Regional Water Quality NEWSLETTER

DATE: Report for December 2010
Sampling conducted December 6, 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. 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.
2. 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: 3.6 mg/L
    - CAP supply: 2.4 mg/L
3. A brief discussion on in-situ GAC regeneration is provided, and we look to you for additional ideas.

Table 1 - SRP/CAP OPERATIONS - Values in cfs, for December 6, 2010

System	SRP Diversions	CAP
Arizona Canal	335	0
South Canal	103	0
Pumping	71	0
Total	509	0

- **SRP is releasing water from both Verde and Salt River Systems**. Salt River release from Saguaro Lake: 8 cfs; Verde River release from Bartlett Lake: 500 cfs.
- **SRP reservoirs are 85% full.**

CAP Operations of Lake Pleasant
12/10/10

Flow from Colorado River: 3013 cfs (Mark Wilmer pump station at Havasu inlet)

Lake Pleasant Operations/Waddell Canal: 1650 cfs INTO Lake Pleasant (filling)
Lake Pleasant Capacity 70% full

For December sampling:

- South Tempe WTP is offline
- No water in Salt River at Blue point Bridge
- No water in Head of Tempe Canal (HTC)
- No water in Union Hill WTP intake basin (I use Waddell Canal (R3) data instead of UNin)

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 4 - Reservoir Samples – December 7, 2010

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant (Nov10)	Eplimnion	**<2.0**	**<2.0**	**<2.0**
Lake Pleasant (Nov10)	Hypolimnion	**<2.0**	**<2.0**	**<2.0**
Verde River @ Beeline		**<2.0**	**<2.0**	**<2.0**
Bartlett Reservoir	Epilimnion	**<2.0**	**<2.0**	**<2.0**
Bartlett Reservoir	Epi-near dock	**<2.0**	**<2.0**	**<2.0**
Bartlett Reservoir	Hypolimnion	**<2.0**	**<2.0**	**<2.0**
Salt River @ BluePt Bridge				
Saguaro Lake	Epilimnion	**3.4**	**<2.0**	**4.6**
Saguaro Lake	Epi - Duplicate	**3.1**	**<2.0**	**5.6**
Saguaro Lake	Epi-near dock	**<2.0**	**<2.0**	**<2.0**
Saguaro Lake	Hypolimnion	**2.8**	**<2.0**	**<2.0**
Lake Havasu (Nov10)		**2.3**	**2.5**	**<2.0**
Verde River at Tangle Creek (Oct10)		**<2.0**	**2.2**	**<2.0**

Concentrations of MIB in canals and WTP locations are < 3 ng/L (data available upon request)

Organic Matter in Water Treatment Plants

Table 2 - Water Treatment Plants – December 06, 2010						
Sample Description	**DOC (mg/L)**	**UV254 (1/cm)**	**SUVA (L/mg-m)**	**TDN**		**DOC removal (%)**
24th Street WTP Inlet						
24th Street WTP Treated						
Deer Valley Inlet						
Deer Valley WTP Treated						
Val Vista Inlet						
Val Vista WTP Treated –East						
Val Vista WTP Treated -West						
Union Hills Inlet	**2.38**	**0.043**	**1.80**	**0.48**		
Union Hills Treated	**2.24**	**0.029**	**1.30**	**0.52**		**6**
Tempe North Inlet	**2.82**	**0.079**	**2.78**	**0.43**		
Tempe North Plant Treated	**2.06**	**0.041**	**1.97**	**0.36**		**27**
Tempe South WTP						
Tempe South Plant Treated						
Greenway WTP Inlet	**2.08**	**0.025**	**1.19**	**0.51**		
Greenway WTP Treated	**1.66**	**0.019**	**1.13**	**1.41**		**20**
Glendale WTP Inlet	**2.92**	**0.077**	**2.63**	**0.37**		
Glendale WTP Treated	**2.26**	**0.042**	**1.87**	**0.40**		**22**

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	**2.38**	**0.043**	**1.80**	**0.48**
Union Hills Inlet				
CAP Canal at Cross-connect				
Salt River @ Blue Pt Bridge				
Verde River @ Beeline	**2.70**	**0.076**	**2.81**	**0.28**
AZ Canal above CAP Cross-connect	**2.74**	**0.077**	**2.82**	**0.40**
AZ Canal below CAP Cross-connect	**2.75**	**0.078**	**2.82**	**0.39**
AZ Canal at Highway 87	**2.80**	**0.075**	**2.69**	**0.34**
AZ Canal at Pima Rd.	**2.92**	**0.077**	**2.65**	**0.33**
AZ Canal at 56th St.	**2.86**	**0.077**	**2.68**	**0.36**
AZ Canal - Inlet to 24th Street WTP				
AZ Canal - Central Avenue	**2.85**	**0.079**	**2.76**	**0.35**
AZ Canal - Inlet to Deer Valley WTP				
AZ Canal - Inlet to Glendale WTP	**2.92**	**0.077**	**2.63**	**0.37**
AZ Canal - Inlet to Greenway WTP	**2.08**	**0.025**	**1.19**	**0.51**
South Canal below CAP Cross-connect	**2.77**	**0.084**	**3.03**	**0.39**
South Canal at Val Vista WTP				
Head of the Tempe Canal				
Tempe Canal - Inlet to Tempe's South Plant				
Chandler WTP – Inlet				

Organics in Lakes

Table 4 - Reservoir Samples – December 06, 2010

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Lake Pleasant - nov 2010	Eplimnion	**3.10**	**0.06**	**1.83**	**0.33**
Lake Pleasant - nov 2010	Hypolimnion	**3.11**	**0.06**	**1.84**	**0.34**
Verde River @ Beeline		**2.70**	**0.076**	**2.81**	**0.28**
Bartlett Reservoir	Epilimnion	**3.71**	**0.098**	**2.65**	**0.63**
Bartlett Reservoir	Hypolimnion	**3.56**	**0.093**	**2.60**	**0.47**
Saguaro Lake	Epilimnion	**4.57**	**0.101**	**2.21**	**0.66**
Saguaro Lake	Epi - Duplicate	**4.70**	**0.105**	**2.23**	**0.49**
Saguaro Lake	Hypolimnion	**4.77**	**0.104**	**2.17**	**0.63**
Verde River at Tangle	Oct-10	**1.10**	**0.03**	**2.94**	**0.10**
Havasu	Nov-10	**2.48**	**0.041**	**1.66**	**0.66**

In-situ regeneration of Granular Activated Carbon (GAC)

This is a brief conceptual description of in-situ GAC regeneration for DOC removal (DBP control) and we look towards you for additional ideas.

Traditional GAC regeneration at WTPs involve the following steps:

- Removal of exhausted GAC using slurry transfer, vacuums, etc
- Beds are replaced with virgin or regenerated GAC
- Beds typically remain out of service for 3-4 weeks
- Typical attrition (loss of GAC) is ~ 10%
- On-site or off-site GAC regeneration involves hauling GAC and then thermal regeneration which is costly and produced greenhouse gases
- Regeneration is typically performed when GAC is fully exhausted
- Well suited for deep-bed GAC contactors, but logistically difficult for GAC filter caps because filters boxes were not designed for frequent media access/exchange

In-situ would involve a chemical treatment of GAC *within* the filter/packed beds. This would involve the following steps:

- Turn off filters from operation and isolate effluent flow
- Pass chemical treatments (see below) through bed
- Filter to waste to remove chemical treatment agents
- This could be done in < 8 hours without GAC removal
- Regeneration could be performed any time, and may not need to be conducted on completely exhausted GAC to be economically feasible.

Potential chemical treatments:

- We presented at our September workshop very preliminary data on Fentons reagent and iron nanoparticles produced from ferric chloride (plus hydrogen peroxide) – research on this continues
- Other chemical treatments could involve common drinking water oxidants: H2O2, KMnO4, ozone, ClO2, chloramines. There will be substantial demand by the sorbed organics and GAC itself.
- There may be other oxidants suitable for in-situ regeneration and we are looking to you for any suggestions…???

What is in the literature:

- UofA researchers looked at in-situ regeneration using Fentons Reagents for trace organics (VOCs) in contaminate groundwater (http://www.epa.gov/nrmrl/pubs/600r07008/600r07008.pdf)
- Hints that one could use bacteria to regenerate GAC are available (Putz, A.H., Losh, D.E., and Speitel, G.E., Jr., "Removal of Nonbiodegradable Chemicals from Mixtures during GAC Bioregeneration," Journal of Environmental Engineering, American Society of Civil Engineers, 131 (2): 196-205, 2005.)
- Nothing regarding regeneration to maintain DOC removal for DBP control