Regional Water Quality Newsletter

DATE: Report for November2010
Sampling conducted November 2, 2010
A Tempe, Glendale, Peoria, CAP, SRP and Phoenix – ASU Regional Water Quality Partnership

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

SUMMARY: EVALUATION AND RECOMMENDATIONS

1. Slides from our September 17, 2010 workshop are available online (Thanks for making the workshop a success): ***http://enpub.fulton.asu.edu/pwest/tasteandodor.htm***
2. MIB plus geosmin levels above 10 ng/L in finished water lead to noticeable earthy-musty odors by customers. Currently MIB+geosmin levels are below 10 ng/L in the canals, but are high in the reservoirs. Concentrations in the canals are now 10 to 15 ng/L, and low levels of geosmin appear to be produced in the middle of the Arizona Canal.
3. Preliminary Test Indicates New Fish Virus No Risk for People, Pets or Water Supply
4. Dissolved organic carbon (DOC) concentrations in the reservoir systems are roughly as follows, following thermal destratification in October:
    - Saguaro Lake: 4.7 mg/L
    - Bartlett Lake: 4.0 mg/L
    - CAP supply: 3.0 mg/L
5. Use of Size Exclusion Chromatography for Characterizing DOC Efficiency of Water Treatment Plant Processes is presented for Tempe WTPs (n=2). Coagulation removes a select portion of the DOC. We present graphically an analysis that shows which size fractions of DOC are removed by each treatment process.

Table 1 - SRP/CAP OPERATIONS - Values in cfs, for November 2, 2010

System	SRP Diversions	CAP
Arizona Canal	436	0
South Canal	455	0
Pumping	34	0
Total	925	0

- **SRP is releasing water from both Verde and Salt River Systems**. Salt River release from Saguaro Lake: 635 cfs; Verde River release from Bartlett Lake: 525 cfs.
- **SRP reservoirs are 86% full.**

CAP Operations of Lake Pleasant

Water is being released from Lake Pleasant into the CAP canal and mixing with water being pumped from the Colorado River.

Flow from Colorado River:	3050 cfs (Hassayampa pump station)
Flow from Lake Pleasant into CAP canal:	1650 cfs INTO Lake Pleasant (filling)
Lake Pleasant Capacity	60% full

Storage on the Colorado River:

- Current Lake Powell storage is 15,315 thousand acre-feet (KAF) (63 percent of capacity).
- Lake Mead storage is 9,972 KAF (39 percent of capacity). Total system storage is 32,825 KAF (55 percent of capacity).

Taste and Odor Data

MIB plus geosmin levels above 10 ng/L in finished water lead to noticeable earthy-musty odors by customers. Currently MIB+geosmin levels are above 10 ng/L in the canals.

Table 2 - Water Treatment Plants – November 1, 2010

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Union Hills Inlet	**3.0**	**2.7**	**<2.0**
Union Hills Treated	**3.8**	**2.4**	**<2.0**
Tempe North Inlet	**10.8**	**11.7**	**3.2**
Tempe North Plant Treated	**3.9**	**2.1**	**<2.0**
Tempe South WTP			
Tempe South Plant Treated			
Greenway WTP Inlet	**2.0**	**2.3**	**<2.0**
Greenway WTP Treated	**<2.0**	**2.5**	**<2.0**
Glendale WTP Inlet	**7.7**	**8.6**	**<2.0**
Glendale WTP Treated	**<2.0**	**<2.0**	**<2.0**

WTPs that have activated carbon (PAC or GAC) are removing Taste and Odor compounds, while those without activated carbon are not removing MIB.

Table 3 - Canal Sampling – November 1, 2010

System	Sample Description			
CAP	Waddell Canal	**3.0**	**2.5**	**<2.0**
	Union Hills Inlet	**3.0**	**2.7**	**<2.0**
	CAP Canal at Cross-connect			
	Salt River @ Blue Pt Bridge	**15.1**	**3.6**	**<2.0**
	Verde River @ Beeline	**4.9**	**6.1**	**4.0**
AZ	AZ Canal above CAP Cross-connect	**12.1**	**4.7**	**5.6**
Canal	AZ Canal below CAP Cross-connect	**11.3**	**4.9**	**3.8**
	AZ Canal at Highway 87	**12.2**	**8.3**	**3.8**
	AZ Canal at Pima Rd.			
	AZ Canal at 56th St.	**9.4**	**14.1**	**2.9**
	AZ Canal - Central Avenue	**8.7**	**10.8**	**<2.0**
	AZ Canal - Inlet to Glendale WTP	**7.7**	**8.6**	**<2.0**
South	South Canal below CAP Cross-connect	**12.0**	**5.5**	**2.8**
Tempe	Head of the Tempe Canal	**12.7**	**6.5**	**3.2**
Canals	Tempe Canal - Inlet to Tempe's South Plant			

Most of the MIB is coming from the Salt River system. Some geosmin appears to be produced in the Arizona Canal

Table 4 - Reservoir Samples – November 2, 2010

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant (Oct10)	Eplimnion	**<2.0**	**<2.0**	**<2.0**
Lake Pleasant (Oct10)	Hypolimnion	**5.3**	**<2.0**	**<2.0**
Verde River @ Beeline		**4.9**	**6.1**	**4.0**
Bartlett Reservoir	Epilimnion			
Bartlett Reservoir	Epi-near dock	**3.9**	**<2.0**	**<2.0**
Bartlett Reservoir	Hypolimnion			
Salt River @ BluePt Bridge		**15.1**	**3.6**	**<2.0**
Saguaro Lake	Epilimnion			
Saguaro Lake	Epi-near dock	**13.1**	**5.4**	**<2.0**
Saguaro Lake	Hypolimnion			
Lake Havasu (Oct10)		**6.4**	**4.2**	**<2.0**
Verde River at Tangle Creek (Sept10)		**6.9**	**2.7**	**<2.0**

***Reservoirs were sampled only at the docks this month because the SRP boat was not available.**

Monday, November 1, 2010

Preliminary Test Indicates New Fish Virus No Risk for People, Pets or Water Supply

PHOENIX -- Arizona may have a new microscopic aquatic invader - largemouth bass virus, which can kill fish but is not harmful to people.

"There has been a preliminary detection of this fish virus at Saguaro Lake," said Arizona Game and Fish Department Fisheries Chief Kirk Young.

Fish samples from Saguaro recently showed preliminary results for the largemouth bass virus, but due to testing timelines for this disease, Arizona Game and Fish is still awaiting a full report from federal laboratories. The full report is expected in the next three to four weeks. Confirmation of the detection will then be sought with another, independent laboratory.

Young emphasized that even if the virus is present, the disease posses no risk to people and pets and the water is safe for drinking water supply and recreation. "Largemouth bass virus is not known to infect any warm-blooded animals and any fish that are caught by anglers are safe to eat," said Young. "However, we always recommend that you thoroughly cook any fish you intend to eat and never use found dead or dying fish for food."

If confirmed, Saguaro would be the first water in Arizona to test positive for the presence of the virus. Although not previously detected in Arizona, at least 18 other states have found the fish disease in bodies of water dating back to 1991.

Game and Fish is working to develop a sampling effort to determine the presence of this fish virus in other Arizona bass lakes.

Largemouth bass virus can cause fish mortality but does not always do so. "It is not precisely known what triggers the activation of the virus into a disease outbreak, but it has been associated with stress events such as high water temperatures," Young said. "The virus only affects largemouth bass, but other fish species can carry the virus as well as water itself."

In other locations around the country where the virus has been found, bass populations typically suffer one-time effects of the disease before infected waters returned to normal. The virus appears to diminish over time and not every infected fish becomes sick. For instance, only five lakes in Texas suffered fish kills even though the virus was found in 23 of the state's reservoirs. "Usually the number of infected fish that die is relatively low compared to the entire population, with the virus mostly affecting older and larger fish," said Young.

Young emphasized that even though testing results are only preliminary at this point, Game and Fish wanted to inform the public immediately rather than waiting for full confirmation. "If the virus is present, there are precautions the public can take to help stop the spread of the virus," Young said. "As with all aquatic invasive species such as quagga mussels, public awareness and cooperation are critically important to preventing an even larger problem."

One preventive measure that's vital is that people absolutely avoid transporting live fish or

water from one body of water to another.

"You might be spreading an unwanted disease or even introducing an unwanted organism that could prove deadly to a fishery or substantially alter a lake ecosystem," said Young. "Don't transport live fish caught from a lake - period. It's the wrong thing to do and it's unlawful."

It's also important to clean, dry and drain your boat before leaving any lake at any time, and to disinfect your boat or wait at least five days before launching your boat on another water. In fact, at several lakes it's now the law that you do so. This is extremely important as the bass virus can live for up to seven days in standing water.

Other ways anglers and boaters can help stop the spread of invasive species:

* Dispose of all unused bait in the trash, never in the water.
* Never transfer live fish from one body of water to another.
* Rinse any mud and/or debris from equipment and wading gear.
* Drain any water from boats, bilge, bait buckets, and live wells before leaving the launch area. A mild mixture of bleach and water can be used to disinfect your equipment. Allow everything to air dry before moving to another body of water.
* Stage fishing tournaments in cooler weather to reduce stress on caught bass.
* Run aerators continuously while fish are in live wells if temperatures are over 70 degrees.
* If you see any dead or dying fish, please report your observation to Game and Fish.
* Educate others to follow these steps.

More information on largemouth bass virus is available at:
http://sports.espn.go.com/outdoors/bassmaster/news/story?page=b_conserv_lmbv_factsheet

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Contact:

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Organic Matter in Water Treatment Plants

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN		DOC removal (%)
Union Hills Inlet	2.76	0.044	1.58	0.50		
Union Hills Treated	2.22	0.023	1.05	0.44		19
Tempe North Inlet	4.29	0.094	2.19	0.34		
Tempe North Plant Treated	2.77	0.041	1.48	0.33		35
Tempe South WTP						
Tempe South Plant Treated						
Greenway WTP Inlet	4.08	0.091	2.22	0.45		
Greenway WTP Treated	3.04	0.028	0.92	0.73		26
Glendale WTP Inlet	4.27	0.094	2.19	0.34		
Glendale WTP Treated	3.00	0.038	1.25	0.29		30

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)

Organics in Canals

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Waddell Canal	**2.63**	**0.042**	**1.60**	**0.49**
Union Hills Inlet	**2.76**	**0.044**	**1.58**	**0.50**
CAP Canal at Cross-connect				
Salt River @ Blue Pt Bridge	**4.67**	**0.101**	**2.15**	**0.33**
Verde River @ Beeline	**2.61**	**0.061**	**2.33**	**0.31**
AZ Canal above CAP Cross-connect	**4.27**	**0.092**	**2.15**	**0.30**
AZ Canal below CAP Cross-connect	**4.32**	**0.092**	**2.13**	**0.36**
AZ Canal at Highway 87	**4.32**	**0.094**	**2.17**	**0.42**
AZ Canal at Pima Rd.				
AZ Canal at 56th St.	**4.22**	**0.092**	**2.19**	**0.36**
AZ Canal - Central Avenue	**4.29**	**0.095**	**2.21**	**0.36**
AZ Canal - Inlet to Glendale WTP	**4.27**	**0.094**	**2.19**	**0.34**
AZ Canal - Inlet to Greenway WTP	**4.08**	**0.091**	**2.22**	**0.45**
South Canal below CAP Cross-connect	**4.32**	**0.092**	**2.14**	**0.39**

Organics in Lakes

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Lake Pleasant - October	Eplimnion	**3.33**	**0.062**	**1.85**	**0.51**
Lake Pleasant - October	Hypolimnion	**3.99**	**0.062**	**1.55**	**0.34**
Verde River @ Beeline		**2.61**	**0.061**	**2.33**	**0.31**
Bartlett Reservoir	Epi-near dock	**4.04**	**0.095**	**2.34**	**0.43**
Bartlett Reservoir	Hypolimnion				
Salt River @ BluePt Bridge		**4.67**	**0.101**	**2.15**	**0.33**
Saguaro Lake	Epi-near dock	**4.85**	**0.103**	**2.12**	**0.30**
Verde River at Tangle	August	**1.03**	**0.03**	**2.95**	**1.03**
Havasu - October		**2.78**	**0.04**	**1.54**	**0.57**

Use of Size Exclusion Chromatography for Characterizing DOC Efficiency of Water Treatment Plant Processes

The ASU team presented data from several treatment facilities on SEC-DOC results at the workshop (see our slides). We have conducted sampling and analysis this month with data from Tempe (Attached).

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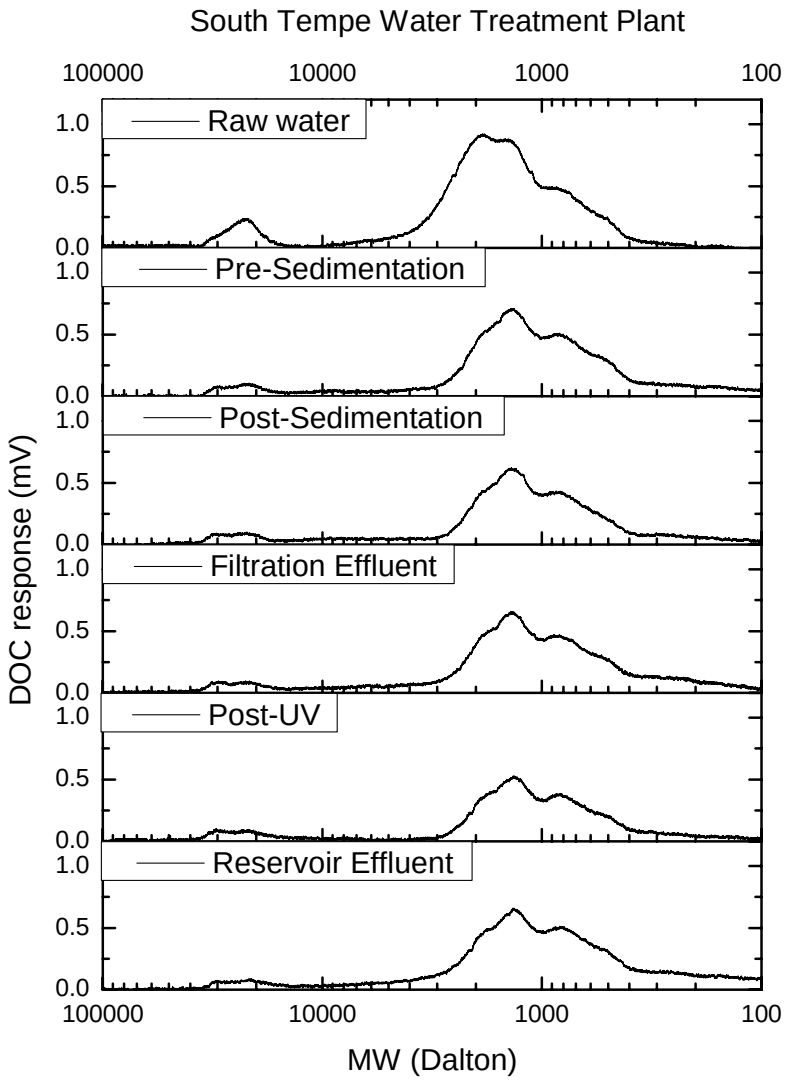
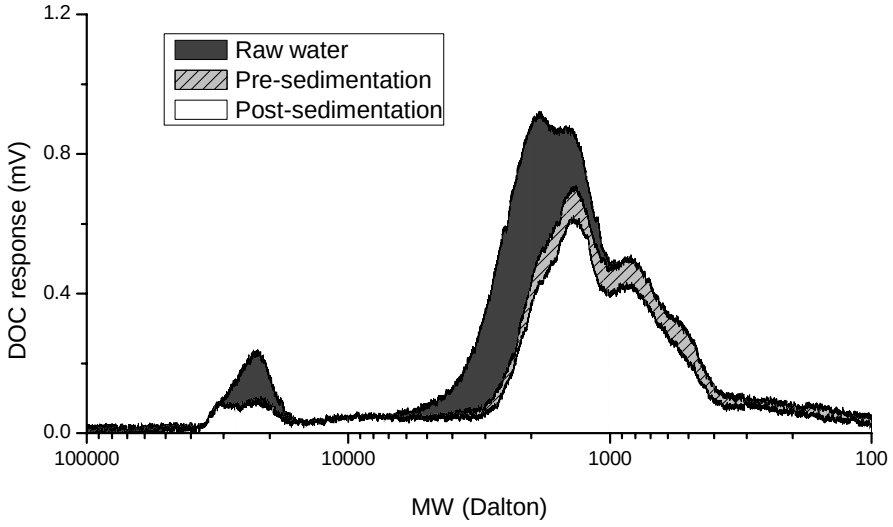
SEC-DOC can provide information on the following to help in process optimization:

1. Distribution of high, medium and low molecular weight organics in raw, through each process, and finished water. We would like to include a few DISTRIBUTION system samples too.
2. Coagulation usually removes higher molecular weight organics.
3. Activated carbon can remove medium molecular weight organics
4. Low molecular weight organics are difficult to remove, yet still form DBPs.
5. SEC-DOC data from source waters can provide useful insight into the future treatability of DOC.



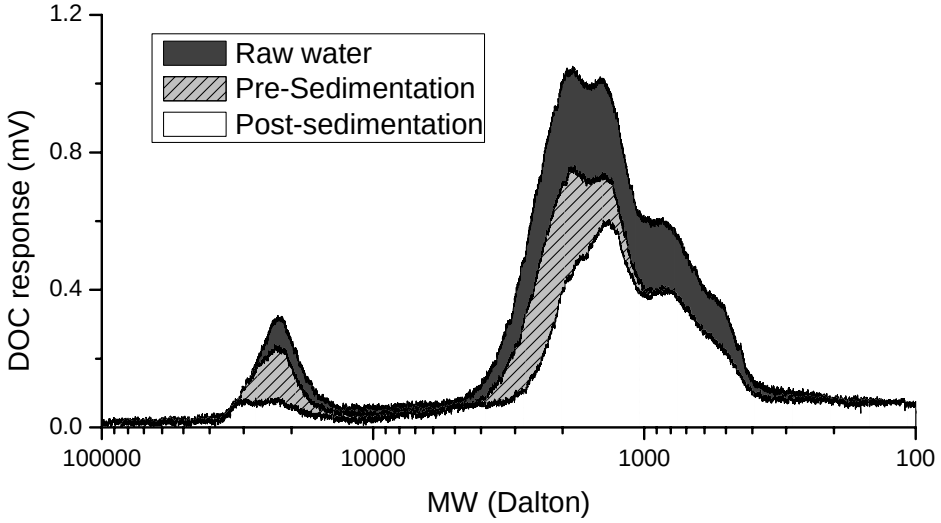
		SPT raw	SPT pre-sed	SPT post-sed	SPT fil-eff	SPT post-UV	SPT res-eff
	total DOC (mg/L)	4.3	2.9	2.5	2.9	2.4	2.4
MW range	**10,000 to 100000**	7%	9%	9%	8%	10%	6%
	1,000 to 10,000	51%	67%	52%	50%	48%	48%
	100 to 1,000	42%	24%	39%	42%	41%	46%

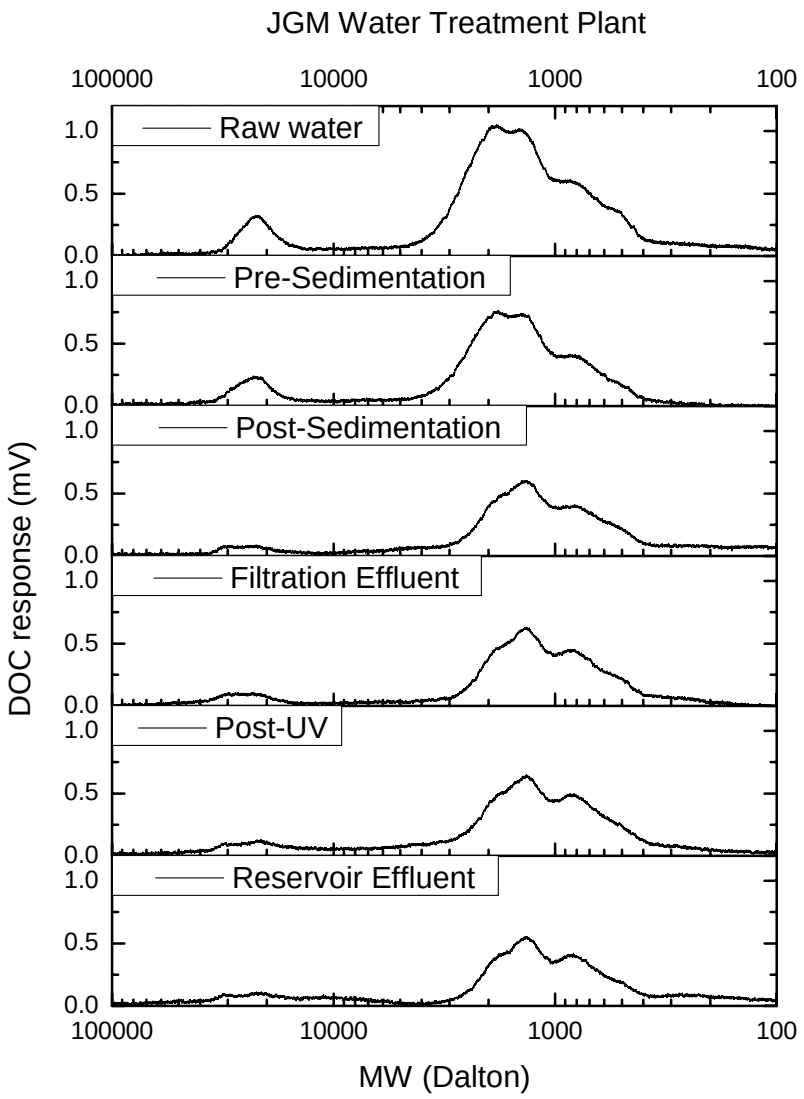
South Tempe Water Treatment Plant



This diagram shows (in shaded regions) the fraction of organic matter REMOVED between raw water and post-presedimentation (dark) and then between pre-sedimentation and after coagulation/sedimentation (cross-hatched area).

JGM Water Treatment Plant





		JGM raw	JGM pre-sed	JGM post-sed	JGM fil-eff	JGM post-UV	JGM res eff
	total DOC (mg/L)	4.3	3.1	2.1	2.3	2.3	2.3
MW range	**10,000 to 100000**	11%	13%	8%	10%	12%	14%
	1,000 to 10,000	60%	63%	52%	53%	52%	47%
	100 to 1,000	29%	23%	40%	37%	36%	39%