FALL
2021

The Official Publication of the Water Environment Association of Utah

DIGESTED news

Celebrating 50 Years of Clean Water

SUSTAINABLE ROI MODEL

USED TO SELECT THE DISINFECTION TECHNOLOGY AT THE SLC WATER RECLAMATION FACILITY

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INSIDE:

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Schoonover Case Study

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Connecting and Growing

Trevor Lindley

The work continues! As we continue to navigate our way through challenges all around, including a resurgence of the COVID-19 virus, the work of your WEAU continues. The Board of Directors (Board) hosted committee training meetings in June at the Jordan Basin WRF to help committees plan training for all WEAU members. The Board has also continued to meet regarding the business of WEAU during the summer; including in July and August when we reviewed our financial reports and approved the 2021-2022 budget.

Two fun highlights from summer WEAU activities include the PWO Golf Tournament, which was held July 14 at Valley View in Layton, and the SLC Bees game, hosted by The Young Professionals, on July 24 at Smith's Ball Park in Salt Lake City. We hope many of you were able to attend. I was personally at the Bees game and saw many WEAU members that I had not seen for quite some time. It was a good time for all in attendance and good to catch up.

Extensive planning continues for the organization including sponsoring two composite all-star operator challenge teams to represent WEAU at WEFTEC in Chicago this October. As well, the mid-year committee is moving forward with planning for our Mid-year Conference held every year (well, almost every year) in November at the Utah Cultural Celebration Center. The current plan is to hold the event in-person. Watch *www.weau.org* and your email for more information and details.

The Board recognized that many entities conduct internal trainings in an effort to help operators advance in their careers through certification. We, as an organization, are motivated to help in this effort as much as we can. The WEAU Board has outlined a training regimen for operator certification, patterned somewhat after Lonn Rasmussen's successful Collection College. The WEAU training will be based on the new WEF training manuals. Additionally, the WEAU training is not intended to replace internal training or personal study but will be offered to help with questions, encourage confidence in test taking, and provide group support. This training is anticipated to run on an annual cycle with a monthly event to review various sections of the manual. We anticipate that the course will be organized by WEAU volunteers, including folks such as Chad Burrell and his team of amazing, experienced WEAU operators and members. Watch for information regarding this effort that is anticipated to begin in the fall of 2021.

The WEAU Board wants to support members as they progress in their career. It's a privilege to be part of such a great organization.

Trevor Lindley
WEAU President
2021-2022

> "As we continue to navigate our way through challenges all around, the work of your WEAU continues.

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11 Woodchuck Units!

Bryan Mansell

Like many of you, I've occasionally been asked the thought provoking, soul stirring, and tongue twisting question: **How much wood could a woodchuck chuck if a woodchuck could chuck wood** (harder to type than to say)?

Have you ever pondered this question? Perhaps it's nonsensical. Perhaps it's metaphorical. Perhaps the subtle "if" is rudely pointing out a woodchuck's inability to chuck wood. Regardless, you're left to consider while your friend, sibling, boss, professor, or pastor awaits a response. Do you take offense, change the subject, or just laugh? Typically, I just laugh and smile nervously. However, on one such occasion, about a year ago, when asked jokingly by a neighbor who I don't know very well, a quip response came to mind. Without hesitation, I blurted out with a serious look on my face, "11 woodchuck units!"

Of course, now whenever I run into that individual, they want to start every conversation reminding me of this, because they thoroughly enjoyed the unexpected response. I suppose you could consider that a backfire, but it also gives us common ground to start from whenever we talk, regardless of the topic at hand.

Since common ground is a scarce commodity in modern America's controversy-craving culture, I'm going to offer a handful of possible responses to that same question. That way, if it comes up, you can make an instant friend through much-needed lightheartedness. A few ideas are as follows:

- 11 woodchuck units!
- About a chucker's dozen!
- Pine, cedar, or balsa wood?
- Over what period of time? What is it chucking them over? Please be specific.
- In units of steres, cords, or board feet?
- Are you referring to a baby chucker or a mother chucker?
- Seven.
- Well, it really depends on how much it chucked the previous day, doesn't it?


Wikipedia

- Mmmm, fresh ground chuuuck…
- How much chuck, could a chuck wood would, if a chuck wood could wood chuck?
- I don't know! Where's a woodchuck we can test?

I'm sure you can come up with better ones. Feel free to chuck them my way. DN

WEAU YP Bees Game Update

WEAU Night at the Bees game was a success! After not being able to host the event last year, we had 100 members, family, and friends attend this year. There was an awesome assortment of raffle prizes (the grand prize was a 55" flat screen TV!), fireworks, and a whole lot of fun! Hope to see everyone at the Bees game again next year!

WEAU Young Professionals!

Please mark your calendars and join us for the following event:

WEAU Mid-year Conference Dinner
November 16 at 4:30 pm
Red Robin (3601 S 2700 W #B152, West Valley City, UT 84119; Floor 1 – Valley Fair Mall)

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Wake up from COVID Brain!

Prepared by Lonn Rasmussen

1. **The primary purpose of the sewer collection system is to _____.**
   a) Collect and quickly transport from origin to treatment
   b) Collect and hold waste until transfer can be arranged
   c) Transport to a landfill
   d) Transport to a nuclear waste site

2. **The average person will contribute _____ to the collection system per day.**
   a) 40 gallons to 55 gallons
   b) 50 gallons to 61 gallons
   c) 60 gallons to 72 gallons
   d) 70 gallons to 100 gallons
   e) 110 gallons to 118 gallons

3. **The operator would expect typical wastewater to be _____.**
   a) 80% water and 20% solids
   b) 85 % water and 15 % solids
   c) 89.2 % water and 10.8 % solids
   d) 93.7 % water and 6.3 % solids
   e) 99.9% water and 0.1% solids

4. **The pH scale is from 1 to 14. What would be considered neutral?**
   a) 1
   b) 3
   c) 7
   d) 10
   e) 14

5. **Hydrogen Sulfide gas produces a _____ smell.**
   a) Sweet appealing
   b) Decaying animal
   c) Petroleum
   d) Vinegar
   e) Rotten Egg

6. **Two Viral diseases commonly found in wastewater are _____.**
   a) Typhoid and Cholera
   b) Tetanus
   c) Mumps and Measles
   d) Polio and Infectious Hepatitis

7. **All trenches over _____ deep require shoring protection.**
   a) 2 feet
   b) 3 feet
   c) 5 feet
   d) 7 feet

8. **The minimum requirement for velocity of flow in a gravity system is _____.**
   a) 1 ft/sec
   b) 2 ft/sec
   c) 4 ft/sec
   d) 5 ft/sec

9. **In a collection system, _____ pumps are the most common.**
   a) Piston
   b) Diaphragm
   c) Centrifugal
   d) Grinder

10. **Entering a manhole is sometimes required of a wastewater collection operator. Before entering the operator should _____.**
    a) Test for methane gas and petroleum gasses
    b) Test for petroleum gases and carbon monoxide
    c) Test for harmful gases and oxygen deficiency
    d) Have a Will in place and have your insurance documentation with you

ANSWERS:
1-A, 2-D, 3-E, 4-C, 5-E, 6-D, 7-C, 8-B, 9-C, 10-C

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A Bear of a Quiz

Attached Growth

Prepared by Paul Krauth

1. Excessive biofilm is typically removed from attached growth process by _____.
a) Scraping
b) Sluffing
c) Washing
d) Wasting

2. The biologic "glue" in a biofilm is composed of _____.
a) ATP
b) DOM
c) EPS
d) VSS

3. The conditions conducive for filter fly populations include _____?
a) Dry surface area
b) High dissolved oxygen
c) Low dissolved oxygen
d) Wet surface area

4. _____ are more likely to cause downstream problems.
a) Algae
b) Flies
c) Snails
d) Worms

5. An important part of an underdrain system and a trickling filter is to aid in _____.
a) Aeration
b) Coagulation
c) Distribution
d) Flocculation

6. Which media would have flow distribution?
a) Crossflow
b) Random
c) Redwood
d) Rock

7. Most trickling filters rotate at _____.
a) 0.1 rpm
b) 0.3 rpm
c) 0.5 rpm
d) 1.0 rpm

8. Typical submergence for an RBC is _____.
a) 20%
b) 40%
c) 60%
d) 80%

9. For separate stage RBC nitrification, the organic loading should be no higher than _____.
a) 0.05 lbs/1000 ft^3
b) 0.20 lbs/1000 ft^3
c) 0.35 lbs/1000 ft^3
d) 0.50 lbs/1000 ft^3

10. What color biofilm would you expect on RBC with high sulfur conditions?
a) Brown
b) Gray
c) Reddish
d) White

ANSWERS:
1-B, 2-C, 3-D, 4-C, 5-A, 6-A, 7-D, 8-B, 9-B, 10-D

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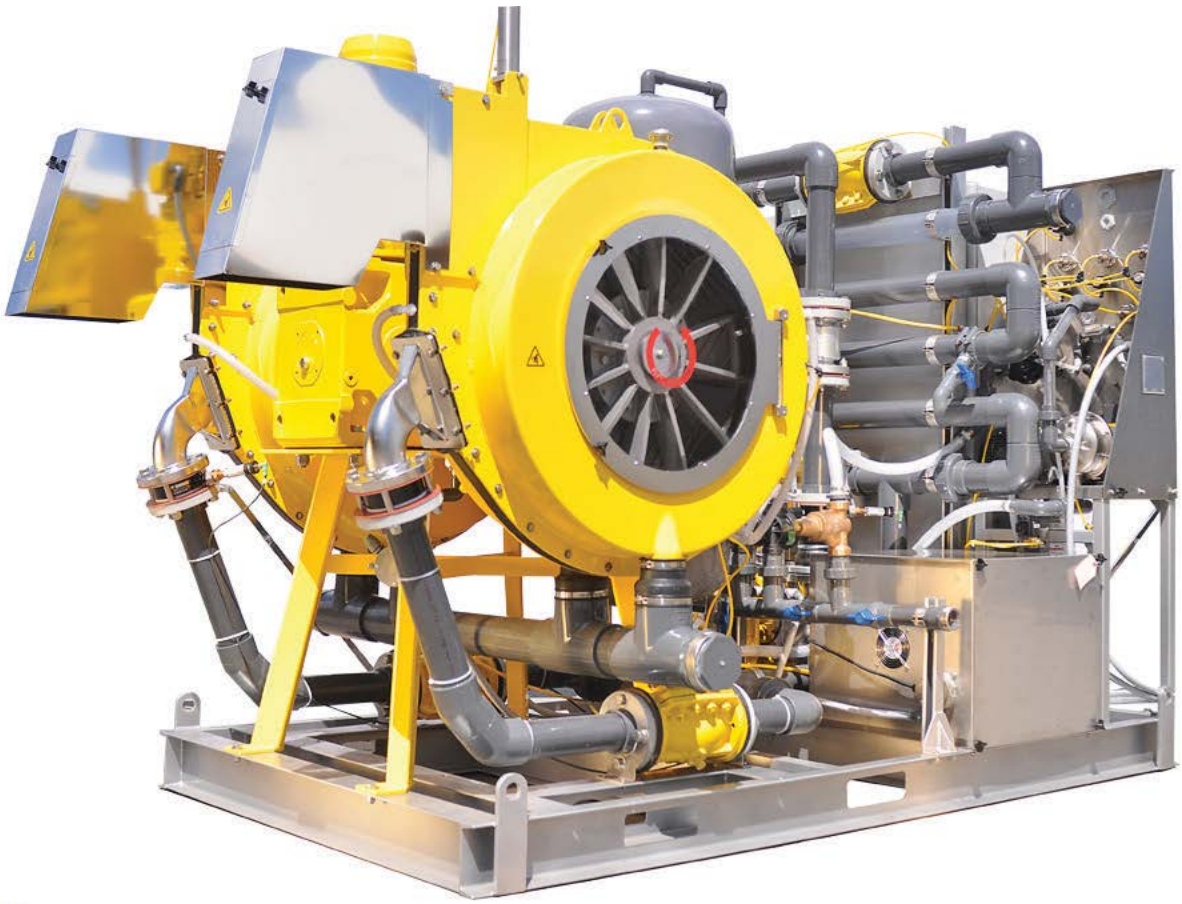

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Operator Spotlight

Kevin Draper has worked at Central Weber Sewer Improvement District for 20 years. He is an operator five, responsible for the operation and maintenance of the headworks facility, as well as the chlorine facility and the offload teams. Additionally, he has Grade 4 wastewater certification in collections and treatment. He is also the forklift certification trainer for the treatment plant.

Kevin has been married to his wife, Michelle, for 23 years; and they have five kids and three grandkids. When he's not working, he likes to spend time with his boys and has been coaching their competitive baseball teams for the last 10 years. During that time, he has been their biggest fan and has had the privilege of watching them play from New York City to California and many places in between. He also coaches their basketball teams. He's very passionate about sports, especially baseball.

In addition, he likes to moonlight at Sportsman's Warehouse, mostly for the discounts on hunting equipment. He really enjoys hunting in his spare time. Likewise, as often as possible, he will be found with a fishing pole in hand.

A proud PWO, Kevin has competed on operator challenge teams many times. One of the things he enjoys outside of the competition itself is the networking opportunities, which can immensely help participants with their day to day work. DN

MARK YOUR CALENDARS

WEAU 2022

MID-YEAR CONFERENCE

NOVEMBER 16, 2022
8:00 AM-4:00 PM

Utah Cultural Celebration Center
1355 West 3100 South
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REGISTRATION

Registration information is available at *www.weau.org*. A continental breakfast and lunch will be provided as part of the registration.

PRELIMINARY TECHNICAL SESSION LISTING

TIME	PLAZA BALLROOM A	PLAZA BALLROOM B	PLAZA BALLROOM C	SUITE C
8:00-8:30	**REGISTRATION AND CONTINENTAL BREAKFAST**			
TOPIC	**NUTRIENT REMOVAL**	**OPERATIONS**	**COLLECTIONS SYSTEMS**	**BIOSOLIDS**
8:30-9:10	Proposed Updates to Utah's Ammonia Criteria *Chris Bittner, UDWQ*	Twinning: Using Digital Twins to Ensure Compliance and Reduce Costs *Alex Puryear, Xylem Inc.*	Condition-Based Maintenance *Eric Petersen, RH Borden and Company*	How ANITA Mox is Helping Various Utilities Remove Ammonia and Total Nitrogen Directly from Centrate/Filtrate *Larry Li, Veolia Water Technologies*
TOPIC	**NUTRIENT REMOVAL**	**OPERATIONS**	**COLLECTIONS SYSTEMS**	**BIOSOLIDS**
9:20-10:00	Biological Filter Systems to Meet Low Ammonia and Total Nitrogen Limits *Larry Li, Veolia Water Technologies*	Instrumentation for Process Control *Benjamin Barker, YSI Inc., a Xylem Brand*	Blue Stakes – What You Don't Know But Should *Spence Felsted, Blue Stakes of Utah 811*	Novel System for Phosphates Sequestration and Biogas Capture from Anaerobically Digested Sludge *Mudit Gangal, Ovivo USA LLC*
10:00-10:20	**BREAK**			
TOPIC	**NUTRIENT REMOVAL**	**OPERATIONS**	**COLLECTIONS SYSTEMS**	**BIOSOLIDS**
10:20-11:00	How Three Facilities with Three Different Configurations Meet Stringent Nutrient Limits *Wendell Khunhar, Hazen and Sawyer*	Filamentous Control *Paul Krauth, Statepoint Engineering*	Vacuum Sewer System Design Overcomes obstacles at an EPA Superfund Site located in the middle of the Salt Lake Valley *Robert Rousselle, PE, Ensign Engineering and Land Surveying*	Preservatives Reduce Land-Applied Biosolids Odors *Marcus Theodore, Earth Renaissance Technologies, LLC*
TOPIC	**NUTRIENT REMOVAL**	**OPERATIONS**	**FACILITIES**	**BIOSOLIDS**
11:10-11:50	Adaptive Mixing and Better Biological Nutrient Removal *Alden Meade, Xylem*	Lab Basics for Operators *Sherry Sheffield, South Valley Water Reclamation Facility*	Resilience in the Face of Crisis, CVWRF's Earthquake Experience *Brandon Heidelberger, Central Valley Water Reclamation Facility*	Decision-Making Process for Biosolids Management Considering Possible Regulatory Changes and Industry Trends *Mohammad Abu-Orf, Hazen and Sawyer*
12:00-1:20	**LUNCH AND KAHOOT QUIZ**			
TOPIC	**NUTRIENT REMOVAL**	**REUSE**	**PROJECT DELIVERY**	**MISCELLANEOUS**
1:30-2:10	PRI-Tech Iron Management Strategy: Breaking the Phosphorus Recycle Loop *Brenda Blake, USP Technologies*	Holistic Benefits of Water Reuse *Vijay Sundaram, AECOM*	Implementing Upgrades Through Streamlined Delivery with Guaranteed Performance *Pete Thompson, PE, NORESCO*	Progressive Design Build Guaranteed: Maximize Your Retirement Benefits *Kory Cox, Utah Retirement Systems*
TOPIC	**NUTRIENT REMOVAL**	**REUSE**	**PROJECT DELIVERY**	**SAFETY AND SECURITY**
2:20-3:00	Basics of Laboratory and Online Phosphorus Monitoring and Control *Jenny Farney, Hach Company*	Effluent Reuse Alternatives for Drought Resiliency *Scott Buecker, AE2S*	Central Valley Water Reclamation Facility, Keeping the plant running during Construction *Kevin Gallagher, Central Valley Water Reclamation Facility*	Avoiding Workers Compensation Pitfalls and Challenges *Brian Child, Olympus Insurance*
3:00-3:20	**BREAK**			
TOPIC	**NUTRIENT REMOVAL**	**SUSTAINABILITY**	**MISCELLANEOUS**	**MISCELLANEOUS**
3:20-4:00	Student Presentation *TBD*	Learning from Israel for Water Supply Resiliency *David Parry, Jacobs Engineering*	Cutting Through the Fat: Elevating your FOG Management Program *Brandt Slivken, Aquatic Informatics*	Training Can't Stop at the End of Class! *John Dunty, Jacobs Engineering*

The content of the technical program is subject to change. Visit *www.weau.org* for updates.

2022
ANNUAL CONFERENCE

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APRIL 12-15, 2022

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The Water Environment Association of Utah is dedicated to the professional growth of its members and the preservation and enhancement of the water environment.

Sustainable Return on Investment Model Used to Select the Disinfection Technology

at the Salt Lake City Water Reclamation Facility

BY IAN GRIFFIN, AECOM CANADA LTD. • SIMON BAKER, AECOM CANADA LTD. •
WILL PETERSON, AECOM TECHNICAL SERVICES • MICHELLE BARRY, SALT LAKE CITY DEPARTMENT OF PUBLIC UTILITIES

FIGURE 1: EXISTING SALT LAKE CITY WATER RECLAMATION FACILITY.

The Salt Lake City Department of Public Utilities (SLCDPU) owns and operates the Salt Lake City Water Reclamation Facility (WRF). The existing facility is more than 55-years old and services approximately 200,000 people over a 100 square -mile service area. The current operations include a 56 mgd trickling filter/activated sludge plant and disinfection of secondary effluent using chlorine gas. Driven by new state and federal water quality regulations and the age of the existing facility, SLCDPU is currently in progress of building a new 56 mgd treatment facility. SLCDPU is funding the project and is in the process of applying for WIFIA funding. To evaluate disinfection alternatives, the SLCDPU required a triple bottom line evaluation that included economic, environmental and social costs as well as consideration of non-monetary criteria such as operator health and safety and ease of operation and maintenance. Five disinfection alternatives were evaluated: chlorine gas, bulk delivery of sodium hypochlorite, on-site generation of sodium hypochlorite, peracetic acid and ultraviolet (UV) irradiation. Ultimately, UV irradiation was selected as the preferred technology based on low lifecycle cost and strong overall score on the non-monetary evaluation.

ECONOMIC EVALUATION USING TRIPLE BOTTOM LINE ANALYSIS

A triple bottom line evaluation of the alternatives was completed that accounted for monetized economic, environmental, and social considerations. Costs were monetized over a 25-year lifespan using a sustainable return on investment (sROI) analysis model (Bohmholdt, 2014). Economic costs included capital costs and operations and maintenance costs. The environmental and social costs that were monetized included: greenhouse gas emissions, criteria air pollutants, residual value of investments, safety impacts from truck trips and roadway maintenance costs.

Capital and O&M costs were determined from conceptual level designs prepared for each disinfection alternative. Each alternative was designed to meet the WRF's Utah Pollution Discharge Elimination System limits on E. coli; a maximum weekly geometric mean of 158 MPN/100 mL and a maximum monthly geometric mean of 126 MPN/100 mL.

As requested by the SLCDPU, the analysis used a 25-year operations period, beginning at completion of project construction and a conventional 3% discount rate, discounting all values to 2018. All dollars were escalated to 2021 dollars using an escalation rate of 2.2% per year. The analysis uses constant dollars to avoid uncertainty associated with inflation over the period of analysis.

EMISSIONS GENERATED

Each option would emit greenhouse gases and criteria air pollutants from the consumption of electricity, because the electricity in Utah is produced primarily using coal and natural gas power plants. Each alternative would use different amounts of electricity, as shown in Table 1. The analysis assumed that the energy demands would be required 365 days per year and would remain constant throughout the analysis period. The values shown in Table 1 did not include electrical consumption required for other electrical loads, such as building lighting or mechanical, because these were expected to be similar for all disinfection alternatives.

TABLE 1: AVERAGE DAILY POWER CONSUMPTION FOR EACH DISINFECTION ALTERNATIVE

Alternative	Power Consumption (kilowatt hours per day)
Chlorine Gas	240
Bulk Delivery of Sodium Hypochlorite	0.5
On-site Generation of Sodium Hypochlorite	5,200
Peracetic Acid	0.25
Ultraviolet	3,250

Although chlorine gas and bulk delivery of sodium hypochlorite and peracetic acid have low power consumptions, the production of these chemicals also would consume power. However, the electricity consumption during production was not estimated because this power consumption would happen off-site and at a third party's premises. Each kilowatt hour of electricity would result in incremental emissions in the form of carbon dioxide (CO_2), nitrogen oxide (NO_x), and sulfur dioxide (SO_2), as indicated in the 2016 Utah Electricity Profile (EIA, 2016). A summary of the emission rates for Utah is shown in Table 2.

TABLE 2: EMISSION RATES FOR VARIOUS POLLUTANTS FROM POWER GENERATION IN UTAH

Pollutant	Emissions Rate (pounds per megawatt hour)
CO_2	1,629
NO_x	1.9
SO_2	0.6

NO_x, and SO_2 have economic values as published in DOT's 2018 Benefit Cost Analysis Guidance for Discretionary Grant Programs (DOT, 2018), while carbon dioxide was valued using the Social Cost of Carbon from the Interagency Working Group (IWG, 2013). The values were escalated to 2021 dollars and were applied to the quantities of emissions resulting from the electricity used by each alternative.

Transportation trucks for the chemicals also would emit pollutants. In addition to NO_x, particulate matter (PM) and volatile organic compounds (VOCs) were monetized for truck deliveries. Particulate matter was further classified by size. Emission rates for trucks were obtained from EPA guidance (EPA, 2008) and are summarized in Table 3. Economic values for the pollutants emitted by trucks were obtained from the DOT (DOT, 2018).

TABLE 3: EMISSION RATE FROM HEAVY-DUTY TRUCKS

Pollutant	Emission Rate (gram per mile)
VOC	1.017
NO_x	5.764
PM2.5	0.123
PM10	0.135

Table 4 shows the environmental costs associated with emitting these pollutants. The values were escalated to 2021 dollars and were applied to the quantities of emissions resulting from the electricity used and truck emissions generated by each alternative. The cost of CO_2 emissions increases across the period of analysis to account for incremental damages caused by continued emission of CO_2 even as society becomes more stressed due to climate change.

TABLE 4: ENVIRONMENTAL COST PER POUND OF EMISSIONS

Pollutant	Environmental Cost (2021 dollars) (dollars per pound)
CO_2	Ranges from $0.024 to $0.039 over the analysis period
NO_x	$4.095
SO_2	$24.205
PM2.5	$187.339
PM10	$187.339
VOC	$1.039

"The residual value of an investment is the remaining value of its useful life after the analysis period concludes. The pieces of equipment would have useful lives of 10 to 25 years, depending on the equipment and would require recapitalization several times over the analysis periods."

RESIDUAL VALUE OF INVESTMENT

The residual value of an investment is the remaining value of its useful life after the analysis period concludes. The pieces of equipment would have useful lives of 10 to 25 years, depending on the equipment and would require recapitalization several times over the analysis periods.

SAFETY IMPACTS

The numbers of trucks needed for deliveries annually and the estimated mileage were used to determine the vehicle miles traveled (VMT). Multiplying the number of trucks and mileage by two results in round trip VMT for the chemical disinfection alternatives. UV would not require regular truck deliveries; therefore, the VMT used for this alternative was zero.

The rates of crashes that result in fatalities, injuries, and property damage were applied to the annual VMT to derive the estimated crashes from the change in VMT. For consistency between the types of crashes, the crash rates that were used for fatalities, injuries, and property damage were the national average crash rates.

These crash reduction factors then were converted to the maximum abbreviated injury score (MAIS) crash types, to apply DOT Guidance on the value of avoiding a crash. The conversion is based on the National Highway Safety and Traffic Administration KABCO-AIS Conversion Table, provided in the TIGER Benefit-Cost Analysis Resource Guide (DOT, 2016), for Injury (severity unknown), and No Injury Crashes. KABCO refers to the letters used to designate the five levels of crash severity used by police at a crash scene; AIS refers to the abbreviated injury scale used by hospitals. These factors provide the probability that an injury will range from critical to minor, to more accurately capture the total number of different types of injuries associated with the VMT. Estimating the distribution of expected injury types is important because the economic cost of the injury increases as injury severity increases.

The total annual value for crash severity is based on DOT guidance and the National Highway Safety Council estimates for the value of avoiding a crash. These estimates were applied to the number of crashes avoided to estimate the total value of crashes avoided from auto VMT reduction. However, because the chemical disinfection alternatives would result in increased truck traffic, an increase in VMT would occur, thereby resulting in possible additional crashes. The cost of these crashes is equal to the cost of the crash type multiplied by the frequency of crashes multiplied by the VMT for each alternative.

ROADWAY MAINTENANCE

An increase in truck VMT would result in municipalities incurring additional roadway maintenance costs, such as painting and paving. The roadway maintenance cost was obtained from the Federal Highway Administration's Highway Cost Allocation Study (FHWA, 2000: Table 13). Trucks would incur roadway maintenance costs of $0.02 per mile for an assumed 40-kip truck. Multiplying the truck VMT by the maintenance costs per VMT results in the roadway maintenance costs for the chemical disinfection alternatives.

COST COMPARISON

Typically, a triple bottom-line analysis is conducted and compared against the existing condition or baseline. However, because the existing chlorine contact basins are undersized and cannot be used in the long term, this analysis had no baseline. Instead, all options were compared against each other. Although AECOM considered multiple configurations for each alternative, including repurposing existing tankage and new construction, the repurposing options were eliminated based on risk of repurposing the structures and constructability considerations; therefore, this article focuses only on new construction alternatives.

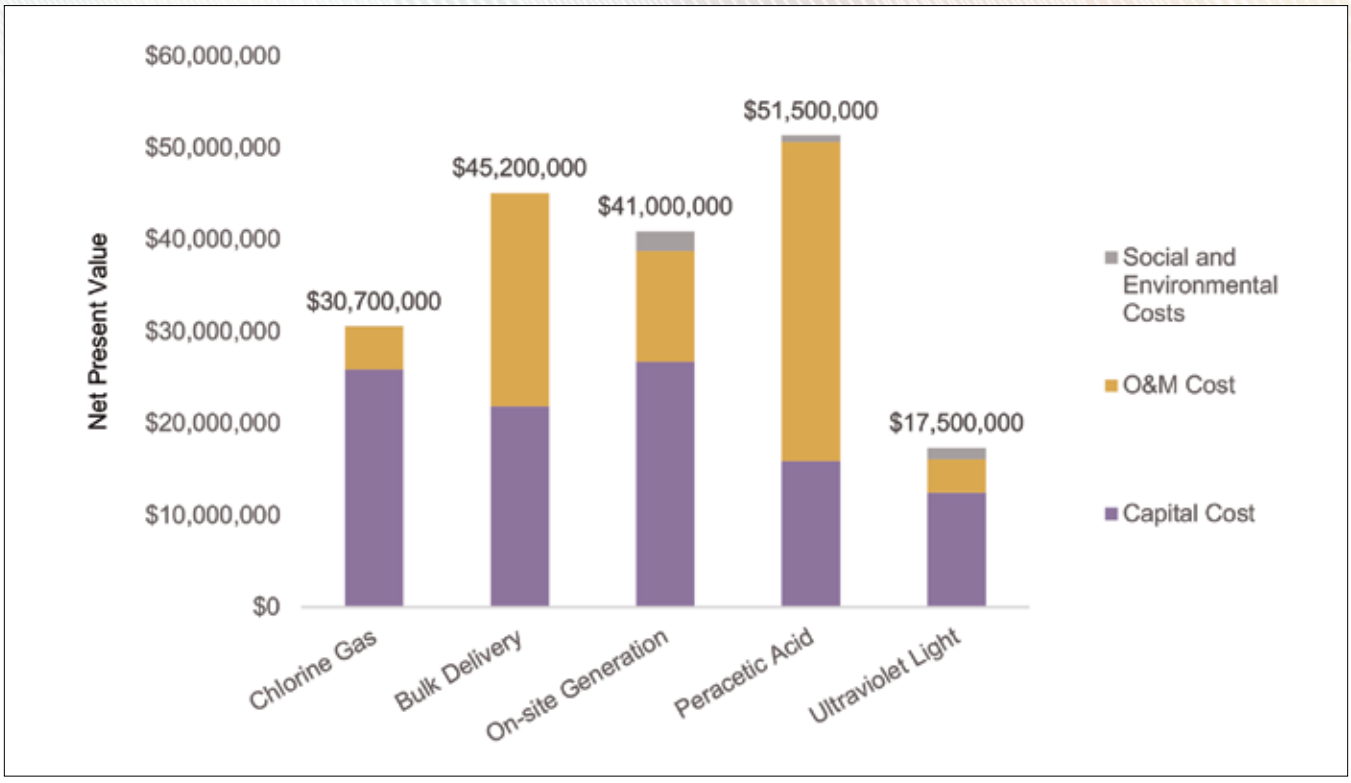

FIGURE 2: NET PRESENT VALUE OF NEW CONSTRUCTION OPTION FOR EACH DISINFECTION ALTERNATIVE.

TABLE 5: SUMMARY OF ECONOMIC, ENVIRONMENTAL AND SOCIAL COSTS

	Economic Cost	Social and Environmental Cost	TOTAL
Chlorine Gas	$30,600,000	$100,000	$30,700,000
Bulk Delivery of Sodium Hypochlorite	$45,200,000	$0	$45,200,000
On-site Generation of Sodium Hypochlorite	$38,700,000	$2,300,000	$41,000,000
Peracetic Acid	$50,700,000	$800,000	$51,500,000
Ultraviolet	$16,100,000	$1,400,000	$17,500,000

A comparison of the 25-year net present values of new construction for each disinfection alternative is presented in Figure 2.

As shown in Figure 2, a new UV facility is significantly more cost effective than the other options. It has the lowest capital and O&M costs, but the second highest social and environmental cost. This is because of the high power consumption associated with UV light and because the energy consumption required for off-site production of chlorine gas, 12.5% sodium hypochlorite and peracetic acid were not considered in the estimate. Because only some social and environmental costs were monetized, AECOM also performed a comparison of the alternatives based on non-monetary factors.

> "If there were a chlorine gas spill, there would be a significant cost to mitigate its effect and remediate the surrounding area. However, it is difficult to estimate the cost of the spill because the impacts could be wide-ranging depending on the quantity, rate of release and proximity to plant staff or the public."

NON-MONETARY ANALYSIS

In concert with the SLCDPU a total of nine non-monetary criteria were considered. These criteria were selected to account for aspects of concern, which cannot easily be assigned a monetary value. For example, if there were a chlorine gas spill, there would be a significant cost to mitigate its effect and remediate the surrounding area. However, it is difficult to estimate the cost of the spill because the impacts could be wide-ranging depending on the quantity, rate of release and proximity to plant staff or the public. Weights were assigned to each criterion based on their relative importance using a pairwise comparison. Table 6 shows the various non-monetary evaluation criteria and their respective weights.

TABLE 6: PAIR-WISE COMPARISON OF THE NON-MONETARY EVALUATION CRITERIA

Evaluation Criteria	Weighting Percentage	Relative Weights
Footprint Requirements	9.7%	1.95
Acceptable Disinfection Technology per Utah Administrative Code R317 (UAC R317)	14.6%	2.92
Widespread and Proven Use of Technology	16.0%	3.20
Impact on Receiving Waters	12.5%	2.50
Ease, Flexibility, and Complexity of Operation	20.1%	4.02
Ease of Maintenance	20.1%	4.02
Suitability for Reuse	6.9%	1.38
Operator and Maintenance Safety	25.0%	5.0
Public Health and Safety	25.0%	5.0
	100%	20

Each alternative received a score between 1 and 5 for each evaluation criteria. The score was multiplied by the weight to determine the total for each criterion. These totals then were summed to determine the total score for each alternative. Scores were assigned by AECOM and reviewed by SLCDPU. A summary showing the factors and associated scores is shown in Table 7.

TABLE 7: SUMMARY OF NON-MONETARY FACTORS AND SCORES

	Chlorine Gas		Bulk Delivery		On-site Generation		Peracetic Acid		Ultraviolet	
Evaluation Criteria	**Score**	**Total**	**Score**	**Total**	**Score**	**Total**	**Score**	**Total**	**Score**	**Total**
Footprint Requirements	2	3.9	2	3.9	2	3.9	3	5.8	5	9.7
Acceptable Disinfection Technology (UAC R317)	5	14.6	5	14.6	5	14.6	1	2.9	5	14.6
Widespread and Proven Use of Technology	5	16.0	5	16.0	3	9.6	1	3.2	5	16.0
Impact on Receiving Waters	2	5.0	2	5.0	2	5.0	3	7.5	5	12.5
Ease, Flexibility and Complexity of Operation	3	12.1	5	20.1	2	8.1	4	16.1	5	20.1
Ease of Maintenance	3	12.1	3	12.1	3	12.1	3	12.1	4	16.1
Suitability for Water Reuse	5	6.9	4	5.6	4	5.6	1	1.4	2	2.8
Operation and Maintenance Staff Safety	1	5.0	3	15.0	2	10.0	1	5.0	4	20.0
Public Health and Safety	1	5.0	3	15.0	4	20.0	2	10.0	5	25.0
Total Overall Score		**80.6**		**107.2**		**88.8**		**64.0**		**136.8**
		53.7%		**71.5%**		**59.2%**		**42.7%**		**91.2%**

"Although the UV irradiation alternative had the second highest social and environmental costs, it had the lowest overall NPV and scored high on the non-monetary analysis."

TOTAL SCORE

The total score for each criterion were summed to calculate the total overall score. As shown in Table 7, the UV disinfection alternative scored significantly higher than any of the other alternatives, receiving approximately 91% of the available points. Peracetic acid scored the lowest, only receiving approximately 43% of the available points.

CONCLUSIONS AND RECOMMENDATIONS

Five disinfection alternatives were evaluated for implementation at the New WRF: chlorine gas, bulk delivery of sodium hypochlorite, on-site generation of sodium hypochlorite, bulk delivery of peracetic acid, and ultraviolet light. A conceptual design for each alternative was prepared, to determine capital and operating costs. Each alternative also was evaluated using a 25-year triple bottom line analysis, which included economic, social, and environmental costs. Although the UV irradiation alternative had the second highest social and environmental costs, it had the lowest overall NPV and scored high on the non-monetary analysis. Therefore, AECOM recommended that UV be implemented as the disinfection method at the new Salt Lake City Water Reclamation Facility.

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The WEAU Operator and Professional Scholarship Award

The WEAU Operator and Professional Scholarship Award is available to individuals serving in Utah's wastewater field. All applications are reviewed by a WEAU Board appointed panel. The scholarship funds are intended to be used towards the applicant's education, trade school classes, academic books, or student loans. WEAU reserves the right to follow up with the applicant to find out how the funds helped further advance their career goals. The applicant may be requested to write a brief summary of their experience in *Digested News*.

Applications are due October 31, 2021.

Applicants may only receive the scholarship once. For those interested in applying, click the link below to view/download the application and return it to *weauscholarship@gmail.com*.

THIS YEAR'S WINNERS

Jeremy Kimpton

My name is Jeremy Kimpton, and I currently work for Richmond, UT. I have been serving in the local government for 16 years now. I came to Richmond to work as the City's water and wastewater superintendent. However, after nine months, I was asked to replace Richmond's City Manager. Moving to the city manager's position did not get me out of running the City's water and wastewater system; it was added to my responsibilities, so I am still actively working in those departments and overseeing the City's day-to-day operations.

I currently have a bachelor's in business administration and am currently working on my master's in public administration through the University of Idaho.

It was later in life that I decided to go back to school for post-secondary education. I let my high school counselor convince me that I did not have what it took to attend college. However, after a failed business in 2009, I decided to obtain my bachelor's degree. After earning my degree, I worked four jobs to put my wife through school while still digging out our failed business. Then, we set out to find better employment opportunities; and eventually it all paid off. In June of 2020, I decided to pursue a master's degree and will graduate in December of 2021.

I also have two daughters currently going to school at the same time as I am. One is currently enrolled at Utah State University, and the other is attending school at what called Dixie State University. Because of this, money is a little tight between helping them with school and my own school expenses so the WEAU Scholarship was a huge blessing. I am very grateful for the scholarship, as it eased the burden of working full time and going back to school.

Clay Marriott

I was able to receive one of the WEAU scholarships this year to help me continue my education at Weber State University. Last year, I returned to Weber State to finish my Construction Management Degree. The scholarship has helped me pay for my tuition to further my education. It has been a lot of work and sacrifice to return and finish my degree. I am grateful to maintain a successful career here at Central Weber Sewer Improvement District and for the management's willingness to allow me the time to finish my education at Weber State. I have worked at Central Weber for 10 years and my plan is to continue working at Central Weber Sewer as its Project Manager and Collection Coordinator. In our spare time, my family and I enjoy all outdoor activities and we love our farm and the animals that come with farming life. We love to work hard, so we can play hard, and always enjoy what life has to offer. I am grateful for every one of the friends, colleagues, and people of the water industry I have been able to associate with while participating and serving in the WEAU. Thank you to the WEAU for the scholarships that give many people an opportunity to further their education. I am very grateful and appreciative of the scholarship and the association.

Jim Giles

My name is Jim Giles. I have worked for the Snyderville Basin Water Reclamation District as a Treatment Operator for seven years. I have learned so much during this time. Two and a half years ago, I decided to jump start my education again. I felt prompted to enroll in the Pathway Program provided by The Church of Jesus Christ of Latter-day Saints. This ended up being a positive experience; and completion of the program a year later made me eligible to continue courses as an online student of BYU-Idaho. I have been taking classes ever since, and have discovered a love for learning that I regret to say I did not have when I was younger. I have enjoyed all of my classes thus far and look forward to learning more as I continue. It has been fun to share what I learn with my wife and kids. I would encourage anyone contemplating furthering their education to go for it. There is no time like the present to better yourself. Plus, it opens up new thoughts and ideas on subjects you never knew you liked. I am grateful for the WEAU scholarship, which has helped me get closer to my goal of earning a college degree. DN

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WEAU Operator and Professional Scholarship Application

The WEAU Scholarship Award is available to individuals serving in Utah's Wastewater field. All applications are reviewed by a WEAU Board appointed panel. The scholarship funds are intended to be used towards the applicants education, trade school classes, education books or student loans. WEAU reserves the right to follow up with the applicant to find out how the funds helped further advance their career goals. The applicant may be requested to write a brief summary of their experience in the Digested News. Applicants may only receive the scholarship once.

Application Requirements and Criteria:

1. Member of Water Environment Association of Utah (WEAU)
2. Currently working/serving in Utah's Wastewater field
3. Complete and submit the application to weauscholarship@gmail.com

Application Deadline:

October 31, 2021

Award Announcement:

WEAU Mid-Year Conference

Questions contact:

weauscholarship@gmail.com

Application Date _____

First Name _____ **Last Name** _____

Phone Number _____ **Email** _____

WEAU Membership Years _____ **WEAU Membership Number** _____

WEAU Involvement (such as what committees have you served on or events have you helped with)

_____ _____

_____ _____

_____ _____

Education/Certification

☐ Treatment I	☐ Treatment II	☐ Treatment III	☐ Treatment IV
☐ Collections I	☐ Collections II	☐ Collections III	☐ Collections IV
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Previous Employment or Experience _____ **Years** _____

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Responsibilities

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Amount of funds requesting _____

Briefly describe how this scholarship would benefit you at your current job

How will you continue to be involved in WEAU?

Comments

Applicant Name _____

Applicant Signature _____ **Date** _____

Manager Name _____

Manager Signature _____ **Date** _____

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2021 WEAU Awards Nominations

Due Friday, December 22, 2021

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Biosolids Program
Safety Program

OUTSTANDING INDIVIDUALS AWARDS
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Snyderville's Marlo Davis Recognised as WEF Fellow

This past June, the Water Environment Federation (WEF) sent out letters to newly confirmed WEF Fellows to notify them of their new designations. This year, WEAU would like to congratulate Marlo Davis, Operations Superintendent at Snyderville Basin Water Reclamation District, on this significant achievement.

The following is the letter sent to Marlo from WEF.

Dear Marlo Davis,

It is my privilege and pleasure to notify you that you have been approved by the WEF Board of Trustees as a WEF Fellow.

You may begin using the designation "WEF Fellow" following your name in a professional capacity. Example: Jane Smith, PhD, WEF Fellow.

We are excited to announce that WEFTEC will be held in Chicago, Illinois October 16-20! The WEF Awards Celebration/ Presidential Ceremony details are below:

WEF Awards Celebration
Presidential Ceremony
Tuesday, October 19, 2021
4:30 pm- 5:30 pm CST

WEF Awards Celebration
Presidential Ceremony Reception
Tuesday, October 19, 2021
5:30 pm- 6:00 pm CST

We hope you will join us in celebrating this outstanding achievement. WEFTEC registration and housing is now open http://www.weftec.org. *Information regarding the ceremony location and practice rehearsal will be sent in the upcoming weeks.*

We congratulate you on this prestigious recognition and becoming a member of the 2021 WEF Fellows.

Sincerely,

Walter T. Marlowe, P.E., CAE
Executive Director
Water Environment Federation

The WEF Fellows Program recognizes the professional achievement, stature, and contributions of WEF members to the preservation and enhancement of the global water environment in the practice areas served by WEF as described below.

WEF Fellow applicants will be considered by a selection committee. To be eligible, applicants must be a Member of WEF for a minimum of five consecutive years and have documentation of 20 years of professional experience and 10 years of professional achievement/stature and contributions to preserving and enhancing the global water environment, in the practice areas served by WEF, including (but not limited to) design/consulting, education, operations, regulation, research and utility management/leadership. For more information, visit *https://bit.ly/3BSB5VA*.

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REGISTER NOW at weftec.org

Prioritizing Health at WEFTEC

The situation with COVID-19 and the variants is constantly changing. The one thing that has not changed is the Water Environment Federation's commitment to the health and safety of our members and the broader water sector.

Because of this unwavering commitment, every individual who attends WEFTEC 2021 in Chicago will be required to provide either proof of full vaccination for COVID-19 or results of a negative test for COVID-19 obtained no more than 48 hours before arrival at registration to pick up credentials. These new requirements are in addition to the City of Chicago's current indoor mask mandate.

Protecting You and Your Communities

We are taking the additional step of requiring proof of vaccination or a negative COVID-19 test to further prioritize the health of every participant at WEFTEC. This decision also follows the rapidly growing trend of requiring proof of vaccination or a negative test result at events such as conferences.

Many of the people who attend WEFTEC serve vital roles in protecting public health in their communities. They come to WEFTEC to connect with other experts, find solutions, learn best practices, and bring information home. This requirement for COVID-19 vaccination or a negative test result provides an extra measure of assurance that we are doing all we can to protect everyone at WEFTEC and the communities to which participants return.

Simple Verification Process

WEF has partnered with Safe Expo to manage the verification process. WEFTEC participants will be asked to upload images of health authority-issued vaccination records to a secured portal or bring proof of a negative COVID-19 test to be verified on site. Everyone is strongly encouraged to upload proof of vaccination in advance of arriving at McCormick Place in Chicago. No one will be allowed to pick up registration materials or participate in the event without this verification or a negative test result.

WEF will follow COVID-19 guidelines from the US Centers for Disease Control and Prevention (CDC) and requirements of state and local health authorities that are in place at the time of WEFTEC. WEF is working closely with the City of Chicago and McCormick Place to provide a safe and comfortable experience for WEFTEC attendees. McCormick Place has enhanced its air quality and cleaning procedures and has received multiple accreditations for maintaining a safe and hygienic environment.

We realize that the decision to require vaccination records or negative test results could prompt questions. Please review the updated information on WEFTEC Health and Well-Being at *www.weftec.org/attend/health-and-wellbeing*.

WEF Appreciates Your Flexibility

WEF understands the ever-evolving landscape of COVID-19, and changing requirements that come with it can be challenging. WEF appreciates your flexibility and dedication. We will update you if health and safety protocols change, and we look forward to seeing you and enjoying a safe and productive WEFTEC in Chicago!

Walt Marlowe
WEF Executive Director DN

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