

Avon Lake Regional Water

Frazil Ice Event

February 13, 2014



Topics to Discuss

- Overview of water system
- Frazil Ice Event
- Moving Forward
- Emergency Plan Update
- Suggestions

Avon Lake Water System

- Provide water to 200,000 people in a 600 sq. mile area, 7 counties
- 85 % produced going to bulk customers - avg day 21 MGD, 50 MGD rating
- Avon, Sheffield, Sheffield Lake, RLCWA, North Ridgeville, Medina County, Medina City
- Only charge 10% more to bulk customers
- Two major Transmission Lines
- Pressure system



Avon Lake Regional Water

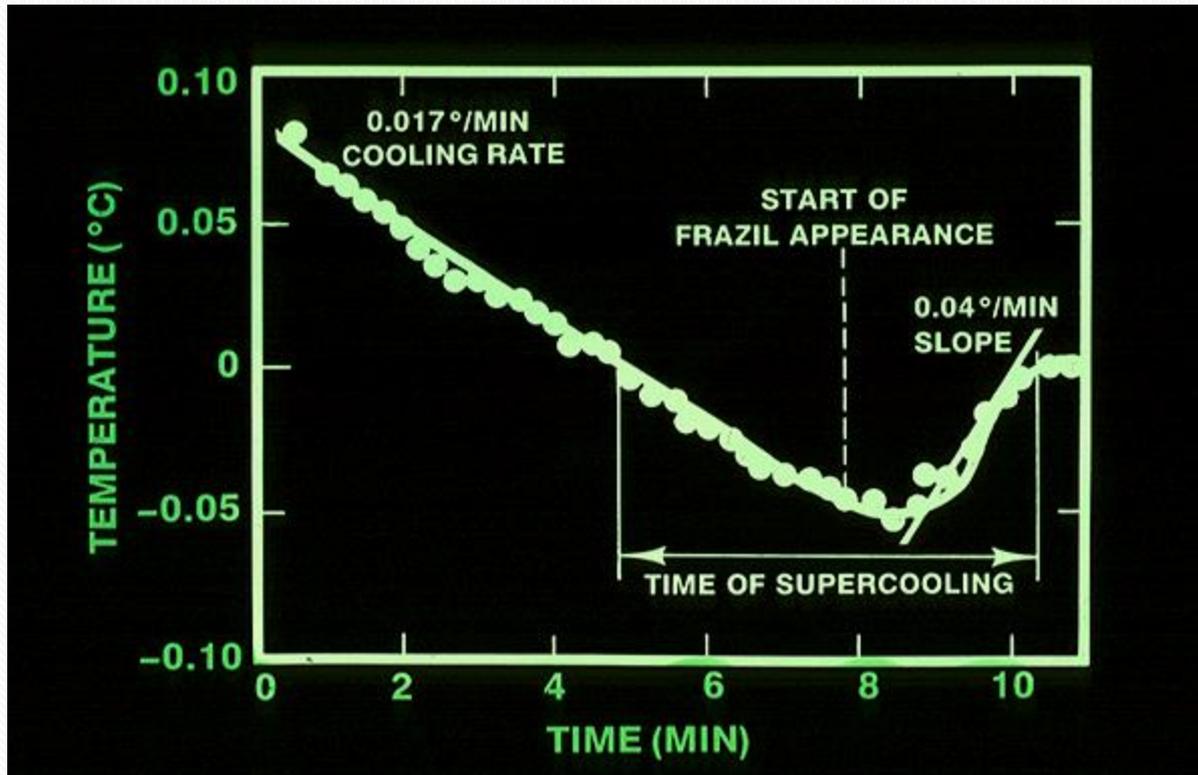
Frazil Ice Event

January 7, 2014 – January 9, 2014

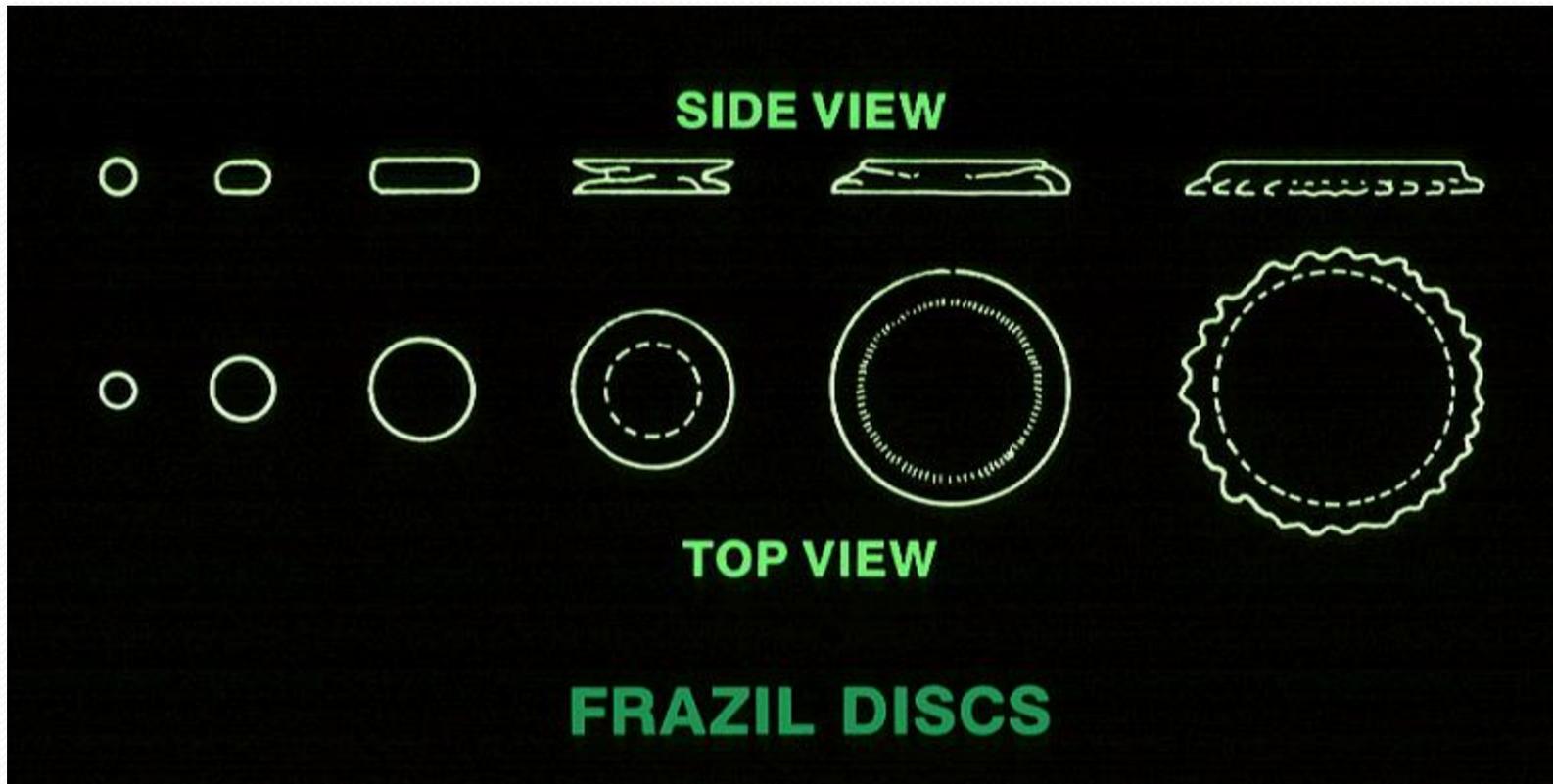
Frazil Ice

- **Frazil ice** is a collection of loose, randomly oriented needle-shaped ice crystals in water. It resembles slush and has the appearance of being slightly oily when seen on the surface of water. It sporadically forms in open, turbulent, supercooled water, which means that it usually forms in rivers, lakes and oceans, on clear nights when the weather is colder, and air temperature reaches -6C (21°F) or lower. (Wikipedia)

Frazil Ice Cooling Rate



Frazil Ice forms



Frazil Ice Formation

- Formed only in areas of open water
- Formed in turbulent water

Flow velocity

Wind mixing

- Formed in supercooled water

$-.01^{\circ}\text{C}$ to $-.02^{\circ}\text{C}$

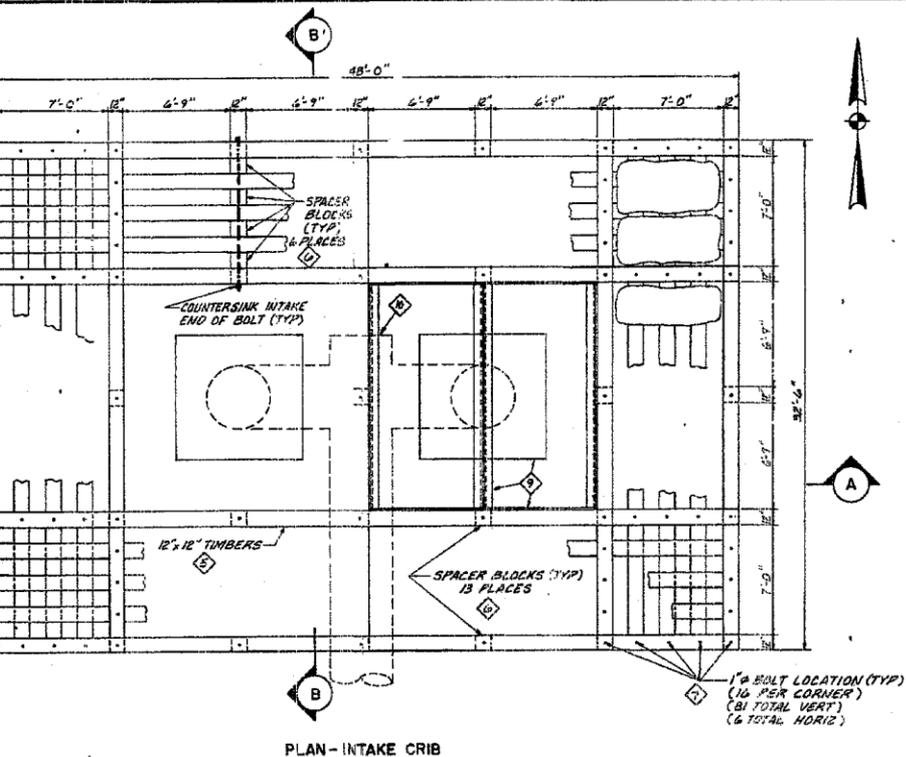
My boss calls it voo doo science

Frazil Ice Blockage

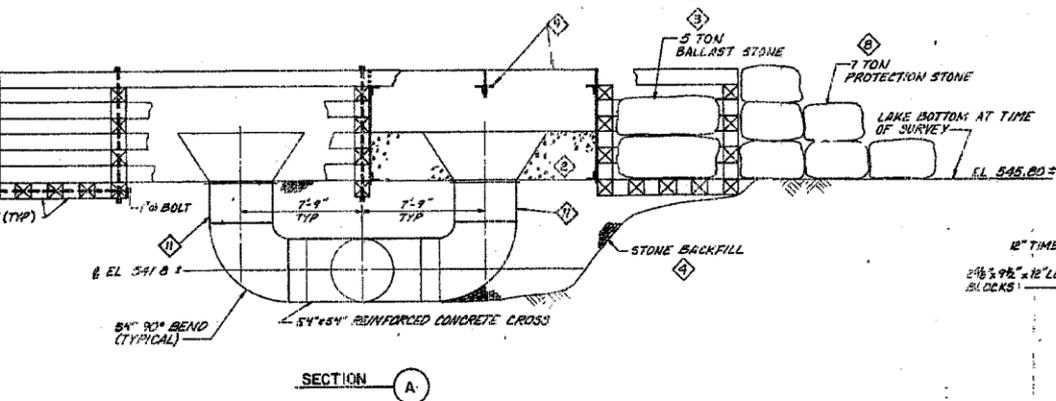
- Occurs as supercooled water enters an intake and builds ice on intake because:
 - Intake surfaces in contact with supercooled water can cool below freezing.
 - Once cooled, ice can adhere to surfaces.
 - Frazil ice contained in water can adhere to growing ice on surfaces.
 - Heat convection from frazil ice to surfaces enables further growth.

Intakes

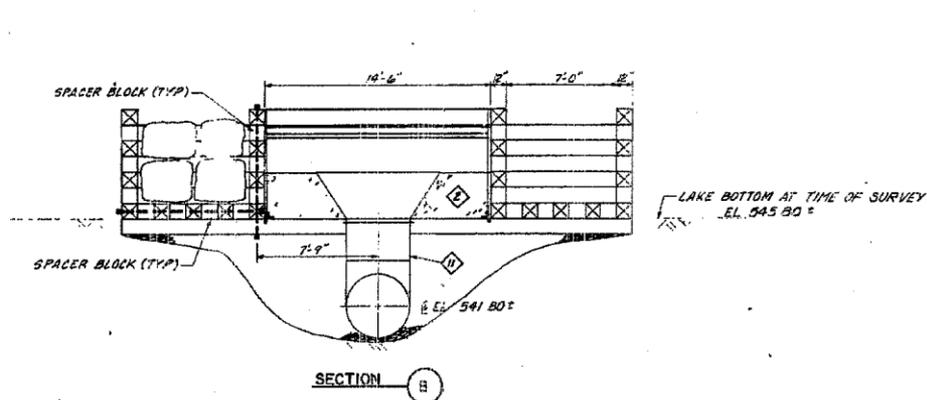
- 54 inch concrete pipe with dual funnel – 2200 feet long – covered by 20 feet of water – installed 1995
- 36 inch concrete pipe with single funnel – 1800 feet long – installed 1960
- Old 24 inch auxiliary intake out of service
- Feed potassium permanganate to both cribs via 1.25 inch pvc line



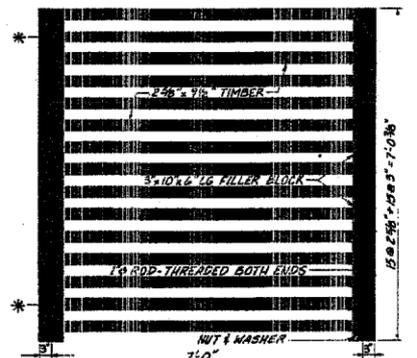
PLAN - INTAKE CRIB



SECTION A-A



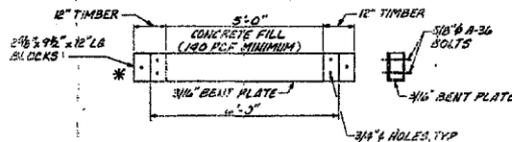
SECTION B-B



PLAN - INTAKE COVER
(8 REQUIRED)
NO SCALE



ELEVATION
(STANDARD PLANK)
NO SCALE



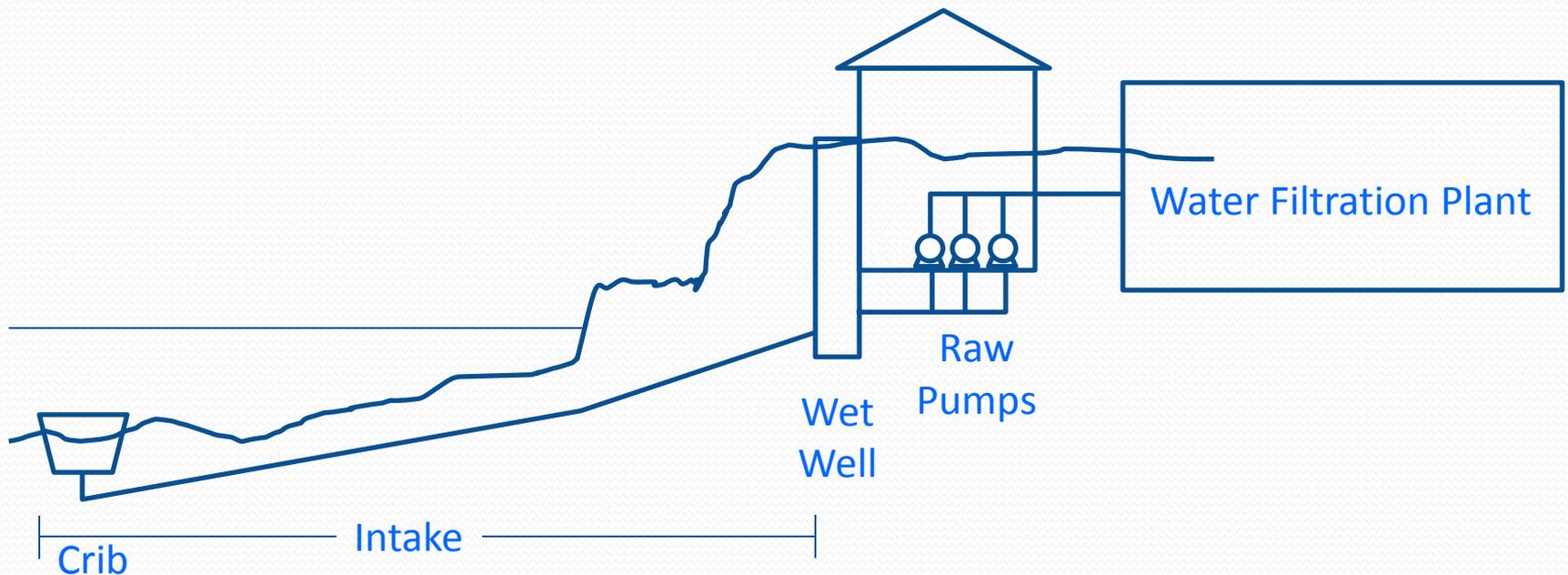
ELEVATION
(BALLAST PLANK)
NO SCALE

- 1 54" REINFORCED CONCRETE SPACER PIPE. CONTRACTOR SHALL VERIFY REQUIRED LENGTH. PROVIDE 54" ANSI 150 B FLANGE CONNECTION ON TOP (TYP FOR 2)
- 2 PROVIDE 54" MECHANICALLY RESTRAINED PLUG ON NORTH SIDE OF CONCRETE PIPE CROSS
- 3 STRUCTURAL STEEL, TYPICAL FOR BOTH INTAKES. SEE DETAILS ON SHEET 6.
- 4 PROTECTION STONE SHALL BE SEVEN (7) TON SIZE BREAKWALL STONE STACKED TO THE HEIGHT OF THE CRIB AT THE FACE OUT TO A ONE (1) STONE HEIGHT A MINIMUM OF FIFTEEN (15) FEET FROM THE FACE CONTINUOUSLY AROUND CRIB.
- 5 ALL TIMBERS SHALL BE BOLTED AT INTERSECTIONS AS SHOWN
- 6 PROVIDE 12" x 12" x 12" TIMBER SPACERS AT MID SPAN POINTS WHERE SHOWN
- 7 ALL TIMBERS SHALL BE 12" x 12" ROUGH CUT, EXCEPT 12" x 12" x 12" SPACER BLOCKS AND INTAKE COVER TIMBERS. NO TIMBERS SHALL BE SPLICED
- 8 BACKFILL AROUND INLET PIPING AND UNDER CRIB SHALL BE O.D. ITEM 703, #2 LIMESTONE
- 9 BALLAST STONE SHALL BE BREAKWALL STONE OF FIVE (5) TO SEVEN (7) TON SIZE. BALLAST PACKETS SHALL BE FILLED WITH STONE, AND EVENLY DISTRIBUTED IN THE INTAKE CRIB. MINIMUM 140 TON OF BALLAST REQUIRED. ALL STONE SHALL BE QUARRIED
- 10 CONCRETE SHALL BE CLASS "C" PER THE DESCRIPTION UNDER 419.03 OF THE STATE OF OHIO DEPARTMENT OF TRANSPORTATION CONSTRUCTION AND MATERIAL SPECIFICATIONS AND PLACED UNDER THE PROVISIONS OF 511.11.

The Event

~9 p.m. Tuesday, 1/7/14

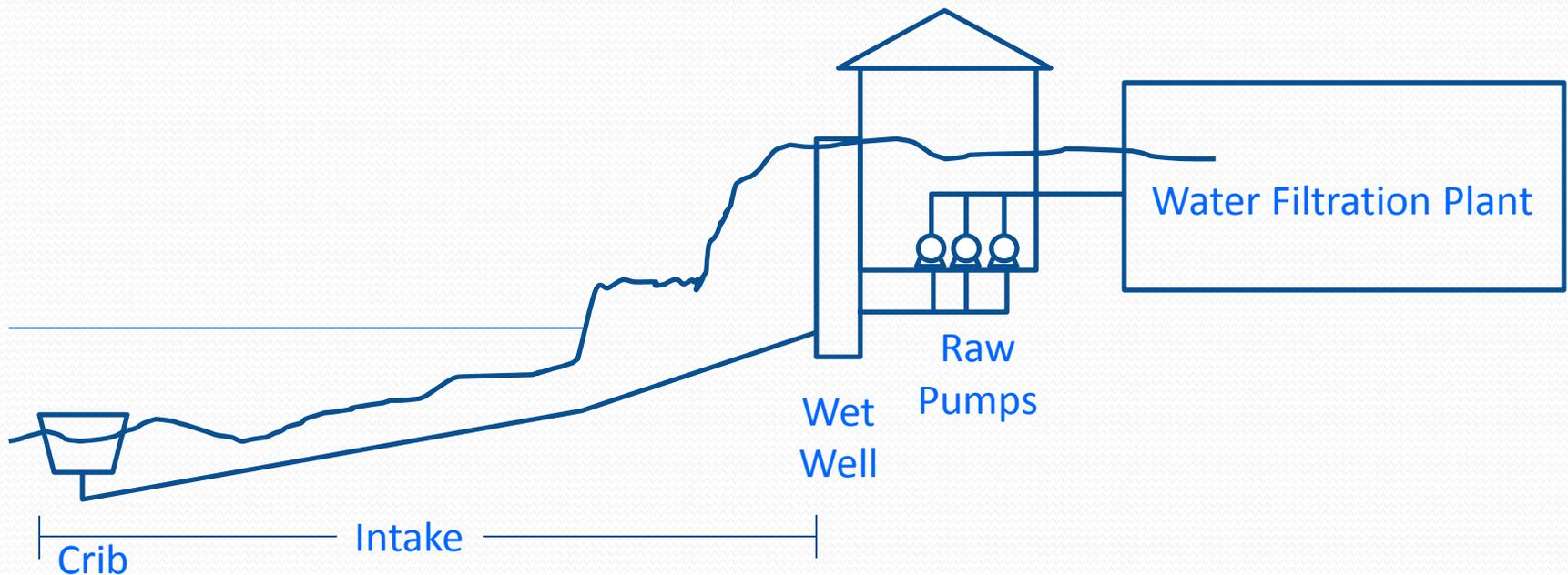
WFP manager called in because he was unable to draw in enough water into wet well. He called in several staff members to resolve issue.



The Event – cont'd

Overnight, 1/7-1/8

As intake flow decreased, backwashed and air sparged intake. Helped increase incoming flow, but did not clear blockage.



The Event – cont'd

Tuesday night and Wednesday, 1/8

- Backflushed intake lines by using water from sedimentation basins
- Used transfer pump (10 MGD) that is used to recycle water from tube settler cleaning
- Pumped water through pump into raw wet well
- Backflushed at least a dozen times and always had some flow – 5-9 MGD

The Event – cont'd

Tuesday night and Wednesday, 1/8

- During backflushing the plant is not producing water for clearwells
- Thus exhausting more of storage that is left in clearwells
- Used about 250,000 gallons of water per backflush
- Had three of four sedimentation basins empty at one time

The Event – cont'd

Wednesday, 1/8

- Always had water to maintain minimum pressure and supply in Avon Lake System
- Also supplied Avon during most of the event which does not have another emergency connection
- All of our bulk customers have elevated storage

The Event – cont'd

Wednesday, 1/8

- Turned off ETL pumps ~midnight & notified Sheffield Lake & Sheffield Village to start drawing more from Lorain & Elyria. Reversed flow from Sheffield Lake to draw in some water.
- ~8-9 a.m., decided Avon Lake customers should be requested to conserve.
- Throughout day, interacted with bulk customers, some Avon Lake commercial customers, OEPA, media.

The Event – cont'd

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The Event – cont'd

- Around midday, OEPA suggests pumping a brine solution out to intakes to possibly help. Initially looked promising but could not sustain gains.
- OEPA contacts Coast Guard to request ice breaker/provided information regarding possible air boat in Sandusky area.
- Mid-afternoon, began investigating pump-around solution. Determined it was best solution and began focusing all resources on implementing.

The Event – cont'd

- Xylem Dewatering Solutions (Painesville), Kendera Construction (Avon Lake), Lake Erie Diving (Mentor) all worked hand-in-hand with staff to implement solution.
- ~11 p.m. First bypass pump operational, pumping ~2mgd.
- Emergency pumping not only supplied water it helped by putting extra head on intakes

The Event – cont'd

Thursday, 1/9

- Got 2nd & 3rd pumps running between 2-3 a.m., yielding ~7mgd – 8mgd.
- During next 2 hours, the changed pumping rate allowed intake ice to dislodge/melt.
- By 5 a.m., pumping ~25mgd.
- During next few hours, allowed RLCWA to turn their PS back on & turned on ETL pumps to begin refilling Island Rd & Spieth tanks for Medina, Medina Cnty, & RLCWA.

The Event – cont'd

- 6 a.m. first electronic message to residents regarding resumption of normal water consumption (~7:45 a.m. CodeRED call).
- Throughout day, interacted with bulk customers, some Avon Lake commercial customers, media.
- Entire event <36 hours (<42 hours including tank refills).







Challenges during the Event

- News Media
- Lorain County – State of Emergency
- Conference Calls with agencies
- Communicating with customers
- Communicating with our bulk customers
- Visitors
- Lack of food and rest

Communication

- Code Red
- Social Media is amazing – we use all the time and 100's of responses
- We have a Communication Specialist - Elana West
- Todd Danielson is excellent with the press
- Made national and a lot of local news



Avon Lake Municipal Utilities

January 9

Success during the night! We are removing our water restrictions and pumping to our neighbors. They will det. when they can remove theirs.

Like · Comment · @AvonLakeWater on Twitter · Share

144

Kristin Coleman Stobe, Jennifer Augustine Haven, Kelly Summers Bryan and 371 others like this. [Top Comments](#)



Write a comment...



Meg Goodwillie Sherban Thanks!!

Like · Reply · 1 · January 9 at 6:30am



Kelly Summers Bryan Thank you for getting this resolved so quickly!

Like · Reply · 1 · January 9 at 6:22am



Michelle Ackerman-Covell Thank you to everyone at the water dept for long hard and very cold work

Like · Reply · 2 · January 9 at 6:16am



Kris Thorpe Thank you!

Like · Reply · January 9 at 6:28am



Scott Rush Great job...and thank you for your hard work!

Like · Reply · 4 · January 9 at 6:30am



Linda Below Awesome communication!

Like · Reply · 3 · January 9 at 7:14am



Stacey Swain Litzler Thank you so much for your innovation and for all the people who were working so hard outside in the cold overnight. This "rescue" could make a great documentary:) The divers, the drilling, the sump pumps, etc.

Like · Reply · 4 · January 9 at 6:57am



Diane Sikorski Thank you for your hard work in solving the problem and keeping us updated along the way.

Like · Reply · 1 · January 9 at 10:18am

Sent: Thursday, January 09, 2014 8:17 AM
To: Todd Danielson
Subject: RE: Avon Lake water restrictions lifted

YES!!

Sent: Saturday, January 11, 2014 6:08 PM
To: Todd Danielson
Subject: Re: Alert message

Importance: High

Dear Mr. Danielson,

Just want to mention how great these notifications have been.

We followed the directions you gave, also informed other's, really a community effort.

Thank you so much for keeping us up dated.

Great system.

(Aren't you glad you have nothing to do with the scary situation with the water in Charleston, West Virginia...yikes)

Sincerely,

Ginny Grodach

Sent: Thursday, January 09, 2014 9:18 AM
To: Contact
Subject: thank you

Thank you all for your hard work and dedication during our recent water crisis. After experiencing limited water usage for just 18 hours, I find myself very much aware of just how lucky we are to live so close to Lake Erie, and equally important, that we have such a dedicated municipal crew who insure clean water in our taps. Thank you so much for your efforts.

Sincerely,

Ann Collins
Ambleside Drive



This email is free from viruses and malware because [avast! Antivirus](#) protection is active.

"IN THE 40-YEAR HISTORY OF RURAL WATER WHAT WE HAVE GOING ON NOW IS BY FAR THE WORST DISASTER ON OUR WATER SYSTEM WE'VE EVER HAD."

— Rural Lorain County Water Authority General Manager Tim Mahoney

ICE BLOCKS WATER SUPPLY

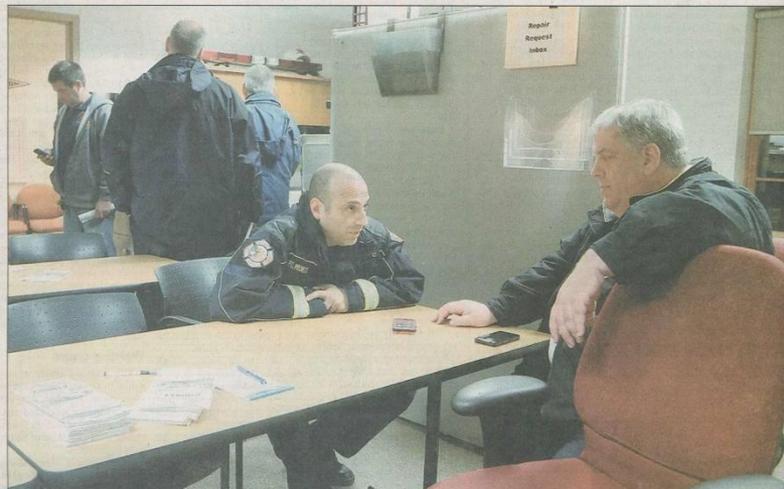
Chelsea Miller,
Lisa Roberson
and Evan Goodenow
The Chronicle-Telegram

Frozen intake pipes that draw water from Lake Erie for Avon Lake Municipal Utilities wreaked havoc on the water supply Wednesday and prompted Lorain County commissioners to declare the county in a state of emergency for the first time in at least five years.

As of late Wednesday, officials in Lorain, Medina and Cuyahoga counties were keeping a wary eye on the situation, fearful that the utility's more than 200,000 customers soon would be without water. The stores that were open were seeing a rush as residents bought up bottled water. And school districts, many of which had yet to return from winter break because of the extreme cold earlier this week, were canceling or preparing to cancel classes yet again in the event that the situation wasn't rectified by this morning.

Todd Danielson, chief utilities executive for Avon Lake Municipal Utilities, which supplies water to 205,706 residents living in a seven-county area, informed customers of the potentially dire situation Wednesday as the company worked to remove slush-like frazil ice that was obstructing

See BLOCK, A2



BRUCE BISHOP / CHRONICLE PHOTOS

ABOVE: Elyria fire Capt. Joe Pronesti and Tom Kelley, Lorain County Emergency Management Agency and Homeland Security director engage in a phone conference discussing the county water situation with other fire officials Wednesday.

BELOW INSET IN MAP: Intake lines below the surface of Lake Erie for Avon Lake Municipal Utilities have become clogged with frazil ice, severely limiting the supply of water provided to the utility's more than 200,000 customers.

IN LAGRANGE

Bare shelves, full tubs as residents prepare for possible shortage

Melissa Linebrink
The Chronicle-Telegram

LAGRANGE — As the water shortage ripples through Lorain County, the village of LaGrange is preparing for the worst.

According to IGA owner Kathy Poling, the store on North Center Street sold out of water by mid-afternoon Wednesday.

"We are out," Poling said Wednesday evening. "And people are still coming in asking for it."

Poling said her store does not have any scheduled deliv-

Earlier in the day, LaGrange village officials sent out an alert informing residents of the impending water shortage.

LaGrange Mayor Kim Strauss said village residents do receive their water from the Rural Lorain County Water Authority, which on Wednesday received word that service had been interrupted by Avon Lake Municipal Utilities.

"RLCWA was notified at 1:30 a.m. (Wednesday) that the water intakes in Lake Erie were frozen over and Avon Lake Municipal Utilities staff

AREAS SUPPLIED BY AVON LAKE MUNICIPAL UTILITIES



IN VERMILION

Supply drop prompts boil alert in the city

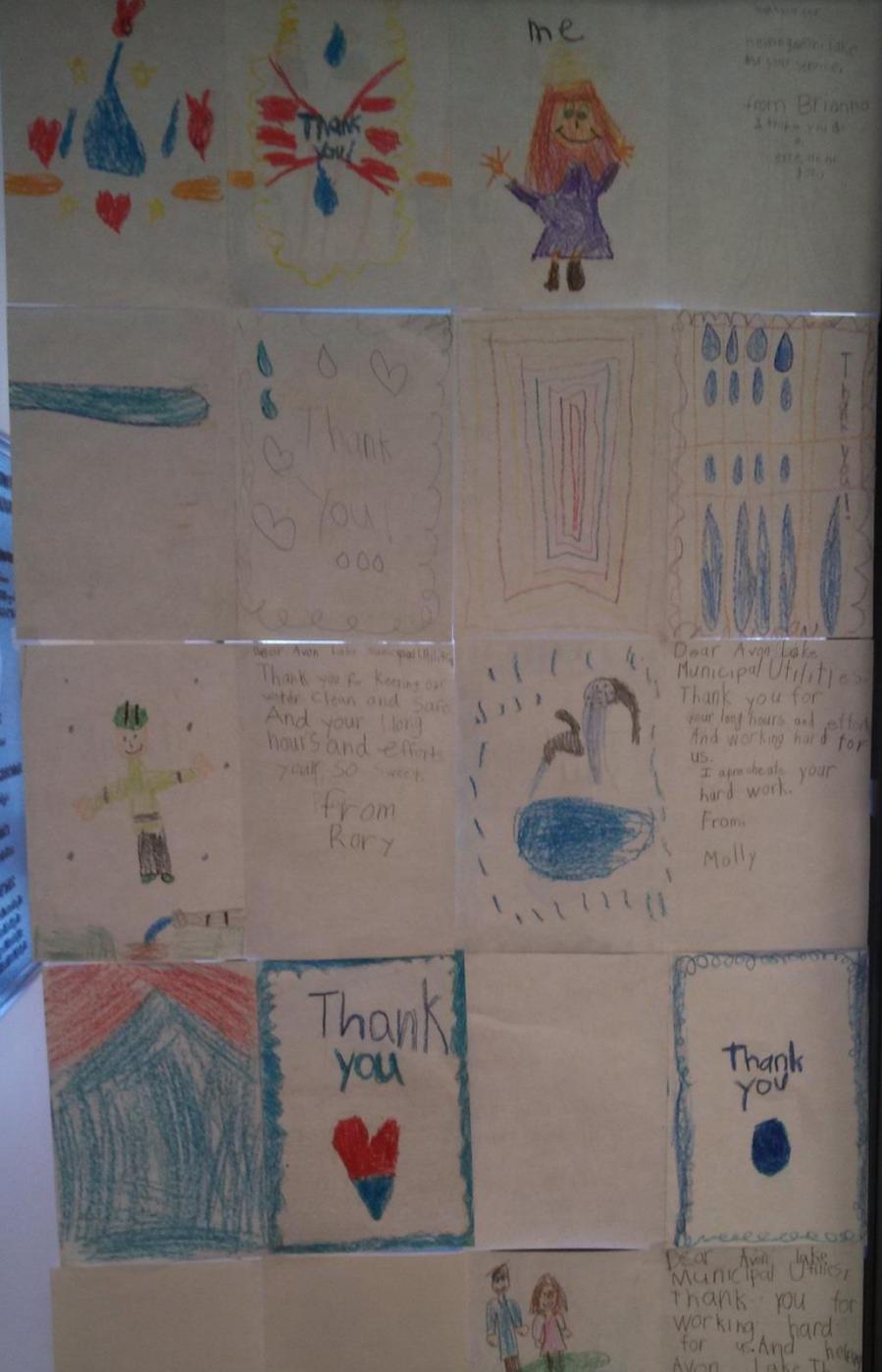
A boil alert has been issued for Vermilion residents until further notice.

On Wednesday evening, water plant technicians noticed a drop in the water system pressure, which prompted the alert.

"The water system didn't look right, so for the safety of citizens, we had to issue the boil alert," said Jim Warner, operator of record at the Vermilion water plant.

Warner said weather could be the cause of the system drop, but the official cause of the problem is under investigation.

Warner said Vermilion's water service is not affected by the situation at Avon Lake Municipal Utilities.



Path Forward

- Immediate:
 - Modifying ability to backwash intakes
 - Modifying intakes and intake structures
 - Modifying operations regarding filling and drawing from tanks
 - Renting 1 pump as onsite backup
 - Relationship in place with pump supplier

Path Forward—cont'd

- Longer term – Will improve ability to bubble air at intakes. Considering:
 - Intake grate modifications, possibly heating
 - Add'l intake (required beyond 60mgd)
 - Add'l clear well capacity (required beyond 50mgd)
 - Add'l elevated storage within A.L.
 - Interconnection w/other water producers

Lessons learned

- We will go to emergency pumping sooner
- Make sure Emergency Plan is updated and relevant
- Looking at ways to backflush more effectively
- Intake improvements needed
- Get food more often and rest your employees if possible
- We had our diver on site: Pat Murphy – Lake Erie Diving – was a good move

Suggestions

- Have your intakes maintained and inspected at least bi-yearly and they do require maintenance – video DVD
- Review your intake plans
- Update and try out your emergency plan and notify critical users to make sure you have correct contacts
- Use Social Media?
- Establish relationships with the news media
- Establish contacts with people or contractors that can help you

Questions

- Steve Heimlich
- Water Plant Manager
- Avon Lake Regional Water
- 440-933-3229 work
- 440-935-6404 cell
- sheimlich@avonlakewater.org
- avonlakewater.org