharging those pollutants; and

2. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

3. For the purposes of this section, adequate notice must include information on:

   a) The quality and quantity of effluent to be introduced into the POTW, and

   b) Any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

4. The permittee must notify the Director of the Office of Water and Watersheds at the following address:

   US EPA Region 10
   Attn: NPDES Permits Unit Manager
   1200 6th Avenue
   Suite 900 OWW-130
   Seattle, WA 98101-3140

# IV. Compliance Responsibilities

## A. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action, for permit termination, revocation and reissuance, or modification, or for denial of a permit renewal application.

## B. Penalties for Violations of Permit Conditions

1. Civil and Administrative Penalties. Pursuant to 40 CFR Part 19 and the Act, any person who violates section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any such sections in a permit issued under section 402, or any requirement imposed in a pretreatment program approved under sections 402(a)(3) or 402(b)(8) of the Act, is subject to a civil penalty not to exceed the maximum amounts authorized by Section 309(d) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note) (currently $37,500 per day for each violation).

2. Administrative Penalties. Any person may be assessed an administrative penalty by the Administrator for violating section 301, 302, 306, 307, 308, 318 or 405 of this Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of this Act. Pursuant to 40 CFR 19 and the Act, administrative penalties for Class I violations are not to exceed the maximum amounts authorized by Section 309(g)(2)(A) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note) (currently $16,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $37,500). Pursuant to 40 CFR 19 and the Act, penalties for Class II violations are not to exceed the maximum amounts authorized by Section

309(g)(2)(B) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note) (currently $16,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $177,500).

3. Criminal Penalties:

   a) Negligent Violations. The Act provides that any person who negligently violates sections 301, 302, 306, 307, 308, 318, or 405 of the Act, or any condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, or any requirement imposed in a pretreatment program approved under section 402(a)(3) or 402(b)(8) of the Act, is subject to criminal penalties of $2,500 to $25,000 per day of violation, or imprisonment of not more than 1 year, or both. In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than $50,000 per day of violation, or by imprisonment of not more than 2 years, or both.

   b) Knowing Violations. Any person who knowingly violates such sections, or such conditions or limitations is subject to criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment for not more than 3 years, or both. In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both.

   c) Knowing Endangerment. Any person who knowingly violates section 301, 302, 303, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under section 402 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine of not more than $250,000 or imprisonment of not more than 15 years, or both. In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than $500,000 or by imprisonment of not more than 30 years, or both. An organization, as defined in section 309(c)(3)(B)(iii) of the Act, shall, upon conviction of violating the imminent danger provision, be subject to a fine of not more than $1,000,000 and can be fined up to $2,000,000 for second or subsequent convictions.

   d) False Statements. The Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both. The Act further provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

**C. Need To Halt or Reduce Activity not a Defense**

It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with this permit.

**D. Duty to Mitigate**

The permittee must take all reasonable steps to minimize or prevent any discharge in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

**E. Proper Operation and Maintenance**

The permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by the permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

**F. Bypass of Treatment Facilities**

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur that does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2 and 3 of this Part.
2. Notice.
   a) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it must submit prior written notice, if possible at least 10 days before the date of the bypass.
   b) Unanticipated bypass. The permittee must submit notice of an unanticipated bypass as required under Part III.G ("Twenty-four Hour Notice of Noncompliance Reporting").
3. Prohibition of bypass.
   a) Bypass is prohibited, and the Director of the Office of Compliance and Enforcement may take enforcement action against the permittee for a bypass, unless:

(i) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(ii) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance; and

(iii) The permittee submitted notices as required under paragraph 2 of this Part.

b) The Director of the Office of Compliance and Enforcement may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in paragraph 3.a. of this Part.

## G. Upset Conditions

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the permittee meets the requirements of paragraph 2 of this Part. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.
2. Conditions necessary for a demonstration of upset. To establish the affirmative defense of upset, the permittee must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
   a) An upset occurred and that the permittee can identify the cause(s) of the upset;
   b) The permitted facility was at the time being properly operated;
   c) The permittee submitted notice of the upset as required under Part III.G, “Twenty-four Hour Notice of Noncompliance Reporting;” and
   d) The permittee complied with any remedial measures required under Part IV.D, “Duty to Mitigate.”
3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

## H. Toxic Pollutants

The permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

### I. Planned Changes

The permittee must give written notice to the Director of the Office of Water and Watersheds as specified in Part III.J.4 and IDEQ as soon as possible of any planned physical alterations or additions to the permitted facility whenever:

1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source as determined in 40 CFR 122.29(b); or
2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitations in this permit.
3. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application site.

### J. Anticipated Noncompliance

The permittee must give written advance notice to the Director of the Office of Compliance and Enforcement and IDEQ of any planned changes in the permitted facility or activity that may result in noncompliance with this permit.

### K. Reopener

This permit may be reopened to include any applicable standard for sewage sludge use or disposal promulgated under section 405(d) of the Act. The Director may modify or revoke and reissue the permit if the standard for sewage sludge use or disposal is more stringent than any requirements for sludge use or disposal in the permit, or controls a pollutant or practice not limited in the permit.

## V. General Provisions

### A. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause as specified in 40 CFR 122.62, 122.64, or 124.5. The filing of a request by the permittee for a permit modification, revocation and reissuance, termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

### B. Duty to Reapply

If the permittee intends to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. In accordance with 40 CFR 122.21(d), and unless permission for the application to be submitted at a later date has been granted by the Regional Administrator, the permittee must submit a new application by February 1, 2017.

**C. Duty to Provide Information**

The permittee must furnish to EPA and IDEQ, within the time specified in the request, any information that EPA or IDEQ may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee must also furnish to EPA or IDEQ, upon request, copies of records required to be kept by this permit.

**D. Other Information**

When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or that it submitted incorrect information in a permit application or any report to EPA or IDEQ, it must promptly submit the omitted facts or corrected information in writing.

**E. Signatory Requirements**

All applications, reports or information submitted to EPA and IDEQ must be signed and certified as follows.

1. All permit applications must be signed as follows:
   a) For a corporation: by a responsible corporate officer.
   b) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively.
   c) For a municipality, state, federal, Indian tribe, or other public agency: by either a principal executive officer or ranking elected official.
2. All reports required by the permit and other information requested by EPA or IDEQ must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
   a) The authorization is made in writing by a person described above;
   b) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company; and
   c) The written authorization is submitted to the Director of the Office of Compliance and Enforcement and IDEQ.
3. Changes to authorization. If an authorization under Part V.E.2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part V.E.2. must be submitted to the Director of the Office of Compliance and Enforcement and IDEQ prior to or together with any reports, information, or applications to be signed by an authorized representative.
4. Certification. Any person signing a document under this Part must make the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

**F. Availability of Reports**

In accordance with 40 CFR 2, information submitted to EPA pursuant to this permit may be claimed as confidential by the permittee. In accordance with the Act, permit applications, permits and effluent data are not considered confidential. Any confidentiality claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice to the permittee. If a claim is asserted, the information will be treated in accordance with the procedures in 40 CFR 2, Subpart B (Public Information) and 41 Fed. Reg. 36902 through 36924 (September 1, 1976), as amended.

**G. Inspection and Entry**

The permittee must allow the Director of the Office of Compliance and Enforcement, EPA Region 10; IDEQ; or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

**H. Property Rights**

The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to persons or property or invasion of other private rights, nor any infringement of federal, tribal, state or local laws or regulations.

### I. Transfers

This permit is not transferable to any person except after written notice to the Director of the Office of Water and Watersheds as specified in Part III.J.4. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Act. (See 40 CFR 122.61; in some cases, modification or revocation and reissuance is mandatory).

### J. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Act.

## VI. Definitions

1. "Act" means the Clean Water Act.
2. "Administrator" means the Administrator of the EPA, or an authorized representative.
3. "Average monthly discharge limitation" means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.
4. "Average weekly discharge limitation" means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week.
5. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.
6. "Chronic toxic unit" ("TUc") is a measure of chronic toxicity. TUc is the reciprocal of the effluent concentration that causes no observable effect on the test organisms by the end of the chronic exposure period (i.e., 100/"NOEC").
7. "Composite" - see "24-hour composite".
8. "Daily discharge" means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the day.
9. "Director of the Office of Compliance and Enforcement" means the Director of the Office of Compliance and Enforcement, EPA Region 10, or an authorized representative.

10. “Director of the Office of Water and Watersheds” means the Director of the Office of Water and Watersheds, EPA Region 10, or an authorized representative.
11. “DMR” means discharge monitoring report.
12. “EPA” means the United States Environmental Protection Agency.
13. “Geometric Mean” means the $n^{th}$ root of a product of n factors, or the antilogarithm of the arithmetic mean of the logarithms of the individual sample values.
14. “Grab” sample is an individual sample collected over a period of time not exceeding 15 minutes.
15. “IDEQ” means the Idaho Department of Environmental Quality.
16. “Inhibition concentration”, IC, is a point estimate of the toxicant concentration that causes a given percent reduction (p) in a non-quantal biological measurement (e.g., reproduction or growth) calculated from a continuous model (e.g., Interpolation Method).
17. “Interference” is defined in 40 CFR 403.3.
18. “LC50” means the concentration of toxicant (e.g., effluent) which is lethal to 50 percent of the test organisms exposed in the time period prescribed by the test.
19. “Maximum daily discharge limitation” means the highest allowable “daily discharge.”
20. “Method Detection Limit (MDL)” means the minimum concentration of a substance (analyte) that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.
21. “Minimum Level (ML)” means the concentration at which the entire analytical system must give a recognizable signal and an acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method-specified sample weights, volumes and processing steps have been followed.
22. “NOEC” means no observed effect concentration. The NOEC is the highest concentration of toxicant (e.g., effluent) to which organisms are exposed in a chronic toxicity test [full life-cycle or partial life-cycle (short term) test], that causes no observable adverse effects on the test organisms (i.e., the highest concentration of effluent in which the values for the observed responses are not statistically significantly different from the controls).
23. “NPDES” means National Pollutant Discharge Elimination System, the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits . . . under sections 307, 402, 318, and 405 of the CWA.
24. “Pass Through” means a Discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a

discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation).

25. “QA/QC” means quality assurance/quality control.

26. “Regional Administrator” means the Regional Administrator of Region 10 of the EPA, or the authorized representative of the Regional Administrator.

27. “Severe property damage” means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

28. “Upset” means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

29. “24-hour composite” sample means a combination of at least 8 discrete sample aliquots of at least 100 milliliters, collected over periodic intervals from the same location, during the operating hours of a facility over a 24 hour period. The composite must be flow proportional. The sample aliquots must be collected and stored in accordance with procedures prescribed in the most recent edition of Standard Methods for the Examination of Water and Wastewater.

# B

## Reuse Permit and Fact Sheet

A. Permit Certificate

**MUNICIPAL**
**WASTEWATER LAND APPLICATION PERMIT**
**LA-000216-02**

**City of Ketchum/Sun Valley Water and Sewer District** LOCATED AT **110 River Ranch Road, Ketchum, ID 83340** IS HEREBY AUTHORIZED TO CONSTRUCT, INSTALL, AND OPERATE A WASTEWATER REUSE SYSTEM IN ACCORDANCE WITH THE RULES FOR THE RECLAMATION AND REUSE OF MUNICIPAL AND INDUSTRIAL WASTEWATER (IDAPA 58.01.17), THE WASTEWATER RULES (IDAPA 58.01.16), THE GROUND WATER QUALITY RULE (IDAPA 58.01.11), AND ACCOMPANYING PERMIT, APPENDICES, AND REFERENCE DOCUMENTS. THIS PERMIT IS EFFECTIVE FROM THE DATE OF SIGNATURE AND EXPIRES ON May 10, 2016.

(For Bill Allred) 05-10-2011

Bill Allred, Regional Administrator Date:
Twin Falls Regional Office
Idaho Department of Environmental Quality

**DEPARTMENT OF ENVIRONMENTAL QUALITY**
**1363 Fillmore**
**Twin Falls, ID 83301**
**(208) 736-2190**
**(208) 736-2194 fax**

**POSTING ON SITE RECOMMENDED**

2010 AGH2060

# B. Permit Contents, Appendices, and Reference Documents



The Sections, Appendices, and Reference Documents listed on this page are all elements of Wastewater Reuse Permit LA-000216-02 and are enforceable as such. This permit does not relieve the City of Ketchum/Sun Valley Water and Sewer District, hereafter referred to as the permittee, from responsibility for compliance with other applicable federal, state or local laws, rules, standards or ordinances.

## C. Abbreviations, Definitions

| | |
|---|---|
| **Ac-in** | Acre-inch. The volume of water or reuse water to cover 1 acre of land to a depth of 1 inch. Equal to 27,154 gallons (often estimated as 27,200 gallons). |
| **BMP or BMPs** | Best Management Practice(s) |
| **BOD** | Biological Oxygen Demand |
| **COD** | Chemical Oxygen Demand |
| **DEQ or the Department** | Idaho Department of Environmental Quality |
| **Director** | Director of the Idaho Department of Environmental Quality, or the Directors Designee, i.e. Regional Administrator |
| **ET** | Evapotranspiration – Loss of water from the soil and vegetation by evaporation and by plant uptake (transpiration) |
| **GS** | Growing Season – Typically April 01 through October 31 (214 days), unless otherwise specified |
| **GW** | Ground Water |
| **GWQR** | IDAPA 58.01.11 "Ground Water Quality Rule" |
| **Guidance** | Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater |
| **$HLR_{gs}$** | Growing Season Hydraulic Loading Rate. Includes any combination of reuse water and supplemental irrigation water applied to land application hydraulic management units during the growing season. The $HLR_{gs}$ limit is specified in Section F. Permit Limits and Conditions. |
| **$HLR_{ngs}$** | Non-Growing Season Hydraulic Loading Rate. Includes any combination of reuse water and supplemental irrigation water applied to each hydraulic management unit during the non-growing season. If applicable, the $HLR_{ngs}$ limit is specified in Section F. Permit Limits and Conditions. |
| **HMU** | Hydraulic Management Unit (Serial Number designation is MU) |
| **IDAPA** | Idaho Administrative Procedures Act |
| **IWR** | Irrigation Water Requirement – Any combination of reuse water and supplemental irrigation water applied at rates commensurate to the moisture requirements of the crop:<br>$IWR = Pdef / E_i$ Where:<br>Pdef = Precipitation deficit (crop specific)<br>$E_i$ = irrigation system efficiency. |
| **SVWSD** | Sun Valley Water and Sewer District |
| **LG** | Lagoon |
| **lb/ac[-day]** | Pounds (of constituent) per acre [per day] |
| **MG** | Million Gallons (1 MG = 36.827 acre-inches) |
| **NGS** | Non-Growing Season – Typically November 01 through March 31 (151 days), unless otherwise specified |
| **NVDS** | Non-Volatile Dissolved Solids ( = Total Dissolved Solids less Volatile Dissolved Solids) |
| **O&M manual** | Operation and Maintenance Manual, also referred to as the Plan of Operation |

## C. Abbreviations, Definitions

| | |
|---|---|
| **Reuse Rules** | IDAPA 58.01.17 "Rules for the Reclamation and Reuse of Municipal and Industrial Wastewater" |
| **SAR** | Sodium Absorption Ratio |
| **SI** | Supplemental Irrigation |
| **Soil AWC** | Soil Available Water Holding Capacity – the water storage capability of the soil down to a depth at which plant roots can utilize the stored moisture (typically 60 inches or root limiting layer) |
| **SMU** | Soil Monitoring Unit (Serial Number designation is SU) |
| **SW** | Surface Water |
| **TDS** | Total Dissolved Solids also referred to as Total Filterable Residue |
| **TMDL** | Total Maximum Daily Load – The sum of the individual waste-load allocations (WLAs) for point sources, Load Allocations (LAs) for non-point sources, and natural background. Such load shall be established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. IDAPA 58.01.02 *Water Quality Standards* |
| **Total Nitrogen** | Total Nitrogen is defined as the sum of all forms of nitrogen present in a sample. Total Nitrogen is determined by adding the values of the Total Kjeldahl Nitrogen (TKN), Nitrate-N and Nitrite-N laboratory results. |
| **Typical Crop Uptake** | Typical Crop Uptake is defined as the median constituent crop uptake from the three (3) most recent years the crop has been grown. Typical Crop Uptake is determined for each hydraulic management unit. For new crops having less than three years of on-site crop uptake data, regional crop yield data and typical nutrient content values, or other values approved by DEQ may be used. |
| **USGS** | United States Geological Survey |
| **Reporting Year** | The reporting year begins with the non-growing season and extends through the growing season of the following year, typically November 01 – October 31. |
| **WW** | Wastewater |
| **WWTP** | Wastewater Treatment Plant |

## D. Facility Information

| | |
|---|---|
| **Legal Name of Permittee** | City of Ketchum/Sun Valley Water and Sewer District |
| **Type of Wastewater** | Municipal (Class A) |
| **Method of Treatment** | Activated Sludge with Chemical Treatment and Tertiary Filtration followed by Disinfection |
| **Reuse Description** | Any permitted Class A use per the Reuse Rules |
| **Treatment Facility and Reuse Locations** | WWTP: 110 River Ranch Road (approximately 1.5 miles southeast of Ketchum, ID)<br>Class A Irrigation Areas: Located within the City's and District's Areas of Impact, see Appendix 2 |
| **County** | Blaine |
| **USGS Quad** | Sun Valley |
| **Depth to Ground Water** | 7 feet at WWTP |
| **Beneficial Uses of Ground Water** | Drinking and Irrigation water supply |
| **Nearest Surface Water** | Big Wood River (within 0.25 mile of treatment plant) |
| **Beneficial Uses of Surface Water** | Cold water aquatic life<br>Primary and secondary recreation |
| **Responsible Official**<br>**Mailing Address**<br><br>**Phone / Fax** | Mr. Steven Hansen, Utilities Manager<br>City of Ketchum/Sun Valley Water and Sewer District<br>P.O. Box 2315, Ketchum, Idaho 83340<br>voice (208) 726-7825 / fax (208) 726-7827 |

## E. Compliance Schedule for Required Activities

The *Activities* in the following table shall be completed on or before the *Completion Date* unless modified by the Department in writing.

| Compliance Activity Number<br>Completion Date | Compliance Activity Description |
|---|---|
| **CA-216-01**<br><br>**Detailed Plan of Operation due at 50% completion of construction of necessary reuse facilities**<br><br>**Updated Plan of Operation due 60 days after one complete year of operation of reuse facilities** | A Plan of Operation (Operation and Maintenance Manual or O&M Manual) for the wastewater treatment and reuse facilities, incorporating the requirements of this permit, shall be submitted to DEQ for review and approval. The Plan of Operation shall be designed for use as an operator guide for actual day-to-day operations to meet permit requirements and shall include daily sampling and monitoring requirements to assess the adequacy of wastewater treatment facility operation.<br><br>The Plan of Operation shall specifically address the following items:<br><br>➢ Quality Assurance Project Plan (QAPP) for monitoring required in this permit. The plan shall cover field activities; laboratory analytical methods and other activities; data verification and validation; data storage, retrieval and assessment; and monitoring program evaluation and improvement. The QAPP shall include all sampling, monitoring and reporting requirements of this permit, as well as a description of approved sample collection methods, appropriate analytical methods, and companion quality control/quality assurance (QA/QC) protocols,<br><br>➢ Operating procedure(s) for when off-specification effluent is produced,<br><br>➢ Operating specifications for UV disinfection system to ensure that the required viral inactivation is being met, and what alarm system is in place to alert the operator of a problem with disinfection,<br><br>➢ Specific design considerations, operation and maintenance procedures, and management practices to be employed to respond to an odor incident if one occurs, including notification procedures,<br><br>➢ Anticipated maintenance necessary to ensure continuous operating capacity of the distribution system,<br><br>➢ A utility user agreement and a plan for educating the public and operators of the distribution system about the origin of the effluent in accordance with IDAPA 58.01.17.601.08.g.<br><br>Refer to Appendix A.12 of the *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater* for a Plan of Operation checklist, and address all relevant items in the checklist. |

## E. Compliance Schedule for Required Activities

| Compliance Activity Number Completion Date | Compliance Activity Description |
|---|---|
| **CA-216-02**<br>**Prior to construction and/or application of wastewater** | Submit plans and specifications for all proposed reuse systems to DEQ for review and approval prior to construction. The reuse system includes the treatment plant, all transmission lines, application areas and storage structures. The plans shall clearly delineate the relation of reuse water distribution lines to sewer collection and drinking water distribution lines.<br>In public areas, exterior drinking fountains, picnic tables, food establishments and other public eating facilities shall be shown and called out on the construction plans, or specifically stated that none exist, and shall be placed out of any spray irrigation areas where reuse water is used.<br>In instances where natural drainages and ephemeral streams are being re-routed, this shall be shown on the plans.<br>Refer to IDAPA 58.01.17 subsections 401 and 601.02 for relevant requirements. |
| **CA-216-03**<br>**Sixty (60) days after completion of construction of each phase of the reuse areas** | A scaled site map delineating wells, streams/canals, water bodies, wetlands, any BMPs constructed in conjunction with the runoff management plan and locations of each wastewater reuse area. Site maps shall be supplied by the permittee, as described in Appendix 2. An updated copy should also be included in the Plan of Operation. |
| **CA-216-04**<br>**One hundred eighty (180) days prior to permit expiration** | Submit an application package to DEQ for permit renewal that includes the most recent seepage test results. |
| **CA-216-05**<br>**After twelve (12) months of operation of Class A facilities** | The permittee shall submit to DEQ for review and approval a Disinfection Monitoring Report that summarizes the first year of operation for the Class A reuse system, including startup and any upset conditions. The report shall discuss results and adequacy of required daily bacteria monitoring. If plant performance indicates that a reduced monitoring frequency is appropriate, the report shall also propose a new frequency for the remainder of the permit term. |

## F. Permit Limits and Conditions

| Category | Permit Limits and Conditions |
|---|---|
| Type of Wastewater | Municipal Class A |
| Application Site Area | See maps in Appendix 2 |
| Growing Season | April 1 through October 31 (214 days) |
| Non-growing Season | November 1 through March 31 (151 days) |
| **Wastewater Treatment System Effluent Maximum Concentration Limits** | |
| Coliform | The median number of total coliform organisms shall not exceed 2.2 colony forming units (CFU) per 100 milliliters (CFU/100 mL), as determined from the results of the last seven (7) days for which the analyses have been completed. In addition the number of total coliform organisms shall not exceed 23 CFU per 100 milliliters in any confirmed sample. |
| Disinfection | As required by IDAPA 58.01.17, Class A effluent shall be disinfected by either:<br>➢ A chlorine disinfection process that provides a concentration/contact time (CT) of four hundred and fifty (450) milligram-minutes per liter (mg-min/L) measured at the end of the contact time based on total chlorine residual and a modal contact time of not less than ninety (90) minutes based on peak day dry weather flow; or<br>➢ A disinfection process that when combined with filtration has been demonstrated to achieve 5-log inactivation of virus.<br>Reuse water shall be limited to the treatment plant grounds until the facility has either successfully demonstrated that the UV disinfection system meets the 5-log inactivation requirement or shows that a chlorine disinfection process will be implemented. DEQ approval is required prior to implementation. |
| Turbidity | The daily arithmetic mean of all daily measurements shall not exceed two (2) Nephelometric Turbidity Units (NTU) and turbidity shall not exceed five (5) NTU at any time. |
| $BOD_5$ | Five-day Biological Oxygen Demand ($BOD_5$) shall not exceed 10 mg/L based on a monthly arithmetic mean, as determined from weekly composite sampling. |
| pH | The pH, as determined by daily grab samples or continuous monitoring shall be between six point zero (6.0) and nine point zero (9.0), inclusive. |
| Total Nitrogen | Total Nitrogen (TKN +Nitrate-N + Nitrite-N) shall not exceed thirty (30) mg/L based on a monthly arithmetic mean as determined from weekly composite sampling. |
| Ground Water Quality | Wastewater reuse activities conducted by the permittee shall not cause a violation of the *Ground Water Quality Rule* (GWQR), IDAPA 58.01.11. |

## F. Permit Limits and Conditions

| Category | Permit Limits and Conditions |
|---|---|
| Redundancy | Automatic activation of the redundant system (NPDES discharge) shall occur if turbidity exceeds five (5) NTU for more than five (5) minutes or if the disinfection system does not achieve the required 5-log removal/inactivation of virus for more than five (5) minutes.<br><br>The maximum number of times that the turbidity or disinfection limits can be exceeded is twice in one week, all of which are required to be immediately reported in accordance with Section I of this permit. |
| Buffer Zones | All buffer zones must comply with local zoning ordinances, at minimum. Other minimum buffer zones are as follows:<br><br>• 0 ft from reuse site to inhabited dwellings<br>• 0 ft from reuse site to areas accessible by the public<br>• 0 ft from reuse site to permanent and intermittent surface water<br>• 0 feet from reuse site to irrigation ditches and canals<br>• 100 feet from reuse site to private water supply wells[1]<br>• 100 feet from reuse site to public water supply wells[1]<br>• Berms and other BMPs shall be used to protect the well head of on-site wells.<br><br>1) These buffer zone distances shall be maintained unless a Department-approved well location acceptability analysis indicates an alternative buffer zone is acceptable<br><br>Drinking fountains, picnic tables, food establishments, and other public eating facilities shall be placed out of any spray irrigation area in which effluent is used, or shall be otherwise protected from contact with the effluent. |
| Fencing and Posting | No fencing required. Signs shall be posted in accordance with IDAPA 58.01.17. |
| Construction Plans | Prior to construction or modification of all reuse water facilities associated with the reuse system or expansion, detailed plans and specifications shall be submitted for review and approval by DEQ. Within 30 days of completion of construction, the permittee shall submit as-built plans for DEQ review and approval. |
| Supplemental Irrigation Water Supply Protection | Reuse water and supplemental irrigation water interconnections shall be equipped with DEQ-approved backflow prevention devices for the protection of supplemental irrigation water sources. |
| Wastewater Treatment Facility Operation | The wastewater treatment facility shall be operated by personnel holding a license from the Idaho Bureau of Occupational Licenses (IBOL) equal to or greater than the classification of the wastewater treatment system.<br><br>Operation of the wastewater treatment system shall be monitored on a 24-hour basis for alarm conditions and qualified operating personnel notified under alarm conditions. |

## F. Permit Limits and Conditions

| Category | Permit Limits and Conditions |
|---|---|
| Distribution System Operator Requirements | All operators of Class A effluent distribution systems, including home occupants, who utilize a combination of Class A effluent and other irrigation waters shall be required to sign a utility user agreement provided by the utility supplying the Class A effluent. The user agreement shall state that the user understands the origin of the effluent and the concept of agronomic rates for applying the Class A effluent. The provider of the Class A effluent shall undertake a public education program within its service area to teach potential customers the benefits and responsibilities of using Class A effluent. |

## G. Monitoring Requirements

The Permittee is allowed to apply reuse water and treat it on a land application site as prescribed in the table below and in accordance with all other applicable permit conditions and schedules.

1) Appropriate analytical methods, as given in the *Idaho Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater*, or as approved by the Idaho Department of Environmental Quality (hereinafter referred to as DEQ), shall be employed. A description of approved sample collection methods, appropriate analytical methods and companion QA/QC protocol shall be included in the facility's Quality Assurance Project Plan (QAPP), which shall be part of the Operation and Maintenance Manual, as required by Compliance Activity CA-216-01 in Section E of this permit.

2) The permittee shall monitor and measure parameters as stated in the Facility Monitoring Table in this section.

3) Samples shall be collected at times and locations that represent typical environmental and process parameters being monitored.

4) Unless otherwise agreed to in writing by DEQ, data collected and submitted shall include, but not be limited to, the parameters and frequencies in the Facility Monitoring Table on the following pages. Reuse water monitoring is required at the frequency shown in the table below if reuse water is applied anytime during the time period shown.

5) Reuse Water Monitoring Procedure: Reuse water shall be sampled at the discharge point from the treatment system. Reuse water composite samples shall consist of one aliquot every six (6) hours over a 24-hour period. No aliquot shall be collected during times when reuse water is not being supplied.

6) Annual reporting of monitoring requirements is described in Section H, Standard Reporting Requirements.

7) Monitoring locations are defined in Appendix 1, "Environmental Monitoring Serial Numbers".

## G. Monitoring Requirements

**Facility Monitoring Table**

| Frequency | Monitoring Point | Description/Type of Monitoring | Parameters |
|---|---|---|---|
| Continuously | WW-021607 | In-line continuously monitoring and recording turbidimeter | Turbidity |
| Daily, when directly applying or storing Class A water | Flow meter(s) or estimate | Volume of reuse water for each Class A Water use | Flow in MGD |
| Daily, when directly applying or storing Class A water[1] | WW-021607 | Grab sample of reuse water | Total Coliform |
| Daily, when directly applying or storing Class A water | WW-021607 | Grab sample or continuous monitoring | pH |
| Weekly, when directly applying or storing Class A water | WW-021607 | Composite sample of reuse water (see Note 5), compiled as monthly arithmetic mean | Total Kjeldahl Nitrogen (TKN), Nitrate- + Nitrite-nitrogen, $BOD_5$ |
| Annually | Annual Report | Each Class A Water use | Acres (irrigation and snowmaking, only) Gallons (all uses) |
| Annually | All supplemental irrigation directly connected to the reuse water distribution system | Backflow testing | Document the testing of all backflow prevention devices for all supplemental irrigation directly connected to the reuse water distribution system(s). Report the testing date(s) and result of the test (pass or fail). If any test failed, report the date of repair or replacement of backflow prevention device, and if the repaired/replaced device is operating correctly. |
| Annually | All flow measurement locations | Flow measurement calibration for all flows | Document the flow measurement calibration of all flow meters and pumps used directly or indirectly to measure all reuse water. |
| As necessary | Nuisance water complaints on private property | Complaint log with date and any follow-up actions taken | Keep a log of complaints of nuisance water such as wet yards and crawl spaces. Submit the complaint log (include previous years) in annual report. |

[1] For first full year of Class A operation. See Compliance Activity CA-216-05.

## H. Standard Reporting Requirements

1.) The Permittee shall submit an Annual Wastewater Reuse Site Performance Report ("Annual Report") prepared by a competent environmental professional no later than January 31 of each year, which shall cover the previous reporting year. The Annual Report shall include an interpretive discussion of monitoring data (ground water, soils, hydraulic loading, wastewater etc.) with particular respect to environmental impacts by the facility.

2.) The annual report shall contain the results of the required monitoring as described in *Section G. Monitoring Requirements*. If the permittee monitors any parameter more frequently than required by this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the annual report.

3.) The annual report shall be submitted to the Engineering Manager in the following Regional DEQ Office:

Twin Falls Regional Office
1363 Fillmore St.
Twin Falls, ID 83301
208-736-2190

4.) Notice of completion of any work described in *Section E. Compliance Schedule for Required Activities* shall be submitted to the Department within 30 days of activity completion. The status of all other work described in Section E shall be submitted with the Annual Report.

5.) All laboratory reports containing the sample results for monitoring required by *Section G. Monitoring Requirements* of this permit shall be submitted with the Annual Report.

# I. Standard Permit Conditions: Procedures and Reporting

1. The permittee shall at all times properly maintain and operate all structures, systems, and equipment for treatment, operational controls and monitoring, which are installed or used by the permittee to comply with all conditions of the permit or the Wastewater Reuse Permit Regulations, in conformance with a DEQ approved, current Plan of Operations (Operations and Maintenance Manual) which describes in detail the operation, maintenance, and management of the wastewater treatment system. This Plan of Operations shall be updated as necessary to reflect current operations.

2. Wastewater(s) or recharge waters applied to the land surface must be restricted to the premises of the application site. Wastewater discharges to surface water that require a permit under the Clean Water Act must be authorized by the U.S. Environmental Protection Agency.

3. Wastewater must not create a public health hazard or nuisance condition as stated in IDAPA 58.01.16.600.03. In order to prevent public health hazards and nuisance conditions the permittee shall:

    a. Apply wastewater as evenly as practicable to the treatment area;
    b. Prevent organic solids (contained in the wastewater) from accumulating on the ground surface to the point where the solids putrefy or support vectors or insects; and
    c. Prevent wastewater from ponding in the fields to the point where the ponded wastewater putrefies or supports vectors or insects.

4. If the permittee intends to continue operation of the permitted facility after the expiration of an existing permit, the permittee shall apply for a new permit at least six months prior to the expiration date of the existing permit in accordance with IDAPA 58.01.17.

5. The permittee shall allow the Director of the Idaho Department of Environmental Quality or the Director's designee (hereinafter referred to as Director), consistent with Title 39, Chapter 1, Idaho Code, to:

    a. Enter the permitted facility,
    b. Inspect any records that must be kept under the conditions of the permit.
    c. Inspect any facility, equipment, practice, or operation permitted or required by the permit.
    d. Sample or monitor for the purpose of assuring permit compliance, any substance or any parameter at the facility.

6. The permittee shall report to the Director under the circumstances and in the manner specified in this section:

    a. In writing thirty (30) days before any planned physical alteration or addition to the permitted facility or activity if that alteration or addition would result in any significant change in information that was submitted during the permit application process.
    b. In writing thirty (30) days before any anticipated change which would result in non-compliance with any permit condition or these regulations.
    c. Orally within twenty-four (24) hours from the time the permittee became aware of any non-compliance which may endanger the public health or the environment at telephone numbers provided in the permit by the Director (see below)

        DEQ Regional Office: see Permit Certificate Page
        Emergency 24 Hour Number: 1-800-632-8000

    d. In writing as soon as possible but within five (5) days of the date the permittee knows or should know of any non-compliance unless extended by the DEQ. This report shall contain:

        i. A description of the non-compliance and its cause;
        ii. The period of non-compliance including to the extent possible, times and dates and, if the non-compliance has not been corrected, the anticipated time it is expected to continue; and
        iii. Steps taken or planned to reduce or eliminate reoccurrence of the non-compliance.

    e. In writing as soon as possible after the permittee becomes aware of relevant facts not submitted or incorrect information submitted, in a permit application or any report to the Director. Those facts or the correct information shall be included as a part of this report.

7. The permittee shall take all necessary actions to prevent or eliminate any adverse impact on the public health or the environment resulting from permit noncompliance.

## J. Standard Permit Conditions: Modifications, Violation, and Revocation

1. The permittee shall furnish to the Director within reasonable time, any information including copies of records, which may be requested by the Director to determine whether cause exists for modifying, revoking, re-issuing, or terminating the permit, or to determine compliance with the permit or these regulations.

2. Both minor and major modifications may be made to this permit as stated in IDAPA 58.01.17 with respect to any conditions stated in this permit upon review and approval of the DEQ.

3. Whenever a facility expansion, production increase or process modification is anticipated which will result in a change in the character of pollutants to be discharged or which will result in a new or increased discharge that will exceed the conditions of this permit, or if it is determined by the DEQ that the terms or conditions of the permit must be modified in order to adequately protect the public health or environment, a request for either major or minor modifications must be submitted together with the reports as described in Section I. *Standard Reporting Requirements*, and plans and specifications for the proposed changes. No such facility expansion, production increase or process modification shall be made until plans have been reviewed and approved by the DEQ and a new permit or permit modification has been issued.

4. Permits shall be transferable to a new owner or operator provided that the permittee notifies the Director by requesting a minor modification of the permit before the date of transfer.

5. Any person violating any provision of the Wastewater Reuse Permit Regulations, or any permit or order issued thereunder shall be liable for a civil penalty not to exceed ten thousand dollars ($10,000) or one thousand dollars ($1,000) for each day of a continuing violation, whichever is greater. In addition, pursuant to Title 39, Chapter 1, Idaho Code, any willful or negligent violation may constitute a misdemeanor.

6. The Director may revoke a permit if the permittee violates any permit condition or the Wastewater Reuse Permit Regulations.

7. Except in cases of emergency, the Director shall issue a written notice of intent to revoke to the permittee prior to final revocation. Revocation shall become final within thirty-five (35) days of receipt of the notice by the permittee, unless within that time the permittee requests an administrative hearing in writing to the Board of Environmental Quality pursuant to the Rules of Administrative Procedures contained in IDAPA 58.01.23.

8. If, pursuant to Idaho Code 67-5247, the Director finds the public health, safety or welfare requires emergency action, the Director shall incorporate findings in support of such action in a written notice of emergency revocation issued to the permittee. Emergency revocation shall be effective upon receipt by the permittee. Thereafter, if requested by the permittee in writing, a revocation hearing before the Board of Environmental Quality shall be provided. Such hearings shall be conducted in accordance with the Rules of Administrative Procedures contained in IDAPA 58.01.23.

9. The provisions of this permit are severable and if a provision or its application is declared invalid or unenforceable for any reason, that declaration will not affect the validity or enforceability of the remaining provisions.

10. The permittee shall notify the DEQ at least six (6) months prior to permanently removing any permitted reuse facility from service, including any treatment, storage, or other facilities or equipment associated with the reuse site. Prior to commencing closure activities, the permittee shall: a) participate in a pre-site closure meeting with the DEQ; b) develop a site closure plan that identifies specific closure, site characterization, or cleanup tasks with scheduled task completion dates in accordance with agreements made at the pre-site closure meeting; and c) submit the completed site closure plan to the DEQ for review and approval within forty-five (45) days of the pre-site closure meeting. The permittee must complete the DEQ approved site closure plan.

# Appendix 1
# Environmental Monitoring Serial Numbers

## CLASS A WATER USES FOR LA-000216-02

| Description |
|---|
| Irrigation |
| Fire Suppression |
| Snowmaking |
| Future uses as allowed by the Reuse Rules |

## WASTEWATER SAMPLING POINTS

| Serial Number | Description/Location |
|---|---|
| WW-021607 | Following disinfection and prior to discharge from WWTP |

## LAGOONS

| Serial Number | Description |
|---|---|
| LG-021601 | Dollar Mountain Storage Reservoir |

## FLOW METERS

| Serial Number | Description |
|---|---|
| FM-021601 | Magnetometer at WWTP |

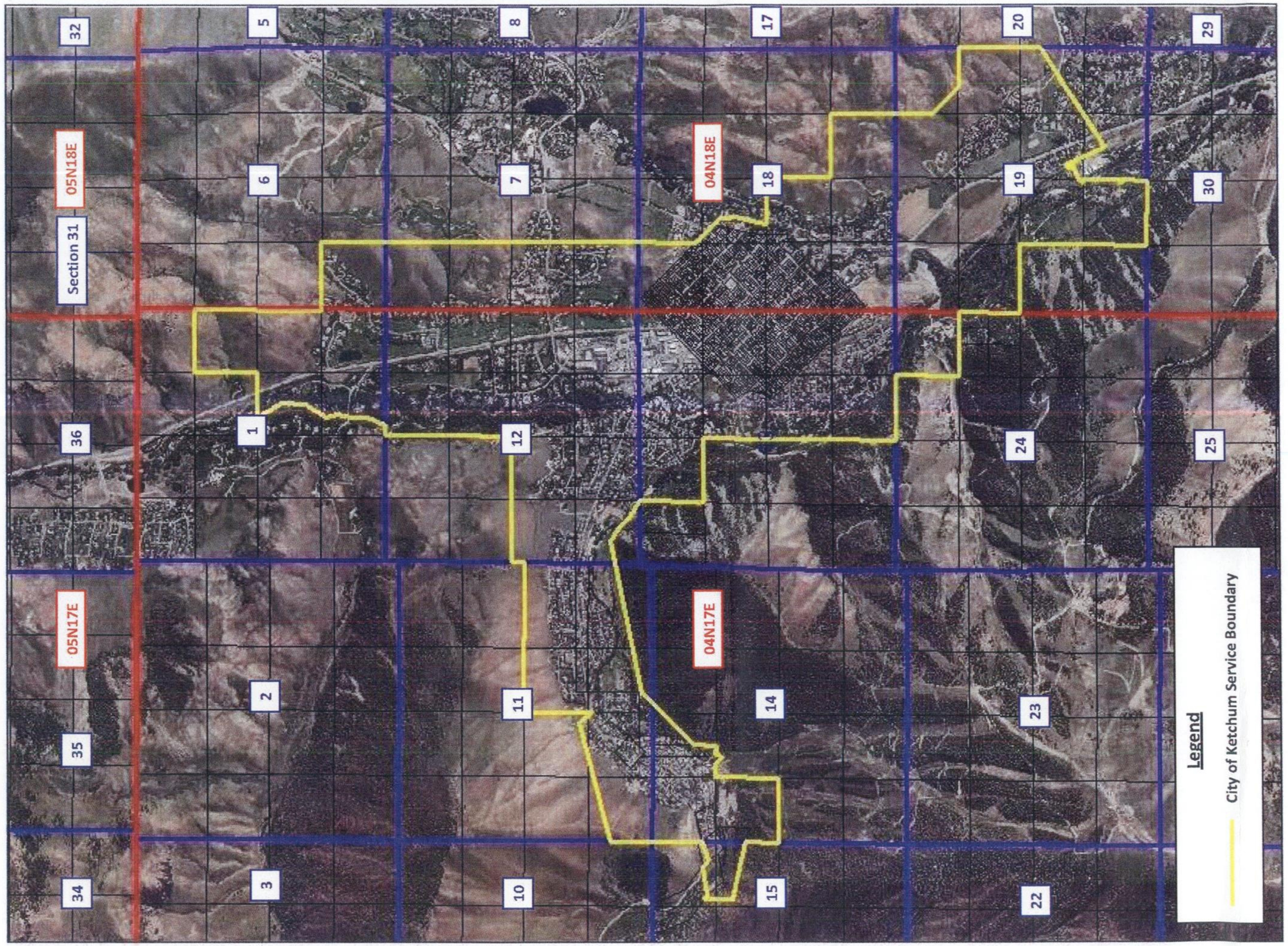
## Site Maps

a) Figure 1. General Location Map
   - General locations (property boundaries) of municipal plant and reuse site. Include township(s), range(s) and section(s).
   - Figure 1.1 – City of Ketchum Service Area
   - Figure 1.2 – SVWSD Service Area

b) Figure 2. Management Unit Map
   - All hydraulic management units (including serial numbers), and all lagoons and storage structures (including serial numbers).
   - Figure 2.1 – City of Ketchum Class A Areas
   - Figure 2.2 – SVWSD Class A Areas

c) Figure 3. Wells/Surface Water/Groundwater Flow Map (See Compliance Activity CA-216-03)
   - All private and public drinking water supply sources within ¼ mile of reuse sites; all springs, wetlands, and surface waters within ¼ mile of reuse sites; and groundwater contours and direction of flow.

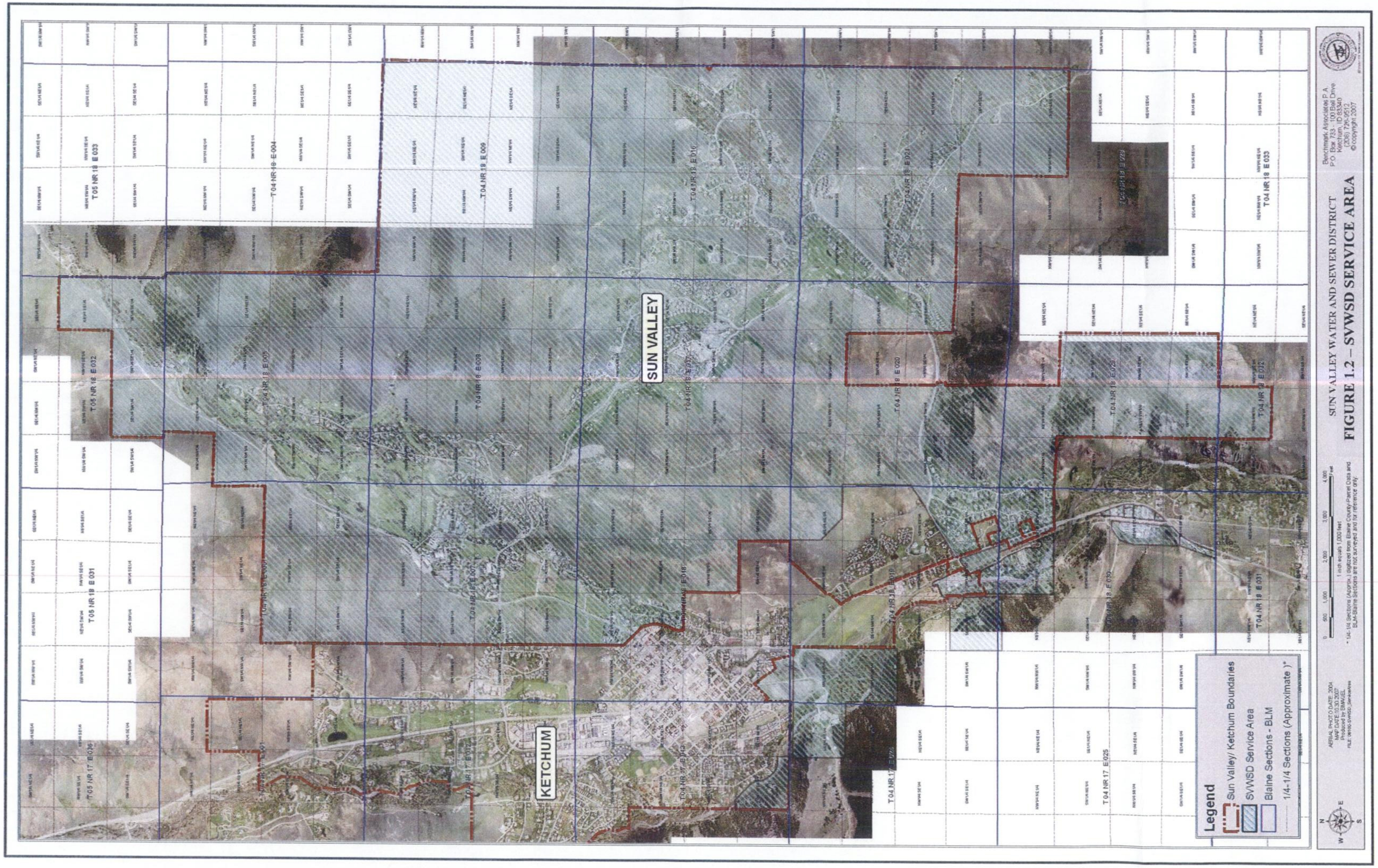
Appendix 2
Site Maps




CITY OF KETCHUM
SERVICE AREA MAP

FIGURE 1.1 – CITY OF KETCHUM SERVICE AREA

Appendix 2
Site Maps



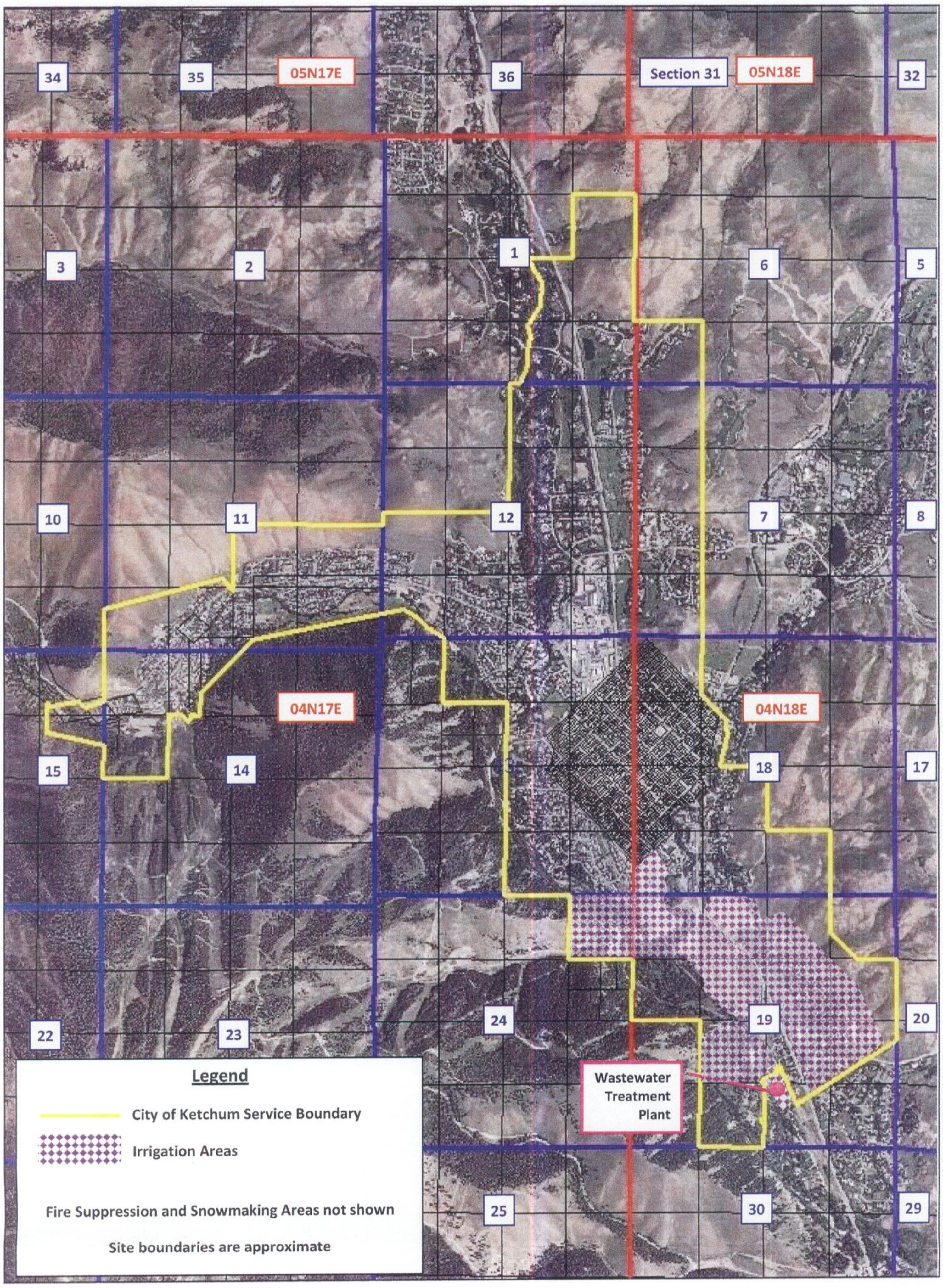
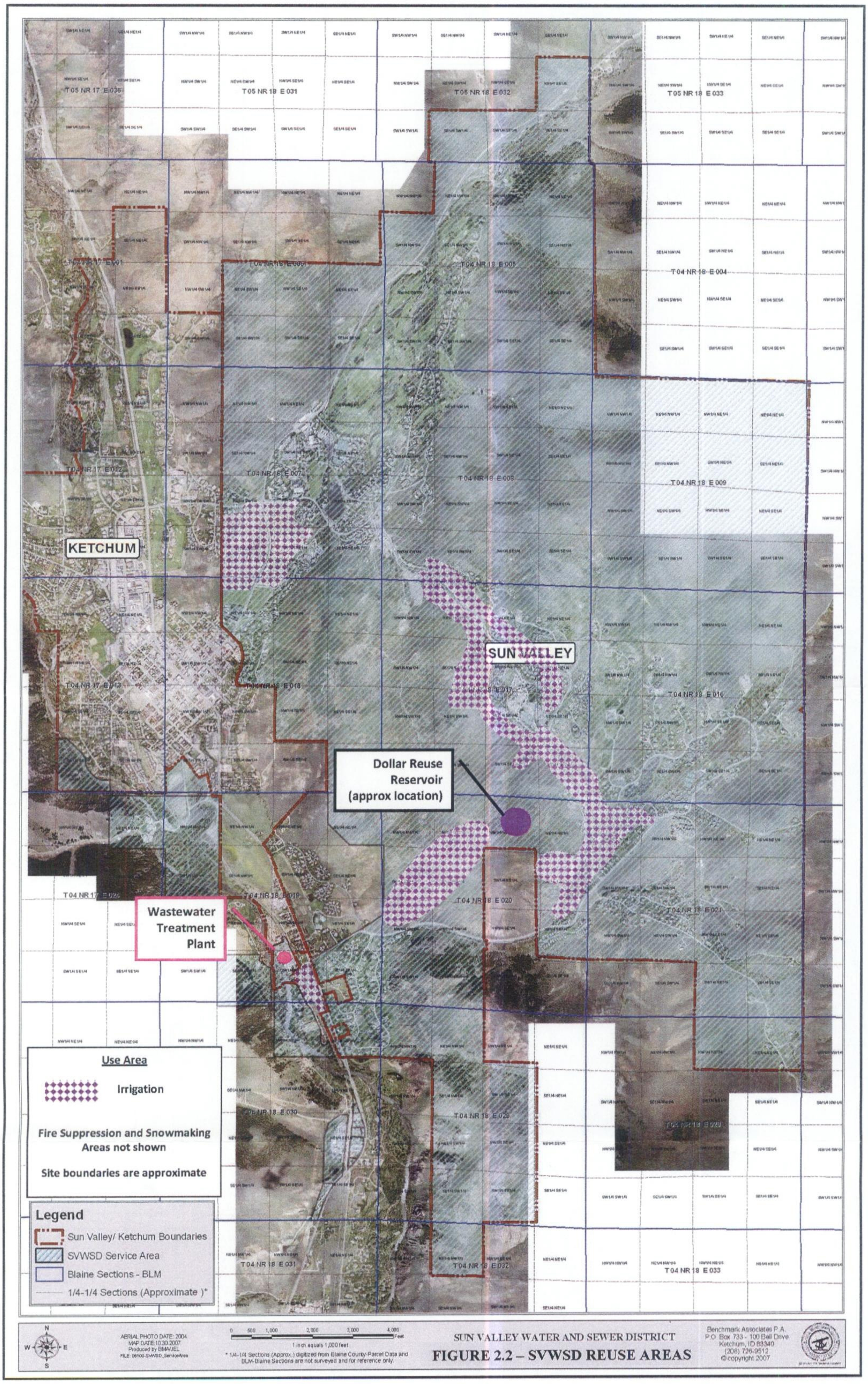



FIGURE 2.1 – CITY OF KETCHUM REUSE AREAS


KETCHUM
SUN VALLEY
Dollar Reuse Reservoir (approx location)
Wastewater Treatment Plant
Use Area
Irrigation
Fire Suppression and Snowmaking Areas not shown
Site boundaries are approximate
Legend
Sun Valley/ Ketchum Boundaries
SVWSD Service Area
Blaine Sections - BLM
1/4-1/4 Sections (Approximate )*
T05 NR 17 E 036
T05 NR 18 E 031
T05 NR 18 E 032
T05 NR 18 E 033
T04 NR 18 E 004
T04 NR 18 E 009
T04 NR 18 E 016
T04 NR 18 E 020
T04 NR 18 E 033
SUN VALLEY WATER AND SEWER DISTRICT
FIGURE 2.2 – SVWSD REUSE AREAS
Benchmark Associates P.A.
P.O. Box 733 - 100 Bell Drive
Ketchum, ID 83340
(208) 726-9512
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# C

## Wastewater Treatment Plant Classification Worksheet

# IDAHO PUBLIC WASTEWATER TREATMENT PLANT CLASSIFICATION WORKSHEET

**OFFICE USE**
**DO NOT WRITE HERE**

System Class __________

Upgrade ___ STD 5 Yr ___

Approved by __________

Date ______________

**Name of System:** Ketchum/Sun Valley Wastewater Treatment Plant

**Legal Owner of Treatment System** City of Ketchum/Sun Valley Water and Sewer District

**System Address:** 110 River Ranch Rd

**City:** Ketchum **State:** ID **Zip Code:** 83340

**Contact Person:** Mick Mummert **Title:** Wastewater Division Supervisor

**Business Phone Number:** (208 )726-7825 **Email** mmummert@ketchumidaho.org

**Treatment System - Design Flow/Actual Flow** 4.0 / 1.4
**(MGD) (MGD)**

**Treatment Plant Classification Worksheet is (Check one):**

☐ **Initial System Rating** ☐ **System Upgrade** ☒ **Standard 5 Year Rating**

**Date of last system classification rating (if applicable)** _____

☒ **Attach a flow schematic or hydraulic flow diagram of the treatment facility to this treatment plant classification worksheet when submitting to DEQ.**

## Instructions:

**Use this rating form for all types of public wastewater treatment plants, facilities, or systems[D-16] that treat domestic and/or industrial wastewater including, but not limited to traditional biological and mechanical treatment processes, large soil absorption systems, community drainfields, and wastewater lagoon systems. <u>Fill out ONE form for the wastewater treatment facility including all sequential, parallel or multiple treatment processes for both effluent and solids that provide treatment of all wastewater introduced into the system.</u>**

## How to Assign Points:

**Evaluate each item listed in the table below and place the specified point value next to each item selected. *Each unit process should have points assigned only once*. Add the total number of points selected to determine the class of the treatment system. Definitions describing all configurations, names, and/or reasons why rating points are or are not assigned to a particular item are provided for those items with a small D-number behind the item, i.e. D-1. Check the definition if unsure whether a particular treatment plant process qualifies for the point value shown.**

**Treatment facilities will be classified as VSWW, Class I, Class II, Class III or Class IV with IV being the largest and most complex. *Mail the completed, signed form to the Department of Environmental Quality 1410 N. Hilton, Boise, ID 83706 Attention: Jerimiah Fenton or Jerimiah.Fenton@deq.idaho.gov. Keep a photocopy of the original form for your files.***

| Item | Points | Your System |
|---|---|---|
| ***System Size (2 to 20 points)*** | | |
| Number of Connections (for information only) | (not scored) | 3200 |
| Maximum population served, peak day (1 point minimum to 10 point maximum) 15334 | 1 point/10,000 or part | 2 |
| Design flow (average/day) or peak months (average/day) Whichever is larger (1 point min to 10 point max) 4.0 MGD design flow | 1 point/MGD or part | 4 |

| Item | Points | Your System |
| --- | --- | --- |
| ***Variation in Raw Wastewater (0 to 6 points)*** [1] | | |
| Variations do not exceed those normally or typically expected | 0 points | 0 |
| Recurring deviations/excessive variations of 100% to 200% in strength/flow | 2 points | 0 |
| Recurring deviations/excessive variations of more than 200% in strength/flow | 4 points | 0 |
| Raw wastewater subject to toxic waste discharges | 6 points | 0 |
| Impact of septage or truck-hauled wastewater (0 to 4 points) | 0-4 points | 0 |
| ***Preliminary Treatment Process*** | | |
| Plant pumping of main flow | 3 points | 3 |
| Screening, comminution | 3 points | 3 |
| Grit removal | 3 points | 3 |
| Equalization | 1 point | 0 |
| ***Primary Treatment Process*** | | |
| Primary clarifiers | 5 points | 0 |
| Imhoff tanks, septic tanks, or similar (combined sedimentation/digestion)[D-8] | 5 points | 0 |
| ***Secondary Treatment Process*** | | |
| Fixed-film reactor[D-7] | 10 points | 0 |
| Activated sludge[D-1] | 15 points | 15 |
| Stabilization ponds or lagoon without aeration | 5 points | 0 |
| Stabilization ponds or lagoon with aeration | 8 points | 0 |
| Membrane Biological Reactor (MBR) – Basic MBR which combines activated sludge (minus secondary clarification) and membrane filtration.[D-17] | 15 points | 0 |
| ***Tertiary Treatment Process*** | | |
| Polishing ponds for advanced wastewater treatment | 2 points | 0 |
| Chemical/physical advanced wastewater treatment w/o secondary[D-5] | 15 points | 0 |
| Chemical/physical advanced wastewater treatment following secondary[D-4] | 10 points | 10 |
| Biological or chemical/biological advanced wastewater treatment[D-2] | 12 points | 0 |
| Nitrification by designed extended aeration only | 2 points | 2 |
| Ion exchange for advanced wastewater treatment | 10 points | 0 |
| Reverse osmosis, electrodialysis and other membrane filtration techniques for advanced wastewater treatment | 15 points | 0 |
| Advanced wastewater treatment chemical recovery, carbon regeneration | 4 points | 0 |
| Media filtration (removal of solids by sand or other media) [D-13] | 5 points | 5 |
| ***Additional Treatment Processes*** | | |
| Chemical additions (2 points each for a max of 6 points)[D-3] | 0-6 points | 4 |
| Dissolved air floatation (for other than sludge thickening) | 8 points | 0 |
| Intermittent sand filter | 2 points | 0 |
| Recirculating intermittent sand filter | 3 points | 0 |
| Microscreens | 5 points | 0 |
| Generation of oxygen | 5 points | 0 |

| | | |
|---|---|---|
| ***Solids Handling*** | | |
| Solids stabilization (used to reduce pathogens, volatile organic chemicals & odors include lime or similar treatment and thermal conditioning)[D-15] | 5 points | 0 |
| Gravity thickening | 2 points | 2 |
| Mechanical dewatering of solids[D-11] | 8 points | 0 |
| Anaerobic digestion of solids | 10 points | 0 |
| Aerobic digestion of solids | 6 points | 6 |
| Evaporative sludge drying | 2 points | 2 |
| Solids reduction (including incineration, wet oxidation) | 12 points | 0 |
| On-site landfill for solids | 2 points | 0 |
| Solids composting[D-14] | 10 points | 10 |
| Land application of biosolids by contractor [D-9] | 2 points | 0 |
| Land application of biosolids by facility operator in responsible charge | 10 points | 0 |
| ***Disinfection (0 to 10 points maximum)*** | | |
| No disinfection | 0 points | 0 |
| Chlorination (including chlorine dioxide or chloramines) or ultraviolet irradiation | 5 points | 5 |
| Ozonation | 10 points | 0 |
| ***Effluent Discharge (0 to 10 points maximum)*** | | |
| No discharge | 0 points | 0 |
| Discharge to surface water receiving stream[D-6] | 0 points | 0 |
| Mechanical post aeration[D-12] | 2 points | 0 |
| Land treatment with surface disposal or land treatment with subsurface disposal [D-10] | 4 points | 0 |
| Direct recycle and reuse | 6 points | 6 |
| ***Instrumentation (0 to 6 point maximum)*** | | |
| SCADA or similar instrumentation systems to provide data with no process operation | 0 points | 0 |
| SCADA or similar instrumentation systems to provide data with limited process operation | 2 points | 0 |
| SCADA or similar instrumentation systems to provide data with moderate process operation | 4 points | 4 |
| SCADA or similar instrumentation systems to provide data with extensive or total process operation | 6 points | 0 |
| ***Laboratory Control (0 to 15 point maximum)*** [2] | | |
| *Bacteriological/Biological Laboratory Control (0 to 5 point maximum)* | | |
| Lab work done outside the treatment plant | 0 points | 0 |
| Membrane filter procedures | 3 points | 3 |
| Use of fermentation tubes or any dilution method; fecal coliform determination | 5 points | 0 |
| *Chemical/Physical Laboratory Control (0 to 10 point maximum)* | | |
| Lab work done outside the treatment plant | 0 points | 0 |
| Push-button or visual (colorimetric) methods for simple tests such as pH, settleable solids | 3 points | 0 |
| Additional procedures such as DO, COD, BOD, gas analysis, titrations, | | |

| | | |
|---|---|---|
| solids, volatile content | 5 points | 0 |
| More advanced determinations such as specific constituents; nutrients, total oils, phenols | 7 points | 7 |
| Highly sophisticated instrumentation such as atomic absorption, gas chromatography | 10 points | 0 |
| | **TOTAL POINTS FOR YOUR SYSTEM** | 96 |

| System Classification Key | Classification |
|---|---|
| A system comprised of only one of the following wastewater treatment processes: aerated lagoon (s), non-aerated lagoons, primary treatment, or LSAS; and associated collection system also meets the definition of a very small wastewater system (VSWWS). | ☐ VSWWS |
| 0-30 points | ☐ Class I |
| 31-55 points | ☐ Class II |
| 56-75 points | ☐ Class III |
| 76 or greater | ☒ Class IV |

Footnote [1] The key concept is frequency and/or intensity of deviation or excessive variation from normal or typical fluctuations; such deviation can be in terms of strength, toxicity, shock loads, I/I, with points from 0-6.

Footnote [2] The key concept is to credit laboratory analyses done on-site by plant personnel under the direction of the operator in direct responsible charge with points from 0-15.

Mickey D. Mumment / 11/10/2021

Signature of Legal Owner or Owner's Representative Date

## Wastewater Treatment Definitions

D-1. **Activated Sludge** - Wastewater treatment by aeration of suspended organisms followed by secondary clarification, including extended aeration, oxidation ditches, Intermittent Cycle Extended Aeration system (ICEAS), and other similar processes. A sequencing batch reactor with the purpose of providing this form of treatment would be rated under this category.

D-2. **Biological or chemical/biological advanced wastewater treatment** - The advanced treatment of wastewater for nutrient removal including nitrification, denitrification, or phosphorus removal utilizing biological or chemical processes or a combination. If the facility is designed to nitrify based solely on detention time in an extended aeration system, only the points for nitrification by designed extended aeration should be given.

D-3. **Chemical addition** - The addition of a chemical to wastewater at an application point for the purposes of adjusting pH or alkalinity, improving solids removal, dechlorinating, removing odors, providing nutrients, or otherwise enhancing treatment, excluding chlorination for disinfection of effluent and the addition of enzymes or any process included in the Tertiary Chemical/Physical Processes. The capability to add a chemical at different application points for the same purpose should be rated as one application; the capability to add a chemical(s) to dual units should be rated as one application; and the capability to add a chemical at different application points for different purposes should be rated as separate applications.

D-4. **Chemical/physical advanced treatment following secondary** - The use of chemical or physical advanced treatment processes following (or in conjunction with) a secondary treatment process. This would include processes such as carbon adsorption, air stripping, chemical coagulation, and precipitation, etc.

D-5. **Chemical/physical advanced treatment without secondary** - The use of chemical or physical advanced treatment processes without the use of a secondary treatment process. This would include processes such as carbon adsorption, air stripping, chemical coagulation, precipitation, etc.

D-6. **Discharge to Receiving Water -** Treatment processes present at the facility are designed to achieve NPDES permit limitations that have already factored in the sensitivity of the receiving stream. Consequently, no additional points are assigned to rate the receiving stream separately from the facility treatment processes.

D-7. **Fixed-film reactor -** Biofiltration by trickling filters or rotating biological contactors followed by secondary clarification.

D-8. **Imhoff tanks (or similar) -** Imhoff tanks, septic tanks, spirogester, clarigester, or other single unit for combined sedimentation and digestion.

D-9. **Land application of biosolids by contractor -** The land application or beneficial reuse of biosolids by a contractor outside of the control of the operator in direct responsible charge of the wastewater treatment facility.

D-10. **Land treatment and disposal (surface or subsurface) -** The ultimate treatment and disposal of the effluent onto the surface of the ground by rapid infiltration or rotary distributor or by spray irrigation. Subsurface treatment and disposal would be accomplished by infiltration gallery, injection, or gravity or pressurized drainfield.

D-11. **Mechanical dewatering -** The removal of water from sludge by any of the following processes and including the addition of polymers in any of the following: vacuum filtration; frame, belt, or plate filter presses; centrifuge; or dissolved air floatation.

D-12. **Mechanical post-aeration -** The introduction of air into the effluent by mechanical means such as diffused or mechanical aeration. Cascade aeration would not be assigned points.

D-13. **Media Filtration -** The advanced treatment of wastewater for removal of solids by sand or other media or mixed media filtration.

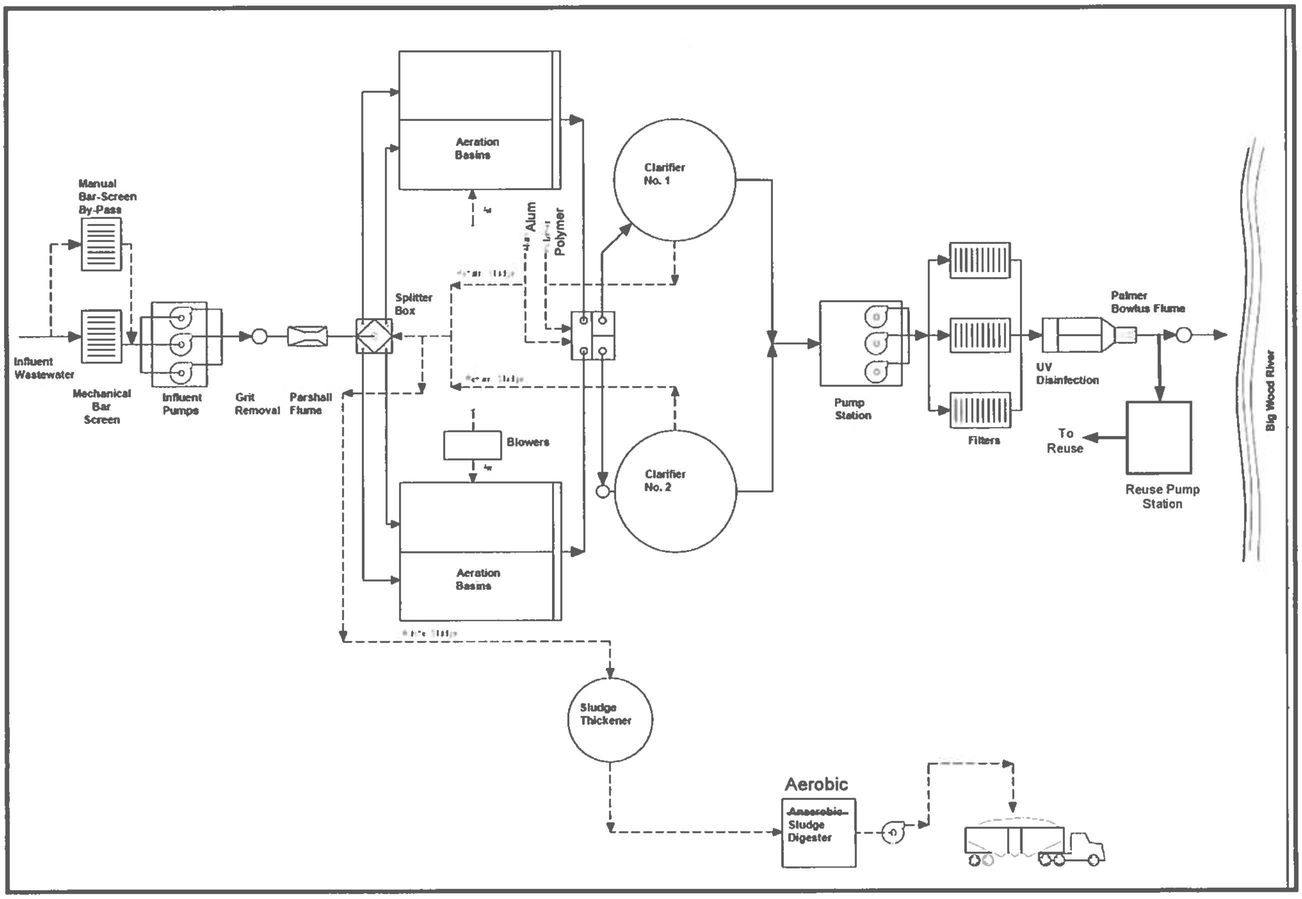
D-14. **Solids composting -** The biological decomposition process producing carbon dioxide, water, and heat. Typical methods are windrow, forced air-static pile, and mechanical.

D--15. **Solids stabilization -** The processes to oxidize or reduce the organic matter in the sludge to a more stable form. These processes reduce pathogens or reduce the volatile organic chemicals and thereby reduce the potential for odor. These processes would include lime (or similar) treatment and thermal conditioning. Other stabilization processes such as aerobic or anaerobic digestion and composting are listed individually.

D-16 **Wastewater Treatment Facility**. Any physical facility or land area for the purpose of collecting, treating, neutralizing or stabilizing pollutants including treatment plants, the necessary intercepting, outfall and outlet sewers, pumping stations integral to such plants or sewers, equipment and furnishing thereof and their appurtenances. A treatment facility may also be known as a treatment system, wastewater treatment system, wastewater treatment facility, or wastewater treatment plant (IDAPA 58.01.16.010).

D-17 **Membrane Biological Reactor (MBR) Point Factoring -** The points assigned to the basic MBR unit does not include points for any additional treatment processes such as phosphorus removal, nitrification, denitrification, land application, rapid infiltration basins, lagoons, etc. Points must be assigned separately to each additional treatment process beyond the basic MBR unit. Additional treatment processes may vary on a case-by-case basis.

Figure 1-2 – Flow Schematic




## 1.2 DESIGN LOADING

The wastewater treatment facilities were designed to successfully treat wastewater with the design loadings outlined in **Table 1-1**.

# D

## Cost Opinion

| | | Aeration Basins - Anoxic and MLR (Nos. 3 & 4) | | Aeration Basin Blower Repair | | Grit Removal System | | Aeration Basin Upgrades (Nos. 1 & 2) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Diffuser System | $17,000 | Blower | $65,000 | Grit Chamber Baffles | | Center Wall Catwalk | $45,000 |
| | | Submersible Mixer | $186,728 | | | Grit Concentrator | | Catwalk Railing | $12,960 |
| | | MLR Pumps | $90,000 | | | Grit Washer | | Catwalk Canopy | $32,400 |
| | | Installation | $117,491 | | | Grit Pump | | Baffle Walls | $115,556 |
| | | | | | | | | Diffuser System | $170,000 |
| | | | | | | Combined Cost | $300,026 | MLR Pumps | $90,000 |
| | | | | | | Installation | $120,010 | Submersible Mixer | $186,728 |
| | | | | | | | | Installation | $218,691 |
| | | | | | | | | Air Piping | $100,000 |
| Electrical | 20.00% | | $78,844 | | $0 | | $84,007 | | $115,738 |
| I&C | 12.00% | | $47,306 | | $0 | | $50,404 | | $69,443 |
| | Subtotal | | **$537,368** | | **$65,000** | | **$554,448** | | **$1,156,515** |
| Contractor's Field Overhead | 10.00% | | $54,000 | | $0 | | $55,000 | | $116,000 |
| Sales Tax on Real Property | 6.00% | | $7,000 | | | | $7,000 | | $25,000 |
| | **Subtotal** | | **$598,000** | | **$65,000** | | **$616,000** | | **$1,298,000** |
| Contractor's Fee (Profit) | 10.00% | | $60,000 | | $0 | | $62,000 | | $130,000 |
| Contractor's Bonds and Insurance | 1.50% | | $9,000 | | $0 | | $9,000 | | $19,000 |
| Undefined Scope of Work/Contingency | 25.00% | | $150,000 | | $0 | | $154,000 | | $325,000 |
| | **Subtotal** | | **$817,000** | | **$65,000** | | **$841,000** | | **$1,772,000** |
| Escalation for Unforseen Market Conditions | 5.00% | | $41,000 | | $0 | | $42,000 | | $89,000 |
| | **Subtotal** | | **$858,000** | | **$65,000** | | **$883,000** | | **$1,861,000** |
| Engineering Design and SDC | 15.00% | | $129,000 | | $0 | | $132,000 | | $279,000 |
| | **Subtotal** | | **$987,000** | | **$65,000** | | **$1,015,000** | | **$2,140,000** |
| | -20% | | **$790,000** | | **$52,000** | | **$812,000** | | **$1,712,000** |
| | 40% | | **$1,382,000** | | **$91,000** | | **$1,421,000** | | **$2,996,000** |

| | | Rotary Drum Thickener & Dewatering Building | | Remove Digester No. 1 Building and New Flat Covers | | Clarifier No. 1 HVAC and Roof Repair | | Gravity Thickener & Transfer Building Demo | |
|---|---|---|---|---|---|---|---|---|---|
| | | RDT | $355,000 | Dig #1 Bldg Demo | $40,000 | C1D1 Heaters (x2) | $20,000 | Thickener Demo | $40,000 |
| | | Sludge Transfer to Pro Cav | $11,978 | Digester Cover | $191,599 | Clarifier Roof | $69,775 | Transfer Building Demo | $35,000 |
| | | Dewatering Bldg | $2,000,000 | Cover Install | $76,640 | | | | |
| | | Conveyor | $100,000 | Misc. Metals | $50,000 | | | | |
| | | Electrical Service & Control Panel | $150,000 | | | | | | |
| | | Piping | $100,000 | | | | | | |
| | | MCC | $280,000 | | | | | | |
| | | Installation | $398,791 | | | | | | |
| | | | | | | | | | |
| Electrical | 20.00% | | $279,154 | | $10,000 | | $4,000 | | $0 |
| I&C | 12.00% | | $167,492 | | $6,000 | | $2,400 | | $0 |
| | Subtotal | | **$3,842,415** | | **$374,239** | | **$96,175** | | **$75,000** |
| Contractor's Field Overhead | 10.00% | | $384,000 | | $37,000 | | $10,000 | | $8,000 |
| Sales Tax on Real Property | 6.00% | | $144,000 | | $7,000 | | $4,000 | | $5,000 |
| | **Subtotal** | | **$4,370,000** | | **$418,000** | | **$110,000** | | **$88,000** |
| Contractor's Fee (Profit) | 10.00% | | $437,000 | | $42,000 | | $11,000 | | $9,000 |
| Contractor's Bonds and Insurance | 1.50% | | $66,000 | | $6,000 | | $2,000 | | $1,000 |
| Undefined Scope of Work/Contingency | 25.00% | | $1,093,000 | | $105,000 | | $28,000 | | $22,000 |
| | **Subtotal** | | **$5,966,000** | | **$571,000** | | **$151,000** | | **$120,000** |
| Escalation for Unforseen Market Conditions | 5.00% | | $298,000 | | $29,000 | | $8,000 | | $6,000 |
| | **Subtotal** | | **$6,264,000** | | **$600,000** | | **$159,000** | | **$126,000** |
| Engineering Design and SDC | 15.00% | | $940,000 | | $90,000 | | $24,000 | | $19,000 |
| | **Subtotal** | | **$7,204,000** | | **$690,000** | | **$183,000** | | **$145,000** |
| | -20% | | **$5,763,000** | | **$552,000** | | **$146,000** | | **$116,000** |
| | 40% | | **$10,086,000** | | **$966,000** | | **$256,000** | | **$203,000** |

| | | Digester No. 2 | | Screw Press | | New & Replacement Digester Blowers | | AB Blower 1 & Electrical | |
|---|---|---|---|---|---|---|---|---|---|
| | | Concrete | $688,148 | Screw Press | $450,000 | Blower Replacement | $232,000 | Blowers | $249,000 |
| | | Digester Diffusers | $97,105 | | | New Blowers | $232,000 | Air Piping | $75,000 |
| | | Dig #2 & #3 Transfer Pumps | $23,956 | Installation | $180,000 | | | MCC-2 | $275,000 |
| | | Digester Cover | $191,599 | | | Installation | $215,600 | Installation | $239,600 |
| | | Installation | $165,064 | | | Air Piping | $75,000 | Spare Xfrmr | $50,000 |
| | | Excavation | $92,444 | | | | | | |
| | | Air Piping | $100,000 | | | | | | |
| Electrical | 20.00% | | $24,791 | | $126,000 | | $150,920 | | $167,720 |
| I&C | 12.00% | | $14,875 | | $75,600 | | $90,552 | | $100,632 |
| | Subtotal | | **$1,397,982** | | **$831,600** | | **$996,072** | | **$1,156,952** |
| Contractor's Field Overhead | 10.00% | | $140,000 | | $83,000 | | $100,000 | | $116,000 |
| Sales Tax on Real Property | 6.00% | | $68,000 | | $11,000 | | $13,000 | | $14,000 |
| | **Subtotal** | | **$1,606,000** | | **$926,000** | | **$1,109,000** | | **$1,287,000** |
| Contractor's Fee (Profit) | 10.00% | | $161,000 | | $93,000 | | $111,000 | | $129,000 |
| Contractor's Bonds and Insurance | 1.50% | | $24,000 | | $14,000 | | $17,000 | | $19,000 |
| Undefined Scope of Work/Contingency | 25.00% | | $402,000 | | $232,000 | | $277,000 | | $322,000 |
| | **Subtotal** | | **$2,193,000** | | **$1,265,000** | | **$1,514,000** | | **$1,757,000** |
| Escalation for Unforseen Market Conditions | 5.00% | | $110,000 | | $63,000 | | $76,000 | | $88,000 |
| | **Subtotal** | | **$2,303,000** | | **$1,328,000** | | **$1,590,000** | | **$1,845,000** |
| Engineering Design and SDC | 15.00% | | $345,000 | | $199,000 | | $239,000 | | $277,000 |
| | **Subtotal** | | **$2,648,000** | | **$1,527,000** | | **$1,829,000** | | **$2,122,000** |
| | -20% | | **$2,118,000** | | **$1,222,000** | | **$1,463,000** | | **$1,698,000** |
| | 40% | | **$3,707,000** | | **$2,138,000** | | **$2,561,000** | | **$2,971,000** |

| | | AB Blower 2 + Building | | AB Blower 3 | | AB Blower 4 & Yard Piping | | Replace Generator & MCC-3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Blowers | $249,000 | Blowers | $249,000 | Blowers | $249,000 | Generator | $225,000 |
| | | Building Expansion | $311,250 | Air Piping | $75,000 | Air Piping | $75,000 | MCC-3 | $185,000 |
| | | Air Piping | $75,000 | | | Yard Piping to 16" | $10,000 | Installation | $90,000 |
| | | Installation | $129,600 | Installation | $129,600 | Installation | $207,600 | | |
| | | | | | | MCC-4 | $185,000 | | |
| Electrical | 20.00% | | $90,720 | | $90,720 | | $128,320 | | $100,000 |
| I&C | 12.00% | | $54,432 | | $54,432 | | $76,992 | | $60,000 |
| | Subtotal | | **$910,002** | | **$598,752** | | **$931,912** | | **$660,000** |
| Contractor's Field Overhead | 10.00% | | $91,000 | | $60,000 | | $93,000 | | $66,000 |
| Sales Tax on Real Property | 6.00% | | $26,000 | | $8,000 | | $12,000 | | $40,000 |
| | **Subtotal** | | **$1,027,000** | | **$667,000** | | **$1,037,000** | | **$766,000** |
| Contractor's Fee (Profit) | 10.00% | | $103,000 | | $67,000 | | $104,000 | | $77,000 |
| Contractor's Bonds and Insurance | 1.50% | | $15,000 | | $10,000 | | $16,000 | | $11,000 |
| Undefined Scope of Work/Contingency | 25.00% | | $257,000 | | $167,000 | | $259,000 | | $192,000 |
| | **Subtotal** | | **$1,402,000** | | **$911,000** | | **$1,416,000** | | **$1,046,000** |
| Escalation for Unforseen Market Conditions | 5.00% | | $70,000 | | $46,000 | | $71,000 | | $52,000 |
| | **Subtotal** | | **$1,472,000** | | **$957,000** | | **$1,487,000** | | **$1,098,000** |
| Engineering Design and SDC | 15.00% | | $221,000 | | $144,000 | | $223,000 | | $165,000 |
| | **Subtotal** | | **$1,693,000** | | **$1,101,000** | | **$1,710,000** | | **$1,263,000** |
| | -20% | | **$1,354,000** | | **$881,000** | | **$1,368,000** | | **$1,010,000** |
| | 40% | | **$2,370,000** | | **$1,541,000** | | **$2,394,000** | | **$1,768,000** |

| | | Pump Replacements | | Replace UV Equipment | | Upgrade PLC Hardware | | Upgrade Filter PLC | |
|---|---|---|---|---|---|---|---|---|---|
| | | Influent | $84,210 | UV System | $500,000 | Hardware | $400,000 | Filter PLC | $30,000 |
| | | Effluent | $76,995 | | | | | | |
| | | RAS | $94,005 | Installation | $200,000 | Installation | $160,000 | Installation | $12,000 |
| | | WAS | $8,243 | | | | | | |
| | | Scum | $15,000 | | | | | | |
| | | Plant Drain | $50,000 | | | | | | |
| | | Alum & Polymer | $30,000 | | | | | | |
| | | Reuse | $313,011 | | | | | | |
| | | | | | | | | | |
| Electrical | 20.00% | | $67,146 | | $140,000 | | $112,000 | | $8,400 |
| I&C | 12.00% | | $40,288 | | $84,000 | | $67,200 | | $5,040 |
| | Subtotal | | **$778,898** | | **$924,000** | | **$739,200** | | **$55,440** |
| Contractor's Field Overhead | 10.00% | | $78,000 | | $92,000 | | $74,000 | | $6,000 |
| Sales Tax on Real Property | 6.00% | | | | $12,000 | | $10,000 | | $1,000 |
| | **Subtotal** | | **$857,000** | | **$1,028,000** | | **$823,000** | | **$62,000** |
| Contractor's Fee (Profit) | 10.00% | | $86,000 | | $103,000 | | $82,000 | | $6,000 |
| Contractor's Bonds and Insurance | 1.50% | | $13,000 | | $15,000 | | $12,000 | | $1,000 |
| Undefined Scope of Work/Contingency | 25.00% | | $214,000 | | $257,000 | | $206,000 | | $16,000 |
| | **Subtotal** | | **$1,170,000** | | **$1,403,000** | | **$1,123,000** | | **$85,000** |
| Escalation for Unforseen Market Conditions | 5.00% | | $59,000 | | $70,000 | | $56,000 | | $4,000 |
| | **Subtotal** | | **$1,229,000** | | **$1,473,000** | | **$1,179,000** | | **$89,000** |
| Engineering Design and SDC | 15.00% | | $184,000 | | $221,000 | | $177,000 | | $13,000 |
| | **Subtotal** | | **$1,413,000** | | **$1,694,000** | | **$1,356,000** | | **$102,000** |
| | -20% | | **$1,130,000** | | **$1,355,000** | | **$1,085,000** | | **$82,000** |
| | 40% | | **$1,978,000** | | **$2,372,000** | | **$1,898,000** | | **$143,000** |

| | | Digester No. 1 Diffusers | | Clarifier Mechanism No. 1 Replacement | | Upgrade Dewatering PLC | | Misc. Headworks Improvements | |
|---|---|---|---|---|---|---|---|---|---|
| | | 4x 6" 12ga 304SS Dropleg | | Mechanism Refurbish | $163,000 | Dewatering PLC | $30,000 | Misc. Improvements | $50,000 |
| | | 4x 4" 17.7 SDR PVC Manifold | | | | | | | |
| | | 4x 4" 17.7 SDR PVC Distributors | | Installation | $65,200 | Installation | $12,000 | Installation | $20,000 |
| | | 613x 9" SSII Diffusers | $52,105 | | | | | | |
| | | | | | | | | | |
| | | Piping Cost | $45,000 | | | | | | |
| | | Installation | $38,842 | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Electrical | 20.00% | | $0 | | $45,640 | | $8,400 | | $14,000 |
| I&C | 12.00% | | $0 | | $27,384 | | $5,040 | | $8,400 |
| | Subtotal | | **$135,947** | | **$301,224** | | **$55,440** | | **$92,400** |
| Contractor's Field Overhead | 10.00% | | $14,000 | | $30,000 | | $6,000 | | $9,000 |
| Sales Tax on Real Property | 6.00% | | $2,000 | | $4,000 | | $1,000 | | $1,000 |
| | **Subtotal** | | **$152,000** | | **$335,000** | | **$62,000** | | **$102,000** |
| Contractor's Fee (Profit) | 10.00% | | $15,000 | | $34,000 | | $6,000 | | $10,000 |
| Contractor's Bonds and Insurance | 1.50% | | $2,000 | | $5,000 | | $1,000 | | $2,000 |
| Undefined Scope of Work/Contingency | 25.00% | | $38,000 | | $84,000 | | $16,000 | | $26,000 |
| | **Subtotal** | | **$207,000** | | **$458,000** | | **$85,000** | | **$140,000** |
| Escalation for Unforseen Market Conditions | 5.00% | | $10,000 | | $23,000 | | $4,000 | | $7,000 |
| | **Subtotal** | | **$217,000** | | **$481,000** | | **$89,000** | | **$147,000** |
| Engineering Design and SDC | 15.00% | | $33,000 | | $72,000 | | $13,000 | | $22,000 |
| | **Subtotal** | | **$250,000** | | **$553,000** | | **$102,000** | | **$169,000** |
| | -20% | | **$200,000** | | **$442,000** | | **$82,000** | | **$135,000** |
| | 40% | | **$350,000** | | **$774,000** | | **$143,000** | | **$237,000** |

| | | Headworks PLC | | Upgrade UV PLC | | Clarifier Mechanism No. 2 Replacement | | Lab/Ops/Maintenance Remodel | |
|---|---|---|---|---|---|---|---|---|---|
| | | Headworks PLC | $30,000 | UV PLC | $30,000 | Mechanism Refurbish | $133,500 | Upgrade Lab/Ops/Maintenance Building | $400,000 |
| | | Installation | $12,000 | Installation | $12,000 | Installation | $53,400 | | |
| | | | | | | | | All Buildings Stucco Repair (built into $500,000 above) | |
| | | | | | | | | | |
| Electrical | 20.00% | | $8,400 | | $8,400 | | $37,380 | | $80,000 |
| I&C | 12.00% | | $5,040 | | $5,040 | | $22,428 | | $48,000 |
| | Subtotal | | **$55,440** | | **$55,440** | | **$246,708** | | **$528,000** |
| Contractor's Field Overhead | 10.00% | | $6,000 | | $6,000 | | $25,000 | | $53,000 |
| Sales Tax on Real Property | 6.00% | | $1,000 | | $1,000 | | $3,000 | | $32,000 |
| | **Subtotal** | | **$62,000** | | **$62,000** | | **$275,000** | | **$613,000** |
| Contractor's Fee (Profit) | 10.00% | | $6,000 | | $6,000 | | $28,000 | | $61,000 |
| Contractor's Bonds and Insurance | 1.50% | | $1,000 | | $1,000 | | $4,000 | | $9,000 |
| Undefined Scope of Work/Contingency | 25.00% | | $16,000 | | $16,000 | | $69,000 | | $153,000 |
| | **Subtotal** | | **$85,000** | | **$85,000** | | **$376,000** | | **$836,000** |
| Escalation for Unforseen Market Conditions | 5.00% | | $4,000 | | $4,000 | | $19,000 | | $42,000 |
| | **Subtotal** | | **$89,000** | | **$89,000** | | **$395,000** | | **$878,000** |
| Engineering Design and SDC | 15.00% | | $13,000 | | $13,000 | | $59,000 | | $132,000 |
| | **Subtotal** | | **$102,000** | | **$102,000** | | **$454,000** | | **$1,010,000** |
| | -20% | | **$82,000** | | **$82,000** | | **$363,000** | | **$808,000** |
| | 40% | | **$143,000** | | **$143,000** | | **$636,000** | | **$1,414,000** |

| | | Replace VFD's | | Utility Tractor | | Sewer Cleaning "Vac" Truck | | Parking Lot Repaving | | Outfall Clearing | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | RAS Pumps (3) x 2 | $170,000 | Tractor | $67,000 | Vac Truck | $450,000 | Parking Lot Repaving | $400,000 | Outfall Clearing | $100,000 |
| | | UV Feed Pumps (3) x 2 | $220,000 | | | | | | | (2 x in 20 years) | |
| | | Influent Pumps (3) x 2 | $230,000 | | | | | | | | |
| Electrical | 20.00% | | $124,000 | | $0 | | $0 | | $0 | | $0 |
| I&C | 12.00% | | $74,400 | | $0 | | $0 | | $0 | | $0 |
| | Subtotal | | **$818,400** | | **$67,000** | | **$450,000** | | **$400,000** | | **$100,000** |
| Contractor's Field Overhead | 10.00% | | $82,000 | | $0 | | $0 | | $40,000 | | $10,000 |
| Sales Tax on Real Property | 6.00% | | $49,000 | | $0 | | $0 | | $24,000 | | $6,000 |
| | **Subtotal** | | **$949,000** | | **$67,000** | | **$450,000** | | **$464,000** | | **$116,000** |
| Contractor's Fee (Profit) | 10.00% | | $95,000 | | $0 | | $0 | | $46,000 | | $12,000 |
| Contractor's Bonds and Insurance | 1.50% | | $14,000 | | $0 | | $0 | | $7,000 | | $2,000 |
| Undefined Scope of Work/Contingency | 25.00% | | $237,000 | | $0 | | $0 | | $116,000 | | $29,000 |
| | **Subtotal** | | **$1,295,000** | | **$67,000** | | **$450,000** | | **$633,000** | | **$159,000** |
| Escalation for Unforseen Market Conditions | 5.00% | | $65,000 | | $0 | | $0 | | $32,000 | | $8,000 |
| | **Subtotal** | | **$1,360,000** | | **$67,000** | | **$450,000** | | **$665,000** | | **$167,000** |
| Engineering Design and SDC | 15.00% | | $204,000 | | $0 | | $0 | | $0 | | $0 |
| | **Subtotal** | | **$1,564,000** | | **$67,000** | | **$450,000** | | **$665,000** | | **$167,000** |
| | -20% | | **$1,251,000** | | **$54,000** | | **$360,000** | | **$532,000** | | **$134,000** |
| | 40% | | **$2,190,000** | | **$94,000** | | **$630,000** | | **$931,000** | | **$234,000** |