Regional Water Quality NEWSLETTER

DATE: Report for November 2012

A Tempe, Glendale, Peoria, Chandler, CAP, SRP, Arizona American Water– ASU Regional Water Quality Partnership

http://enpub.fulton.asu.edu/pwest/tasteandodor.htm

SUMMARY: EVALUATION AND RECOMMENDATIONS

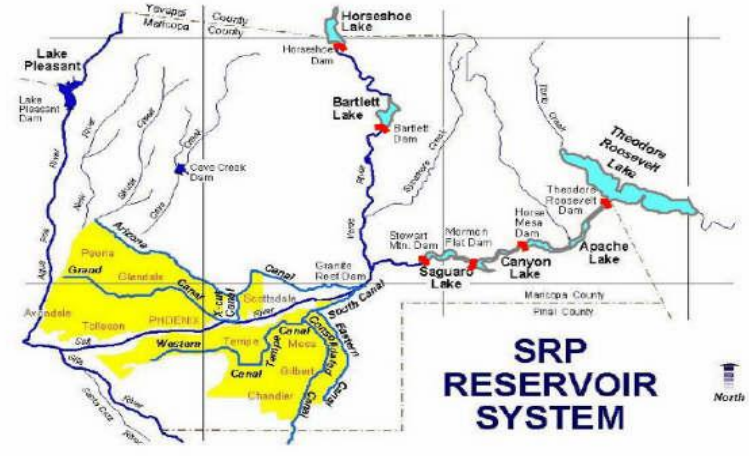
1. MIB and geosmin levels dropped significant from early and mid October until the first week of November. Current levels in the canals are generally < 10 ng/L, although they were above 20 ng/L in mid-October.
2. Dissolved organic carbon levels in the canals are lowest they have been all year, in part due to pumping of groundwater and in part due to slightly lower DOC concentrations in Saguaro Lake following thermal destratification last month.
3. DO YOU GAC? We have a quick 5 question survey to document Valley-wide granular activated carbon use. Please complete the survey and email it back to me before Thanksgiving. (see last page of Newsletter)
4. There is a fairly new on-line THM analyzer. Information on the system is included. Rumor is City of Phoenix tried it out on THMs in one of their reservoirs. Does anyone have data they could show which either (1) compares its performance to grab samples, (2) general operational information of the unit?
5. We are scheduled to collect our next quarterly samples for organic matter analysis this week – so data will be provided in December.

Quick Update of Water Supplies for November 2012
(during day of sampling – October 6)

Source	Trend in supply	Discharge to water supply system	Flow into SRP Canal System	Dissolved organic carbon Concentration (mg/L) **
Salt River	Reservoirs at 52% full	500 cfs	496 cfs into **Arizona Canal**	4.5 mg/L
Verde River	Reservoirs At 32% full	110 cfs	127 cfs into **South Canal (82% Salt River Water)**	2.7 mg/L
Colorado River	Lake Pleasant is 46% full (Lake Powell is 56% full)	Lake Pleasant filling; direct Colorado River water is in the CAP canal	0 cfs of **CAP water** into Arizona Canal	3.5 mg/L
Groundwater	Generally increasing due to recharge	321 cfs pumping by SRP	321 cfs **Groundwater Pumping** into SRP Canals	0.5 to 1 mg/L

*Concentration of these taste and odor compounds in the upper [lower] levels of the terminal reservoir (Saguaro Lake on the Salt River; Bartlett Lake on the Verde River; Lake Pleasant on the CAP system
**Concentration of DOC in the terminal reservoir
*** On paper cities are receiving CAP water in the SRP canals, but as a method of "paying back" from the last drought for excess CAP deliveries – SRP is delivering wet water only from the Salt and Verde Rivers
Data from the following websites:

- http://www.srpwater.com/dwr/
- http://www.cap-az.com/Operations/LakePleasantOps.aspx
- http://lakepowell.water-data.com/



Groundwater Pumping

SRP has increased groundwater pumping. On the Arizona canal wells below Glendale Cholla WTP but above Peoria Greenway plant are operating. On the South Canal system:

- One large pump operating (4100 gpm) above Val Vista
- Multiple pumps operating on the Consolidated Canal above Chandler WTP
- Multiple pumps operating on the Tempe Canal above S. Tempe WTP

Dissolved Organic Carbon In Reservoirs and Treatment Plants

DOC = Dissolved organic carbon
UV254 = ultraviolet absorbance at 254 nm (an indicator of aromatic carbon content)
SUVA = UV254/DOC
TDN = Total dissolved nitrogen (mgN/L)

Reservoir Samples

Table 4 - Reservoir Samples – November 7, 2012

Reservoir sampling conducted monthly. CAP is sampling Lake Pleasant and Havasu, and USGS is sampling Verde River at Tangle and Salt River above Roosevelt on slightly different days than the other reservoirs.

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Havasu (October)		3.0	0.04	1.4	0.5
Lake Pleasant (October)	Epilimnion	3.0	0.04	1.3	0.3
	Hypolimnion	3.7	0.04	1.0	0.4
Verde River	@ Tangle	1.2	0.07	5.9	0.1
Verde River	@ Beeline Hwy	1.4	0.049	3.6	0.4
Bartlett Reservoir	Epilimnion	6.4	0.058	0.9	0.3
	Hypolimnion	2.7	0.058	2.1	0.2
Salt River above Roosevelt	above Roosevelt				
Saguaro Lake	Epilimnion	4.2	0.072	1.7	0.4
	Epi - Duplicate	4.6	0.069	1.5	0.3
	Hypolimnion	3.8	0.072	1.9	0.4
Salt River	@ Blue Point Bridge	3.1	0.066	2.1	0.3

Organic Matter in Canal

Table 3 - Rivers and Canals – November 6, 2012

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Waddell Canal	2.5	0.056	2.3	0.5
Anthem WTP Inlet	2.9	0.035	1.2	0.5
Union Hills Inlet	2.4	0.058	2.4	0.5
CAP Canal at Cross-connect	No flow			
Salt River @ Blue Pt Bridge	3.1	0.066	2.1	0.3
Verde River @ Beeline	1.4	0.049	3.6	0.4
AZ Canal above CAP Cross-connect	Not available			
AZ Canal below CAP Cross-connect	3.6	0.067	1.9	0.3
AZ Canal at Highway 87	2.9	0.065	2.3	0.3
AZ Canal at Pima Rd.	4.1	0.071	1.7	0.0
AZ Canal at 56th St.	2.8	0.071	2.5	0.5
AZ Canal - Central Avenue	2.8	0.072	2.6	0.6
AZ Canal - Inlet to Glendale WTP	2.6	0.061	2.4	1.0
AZ Canal - Inlet to GreenwayWTP	2.0	0.048	2.4	3.7
South Canal below CAP Cross-connect	2.9	0.060	2.1	0.3
Head of the Tempe Canal	1.6	0.041	2.5	0.8
Tempe Canal - Inlet to Tempe's South Plant	Offline			
Head of the Consolidated Canal	1.5	0.039	2.5	0.9
Middle of the Consolidated Canal	0.6	0.020	3.6	4.4
Chandler WTP – Inlet	0.8	0.021	2.7	4.3

Organics at the Water Treatment Plants

Table 2 - Water Treatment Plants – November 6, 2012

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN	DOC removal (%)
Union Hills Inlet	2.4	0.058	2.4	0.5	
Union Hills Treated	1.9	0.025	1.3	0.4	19
Tempe North Inlet	2.7	0.054	2.0	0.6	
Tempe North Plant Treated	1.6	0.029	1.8	0.6	39
Tempe South Inlet	Offline				
Tempe South Plant Treated					
Greenway WTP Inlet	2.0	0.048	2.4	3.7	
Greenway WTP Treated	1.7	0.005	0.3	2.7	15
Glendale WTP Inlet	2.6	0.061	2.4	1.0	
Glendale WTP Treated	2.1	0.035	1.7	0.9	20
Anthem WTP Inlet	2.9	0.035	1.2	0.5	
Anthem WTP Treated	2.2	0.036	1.7	0.5	24
Chandler WTP Inlet	0.8	0.021	2.7	4.3	
Chandler WTP Treated	0.6	0.015	2.6	4.1	27

Taste and Odor

MIB, Geosmin and Cyclocitral are compounds naturally produced by algae in our reservoirs and canals, usually when the water is warmer and algae are growing/decaying more rapidly. They are non toxic, but detectable to consumers of water because of their earthy-musty-moldy odor. The human nose can detect these in drinking water because the compounds are semi-volatile. Since compounds are more volatile from warmer water, these tend to be more noticable in the summer and fall. The human nose can detect roughly 10 ng/L of these compounds. Our team collects samples from the water sources and raw/treated WTP samples. We usually present all the data when concentrations start to exceed 5 ng/L.

Table 4 - Reservoir Samples – November 7, 2012

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant (Oct)	Eplimnion	**<2.0**	**<2.0**	**<2.0**
Lake Pleasant (Oct)	Hypolimnion	**3.9**	**<2.0**	**<2.0**
Verde River @ Beeline		**15.6**	**3.5**	**<2.0**
Bartlett Reservoir	Epilimnion	**2.3**	**2.1**	**<2.0**
Bartlett Reservoir	Epi-near dock	**2.0**	**<2.0**	**<2.0**
Bartlett Reservoir	Hypolimnion	**2.4**	**2.2**	**<2.0**
Salt River @ BluePt Bridge		**9.9**	**3.5**	**<2.0**
Saguaro Lake	Epilimnion	**9.1**	**8.3**	**<2.0**
Saguaro Lake	Epi - Duplicate	**8.0**	**7.7**	**<2.0**
Lake Havasu (Oct)	October '12	**2.2**	**3.9**	**<2.0**
Verde River at Tangle Creek (Oct)	October '12	**5.4**	**10.4**	**<2.0**

Table 3 - Canal Sampling – November 9, 2012

System	Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
CAP	Waddell Canal	**3.1**	**4.5**	**<2.0**
	Union Hills Inlet	**<2.0**	**3.7**	**<2.0**
	CAP Canal at Cross-connect	**<2.0**	**<2.0**	**<2.0**
AZ Canal	Salt River @ Blue Pt Bridge	**9.9**	**3.5**	**<2.0**
	Verde River @ Beeline	**15.6**	**3.5**	**<2.0**
	AZ Canal above CAP Cross-connect			
	AZ Canal below CAP Cross-connect	**12.0**	**3.6**	**<2.0**
	AZ Canal at Highway 87	**10.9**	**3.4**	**<2.0**
	AZ Canal at Pima Rd.	**10.2**	**2.8**	**<2.0**
	AZ Canal at 56th St.	**8.4**	**2.8**	**<2.0**
	AZ Canal - Central Avenue	**9.4**	**2.6**	**<2.0**
	AZ Canal - Inlet to Glendale WTP	**4.7**	**2.1**	**<2.0**
	Head of the Consolidated Canal	**4.7**	**2.1**	**<2.0**
	Middle of the Consolidated Canal	**2.5**	**<2.0**	**<2.0**
South Tempe Canals	South Canal below CAP Cross-connect	**9.3**	**3.0**	**<2.0**
	Head of the Tempe Canal	**3.6**	**2.8**	**<2.0**
	Tempe Canal - Inlet to Tempe's South Plant	**14.9**	**27.0**	**<2.0**

Table 2 - Water Treatment Plants – November 6, 2012

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Union Hills Inlet	<2.0	3.7	<2.0
Union Hills Treated	<2.0	<2.0	<2.0
Tempe North Inlet	11.7	2.9	<2.0
Tempe North Plant Treated	4.1	<2.0	<2.0
Tempe South WTP	14.9	27.0	<2.0
Tempe South Plant Treated			
Anthem Inlet	<2.0	<2.0	<2.0
Anthem Treated	<2.0	3.1	<2.0
Chandler Inlet	<2.0	3.8	<2.0
Chandler Treated	<2.0	4.4	<2.0
Greenway WTP Inlet	<2.0	<2.0	<2.0
Greenway WTP Treated	<2.0	<2.0	<2.0
Glendale WTP Inlet	4.7	2.1	<2.0
Glendale WTP Treated	<2.0	<2.0	<2.0

ON-LINE TRIHALOMETHANE MONITOR
AMS THM-100

Aqua Metrology Systems' (AMS) THM-100 enables plant operators to optimize Trihalomethane (THM) remediation processes and to ensure that treatment plants comply with the US Environmental Protection Agency's Stage 2 Disinfection By-Product Rule (DBPR), whilst minimizing their costs of chemical treatment and sludge removal, filtration, blending, and associated energy costs.

BACKGROUND

Trihalomethanes (THMs) are by-products formed as a result of disinfecting water containing natural organic matter with chlorine based disinfectants.

US drinking regulations are carried out under the auspices of the Safe Water Act in accordance with methods established by the US Environmental Protection Agency. Total THMs have a prescribed maximum concentration of 80 µg/L in US drinking water.

In anticipation of the EPA's Stage 2 Disinfection By Product Rule (DBPR), responsible utilities across the United States have invested billions in capital improvements, including organic removal (enhanced coagulation, GAC, microfiltration), pre-oxidation (chlorine dioxide, ozone), alternative disinfection (UV), and THM removal (GAC, aeration) technologies.

Water treatment processes must be optimized to maintain THM production within process limits. Conservative practice necessitates excessive treatment to ensure THM compliance. As a result, these utilities will also spend millions annually in additional operating expenses because they do not currently get continuous THM measurements. Traditional laboratory analysis of water samples can take up to 10 days, too late for treatment process optimization.

THM monitoring, along with other operational parameters, enable cost savings related to timing and amounts of source blending, coagulants, flocculants, disinfection agents, activated carbon, energy and other consumables by bringing the process "under control". With continuous monitoring, any changes in THM levels can be rapidly identified and remediation processes changed accordingly.

Aqua Metrology Systems THM-100

THM-100

Features:

- **Continuous, online results, 24x7.**
- **As accurate as traditional laboratory techniques.**
- **Fully automated for unattended operation.**
- **User programmable sampling frequency.**
- **User configurable alarm thresholds.**
- **Self-calibrating with onboard THM standards.**
- **USB for data retrieval and system upgrades.**
- **4-20 mA for telemetric SCADA notifications.**
- **Easy to install and operate.**

Benefits:

- **Reduction in operating costs by enabling the optimization of THM remediation.**
- **Avert regulatory breaches.**
- **Reduced manual sampling costs .**
- **Peace of mind.**

AMS THM-100

The AMS THM-100 is a stand-alone monitor that provides drinking water plant operators with accurate, continuous, readings within the treatment plant, distribution network, or service resevoir as frequently as every hour. Systems are currently installed in Europe, Asia, and North America. Customer results show that the system is as accurate as a traditional laboratory with superior repeatability.

The analysis technology is based on "purge and trap" extraction, followed by a chemical reaction that produces a colored product which is then quantified spectrophotometrically. The system has no known interferences with non-trihalomethane compounds, including TCE, carbon tetrachloride, and other organo-halogen VOCs regulated by the EPA for drinking water.

Specifications:

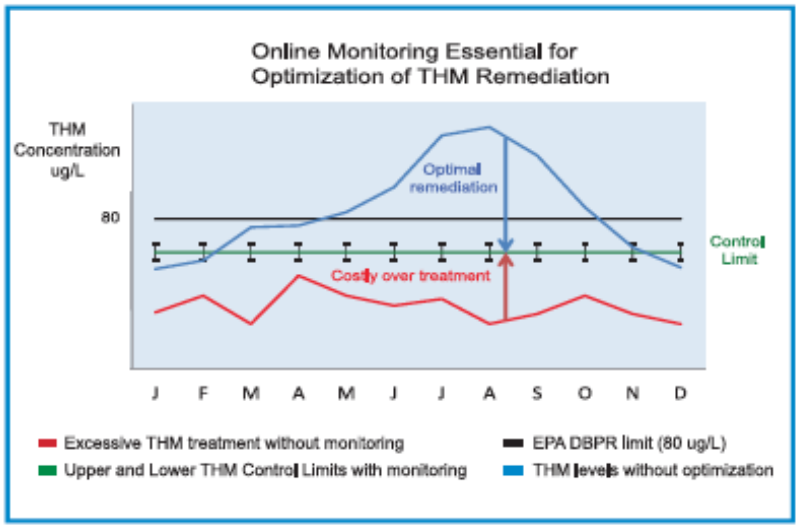
Performance	
Quantitation Range:	5-200 µg/L Total THM
Accuracy Total THM: Chloroform:	 ± 10% 1δ at 50 µg/L
Repeatability Total THM: Chloroform:	 ± 5% 1δ at 50 µg/L
Sample Size:	~0.25 L

Operating Environment	
Instrument:	5-40 °C; < 95% relative humidity, non-condensing

Facility Requirements	
Clean Dry Air:	Max of 2 Lpm @ STP
Electrical:	110-220 VAC, 1 phase, 50/60 Hz, 150 VA

Hardware	
Physical Size:	W - 2.0' (610 mm) D - 1.3' (406 mm) H - 5.0' (1524 mm)

For more information on the AMS THM-100, please contact us.
Specifications subject to change without notice.



Aqua Metrology Systems Limited
1225 E. Arques Avenue, Sunnyvale, CA 94085
Phone: (408) 523-1900 | Fax: (408) 523-1909
E-mail: info@aquametrologysystems.com
www.aquametrologysystems.com

Systems to enable optimization of THM remediation

Do you GAC?

Please complete the survey below and email to: p.westerhoff@asu.edu and michelle.cummings@asu.edu before Thanksgiving

1. What is the name of the Water Treatment Plant you represent: _____
2. Does your plant use GAC in any capacity:
    a. Yes
    b. No
3. Does your plant use GAC filter caps
    a. Yes
    b. No
    c. If yes – how deep (ft): _____ and what is the Empty bed contact time (minutes)
    d. If yes – how long does it operate before regeneration: _____
    e. If yes – what is the lower media type: _____ft of _____media
4. Does your plant use GAC filters (primary filters for turbidity control)
    a. Yes
    b. No
    c. If yes – how deep (ft): _____and what is the Empty bed contact time (minutes)
    d. If yes – how long does it operate before regeneration: _____
5. Does your plant use GAC sorbers (packed beds designed for sorption and not turbidity control)
    a. Yes
    b. No
    c. If yes – how deep (ft): _____and what is the Empty bed contact time (minutes)
    d. If yes – how long does it operate before regeneration: _____
6. Do you add any oxidants (chlorine, chlorine dioxide, ozone) before GAC:
    a. No
    b. Yes
    c. If yes – what is the purpose of this?
7. Does your plant to use GAC in the near future (1-3 years)? If so, why?