Regional Water Quality NEWSLETTER

DATE: Report for April 2009
Sampling conducted April 3 & 7 (lakes) 2009
A Phoenix, Tempe, Glendale, Peoria, CAP, SRP – ASU Regional Water Quality Partnership

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

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SUMMARY: EVALUATION AND RECOMMENDATIONS

1. T&O levels are low. Lakes are starting to stratify and we expect algae to be growing soon. The lakes are currently very clear (i.e., very little algae growth), and are actually among the clearest we have seen them in years.
2. We report on the emergence of "snails" affecting membrane water treatment plants.
3. Organic matter is moderately high in the canal system. We compare SEC-TOC organic matter characterization for 2 WTPs that treat water on the Colorado River. The results indicate good removal of higher molecular weight organics at one WTP, which would affect subsequent DBP formation.
4. We present data on EDC/PPCP occurrence at local WTPs, within the watershed and their removal by UV light during wastewater treatment.
5. Your ideas and suggestions for next month news items are invited – please email me.

Table 1 Summary of WTP Operations

	Verde WTP	Union Hills	24th Street WTP	N.Tempe J.G. Martinez	Deer Valley	Glendale Cholla WTP [3]	Peoria Greenway WTP	Val Vista	South Tempe
	Verde River	CAP Canal	Arizona Canal					South Canal	
PAC Type and Dose			Calgon WPH 15 ppm		Calgon WPH10 15 ppm				Hydro darco O 10 ppm
Copper Sulfate			None		None				None
PreOxidation			None		None				None
Alum Dose Alkalinity pH			50 136/112 6.85		46 6.9 86				22 128 7.8
Finished water DOC DOC removal[2]		2.1 mg/L 21%	2.8 mg/L 39%		3.1 mg/L 33%		3.5 mg/L 22%		3.9 mg/L 15%
Average turbidity over last 7 days			~10 NTU		9 NTU				10 NTU
Recommendations	Off line			Down from Jan 6 thru April 2		Down until April 15th		Down until April 15th	

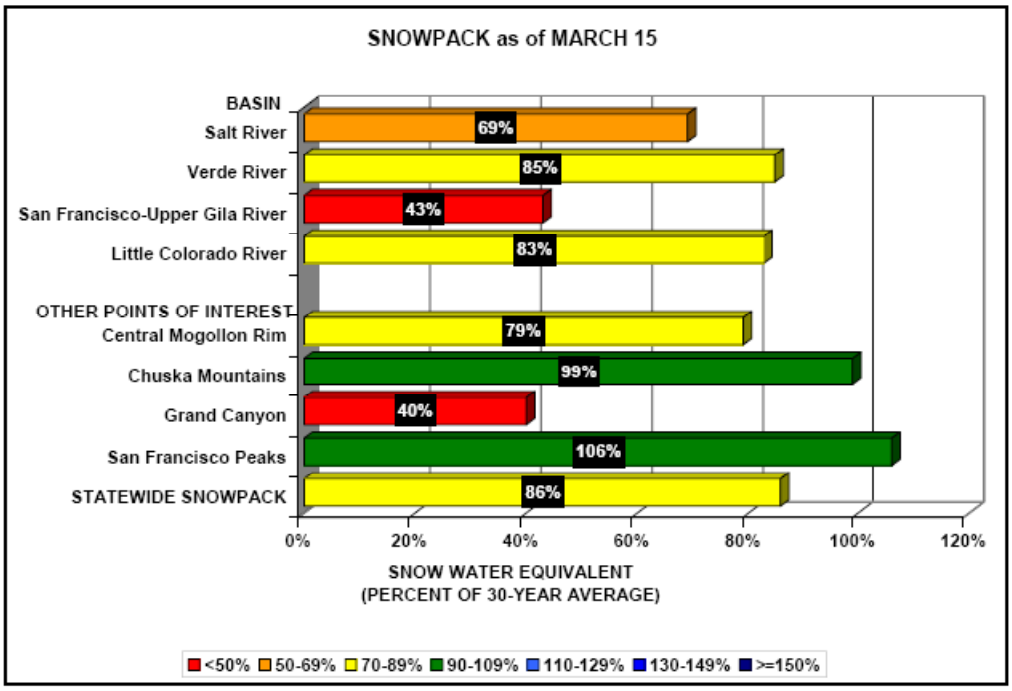
[1] Ferric chloride instead of alum; plus ppm sulfuric acid
[2] Calculated based upon influent and filtered water DOC (note that DOC – not TOC – is used in this calculation)
[3] Sample from finished water includes a blend of surface and ground water sources

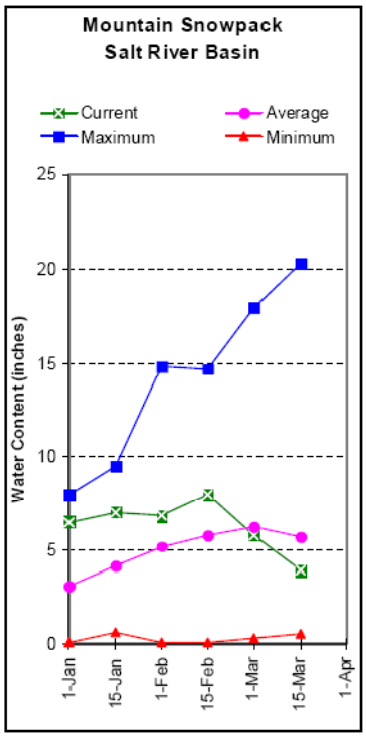
Table 1
SRP/CAP OPERATIONS - Values in cfs, for April 3, 2009

System	SRP Diversions	CAP
Arizona Canal	799	0
South Canal	559	0
Pumping	47	0
Total	1405	0

- **SRP is releasing water from both Verde and Salt River Systems**. Salt River release from Saguaro Lake: 1334 cfs; it is unusual to be releasing Salt River water this time of year. Verde River release from Bartlett Lake: 100 cfs. ***Water in the SRP is primarily from the Salt River*** *– historically we have Verde River water until mid-April.*
- **Flow over Granite Reef Dam**: 15 cfs (this is water being released into the Salt River and not the SRP canal system. This is being done because the Salt River reservoirs are >99% of full capacity.
- **The Verde River system** is at 73% of full capacity. Water is being released from Horseshoe Reservoir into Bartlett Lake to increase storage capacity of Horseshoe Lake should runoff or precipitation begin (Horseshoe Lake is at 47% capacity (49,000 acre-feet) – but this reservoir is significantly smaller than other SRP reservoirs)

While it is heating up in the valley – snow still exists in the watershed that will provide runoff for the next few months. The plots below show the snowpack levels and indicate we are slightly below the long-term 30 year average, but provides evidence that drought will not be a major issue this year for the valley
(ftp://ftp-fc.sc.egov.usda.gov/AZ/snow/basinoutlookrpts/2009/March15.pdf)





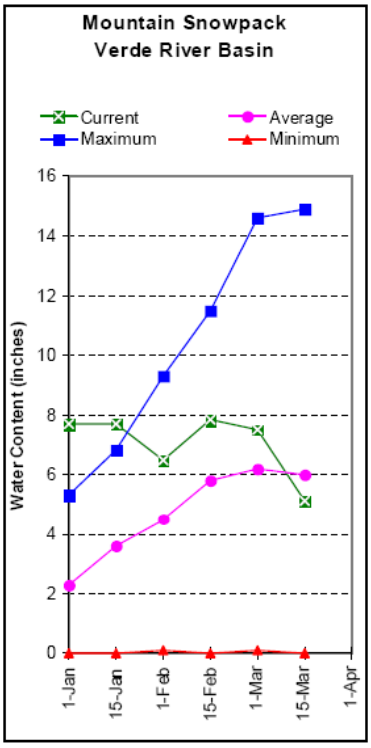


Table 2 - Water Treatment Plants – April 3, 2009

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
24th Street WTP Inlet	**2.5**	**2.5**	**<2.0**
24th Street WTP Treated	**<2.0**	**<2.0**	**<2.0**
Deer Valley Inlet	**2.1**	**2.6**	**<2.0**
Deer Valley WTP Treated	**2.4**	**2.1**	**<2.0**
Val Vista Inlet	**2.3**	**2.6**	**<2.0**
Val Vista WTP Treated –East			
Val Vista WTP Treated -West			
Union Hills Inlet	**<2.0**	**2.2**	**<2.0**
Union Hills Treated	**<2.0**	**2.2**	**<2.0**
Tempe North Inlet			
Tempe North Plant Treated			
Tempe South WTP	**2.1**	**2.1**	**<2.0**
Tempe South Plant Treated	**2.0**	**2.0**	**<2.0**
Greenway WTP Inlet	**<2.0**	**<2.0**	**<2.0**
Greenway WTP Treated	**<2.0**	**<2.0**	**<2.0**
Glendale WTP Inlet	**2.3**	**2.9**	**<2.0**
Glendale WTP Treated			
Glendale WTP Treated (Lab)			

Conclusion: Taste and odor levels are low, because MIB and geosmin are not noticeable in tap water until their concentrations exceed 10 ng/L.

Although not related to Taste and Odor – another biological organism is starting to cause problems in the valley.

Snails have been reported to be growing on drinking water membranes in Scottsdale and Anthem WTPs. The photo below is courtesy of Binga Talabi/Scottsdale and shows snails on the membranes. A separate attached presentation discusses the issues and potential control mechanisms. Our research team will begin thinking of ways to address this issue – but as new facilities are planning designs using membranes this issue should be seriously considered.

Table 3 - Canal Sampling – April 3, 2009

System	Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
CAP	Waddell Canal	<2.0	<2.0	<2.0
	Union Hills Inlet	<2.0	2.2	<2.0
	CAP Canal at Cross-connect			
AZ Canal	Salt River @ Blue Pt Bridge	<2.0	2.1	<2.0
	Verde River @ Beeline	3.5	3.3	<2.0
	AZ Canal above CAP Cross-connect	<2.0	2.6	<2.0
	AZ Canal below CAP Cross-connect	<2.0	<2.0	<2.0
	AZ Canal at Highway 87	<2.0	2.4	<2.0
	AZ Canal at Pima Rd.	<2.0	2.4	<2.0
	AZ Canal at 56th St.	2.3	2.5	<2.0
	AZ Canal - Inlet to 24th Street WTP	2.5	2.5	<2.0
	AZ Canal - Central Avenue	2.1	2.5	<2.0
	AZ Canal - Inlet to Deer Valley WTP	2.1	2.6	<2.0
	AZ Canal - Inlet to Glendale WTP	2.3	2.9	<2.0
South and Tempe Canals	South Canal below CAP Cross-connect	2.1	2.4	<2.0
	South Canal at Val Vista WTP	2.3	2.6	<2.0
	Head of the Tempe Canal	2.4	2.6	<2.0
	Tempe Canal - Inlet to Tempe's South Plant	2.1	2.1	<2.0

Table 4 - Reservoir Samples – April 7, 2009

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant	Eplimnion			
Lake Pleasant	Hypolimnion			
Verde River @ Beeline		3.5	3.3	<2.0
Bartlett Reservoir	Epilimnion	4.3	<2.0	<2.0
Bartlett Reservoir	Epi-near dock	3.9	2.2	<2.0
Bartlett Reservoir	Hypolimnion	<2.0	<2.0	<2.0
Salt River @ BluePt Bridge		<2.0	2.1	<2.0
Saguaro Lake	Epilimnion	<2.0	2.5	<2.0
Saguaro Lake	Epi - Duplicate	<2.0	2.6	<2.0
Saguaro Lake	Epi-near doc	<2.0	2.4	<2.0
Saguaro Lake	Hypolimnion	<2.0	2.1	<2.0
R20 (3/25/09)		<2.0	2.5	<2.0

Organic Matter Status In the Treatment Plants

Table 2 - Water Treatment Plants – April 03, 2009

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN	DOC removal (%)
24th Street WTP Inlet	4.57	0.109	2.38	0.44	
24th Street WTP Treated	2.78	0.042	1.49	0.32	39
Deer Valley Inlet	4.57	0.111	2.43	0.36	
Deer Valley WTP Treated	3.07	0.048	1.56	0.30	33
Val Vista Inlet	4.75	0.110	2.32	0.45	
Val Vista WTP Treated –East					
Val Vista WTP Treated -West					
Union Hills Inlet	2.65	0.039	1.47	0.80	
Union Hills Treated	2.08	0.019	0.93	0.73	21
Tempe North Inlet					
Tempe North Plant Treated					
Tempe South WTP	4.63	0.109	2.36	0.41	
Tempe South Plant Treated	3.91	0.072	1.84	0.37	15
Greenway WTP Inlet	4.43	0.109	2.46	0.37	
Greenway WTP Treated	3.45	0.026	0.76	0.34	22
Glendale WTP Inlet	4.65	0.110	2.37	0.37	
Glendale WTP Treated					

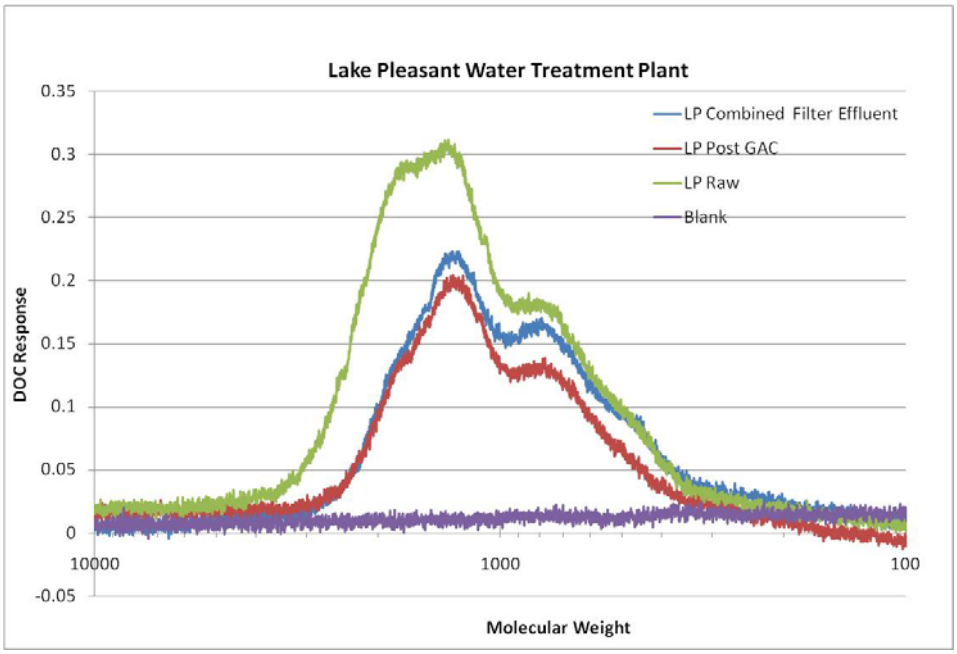
DOC = Dissolved organic carbon
UV254 = ultraviolet absorbance at 254 nm (an indicator of aromatic carbon content)
SUVA = UV254/DOC
TDN = Total dissolved nitrogen (mgN/L)

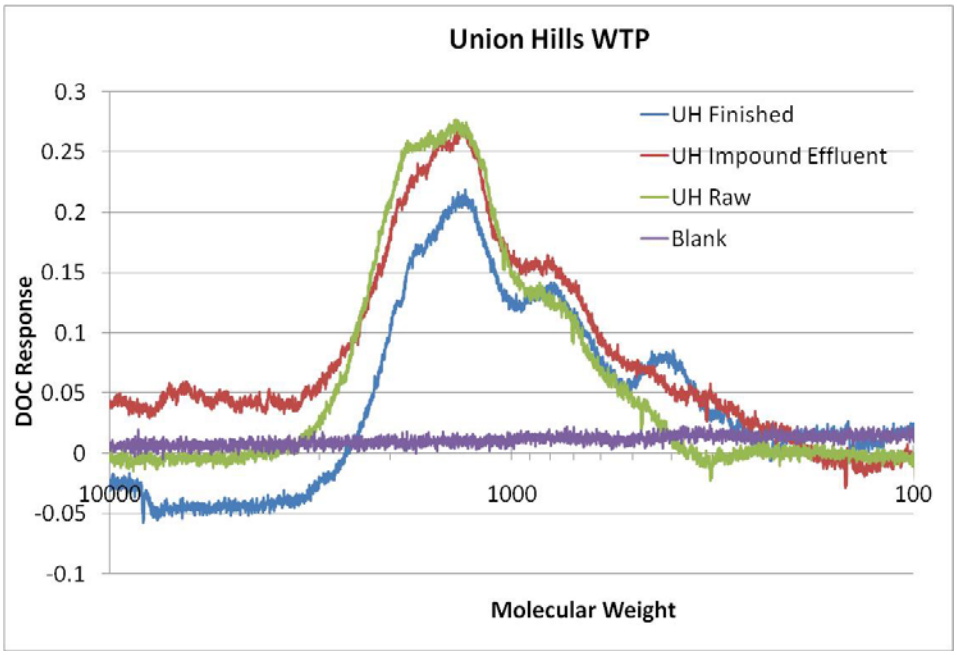
Organic Matter Status In the Canals

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Waddell Canal	2.65	0.039	1.48	0.75
Union Hills Inlet	2.65	0.039	1.47	0.80
CAP Canal at Cross-connect				
Salt River @ Blue Pt Bridge	4.80	0.113	2.35	0.50
Verde River @ Beeline	2.59	0.064	2.46	0.55
AZ Canal above CAP Cross-connect	4.74	0.109	2.29	0.48
AZ Canal below CAP Cross-connect	4.65	0.109	2.34	0.48
AZ Canal at Highway 87	4.56	0.108	2.36	0.46
AZ Canal at Pima Rd.	4.67	0.108	2.31	0.40
AZ Canal at 56th St.	4.49	0.107	2.39	0.46
AZ Canal - Inlet to 24th Street WTP	4.57	0.109	2.38	0.44
AZ Canal - Central Avenue	4.58	0.110	2.41	0.49
AZ Canal - Inlet to Deer Valley WTP	4.57	0.111	2.43	0.36
AZ Canal - Inlet to Glendale WTP	4.65	0.110	2.37	0.37
AZ Canal - Inlet to Greenway WTP	4.43	0.109	2.46	0.37
South Canal below CAP Cross-connect	4.66	0.109	2.34	0.47
South Canal at Val Vista WTP	4.75	0.110	2.32	0.45
Head of the Tempe Canal	4.69	0.109	2.32	0.44
Tempe Canal - Inlet to Tempe's South Plant	4.63	0.109	2.36	0.41
Chandler WTP – Inlet				

Lake samples are still being analyzed

Organic Matter Characterization – using Size Exclusion Chromatography with on-line dissolved organic carbon (SEC-DOC) detection. Last month City of Phoenix WTP staff asked us to compare DOC removal using SEC-DOC for their 2 water treatment plants that use Colorado River water (including Lake Pleasant water). The results are shown below. The raw waters (green) are very similar at the two plants, as expected. The GAC and other processes at the Lake Pleasant WTP does a very good job at preferentially removing higher molecular weight DOC (e.g., > 2000 daltons). The overall DOC removal at Lake Pleasant WTP is only slightly greater than at the Union Hills WTP (as represented by area under the curves).





Selected Sampling: EDC/PPCPs at Granite Reef Underground Storage Project (GRUSP)

The data indicate low levels of EDC/PPCPs in drinking water sources and finished drinking waters (WTP). We show data for finished wastewaters both before and after UV treatment to demonstrate that some compounds are oxidized even at UV dosages applied for microbial inactivation.

Sampling Time	Sample Name	Acetaminophen	Caffeine	Carbamazepine	Cotinine	DEET	Diazepam	Fluoxetine	Hydrocodone	
Dec 2008	CAP Canal @ 7th Street	0	40.3?	2	4	4	0	1	0	
Dec 2008	Verde River @ Beeline	1	3	1	1	7	0	1	0	
Dec 2008	Verde River @ Beeline (dup)	1	6	1	1	7	0	1	0	
Jan 2009	field blank	0	1	1	0	< 0	0	1	0	
Jan 2009	lab blank	0	0	1	< 0	< 0	0	0	0	
Jan 2009	CAP - Wadell Canal	0	7	2	4	3	0	1	0	
Jan 2009	WTP Influent	0	6	1	2	4	0	1	0	
Jan 2009	WTP eff (before Cl2)	0	10	1	2	3	0	0	0	
Jan 2009	WTP eff (post Cl2)	0	6	1	2	3	0	1	0	
Jan 2009	Verde River @ Beeline (dup)	0	6	1	1	2	0	1	0	
Jan 2009	Wastewater effluent	0	27	1110	6	211	3	262	38	
Jan 2009	wastewater effluent (post UV)	0	39	1270	23	189	3	181	15	

Sampling Time	Sample Name	Meprobamate	Pentoxify	Primidone	Oxybenzo	Sulfamethoxaz	Erythromyc	Trimethopri	Ibuprofen	Naproxen
Dec 2008	CAP Canal @ 7th Street	8	0	3	8	8	1	2	0	0
Dec 2008	Verde River @ Beeline	0	0	1	4	1	0	1	0	0
Dec 2008	Verde River @ Beeline (dup)	0	0	1	5	1	0	1	0	0
Jan 2009	field blank	0	0	0	4	1	1	0	0	0
Jan 2009	lab blank	0	0	0	4	1	1	1	0	0
Jan 2009	CAP - Wadell Canal	9	0	3	7	9	0	2	0	0
Jan 2009	WTP Influent	0	0	1	4	2	1	2	0	0
Jan 2009	WTP eff (before Cl2)	0	0	1	5	2	0	2	0	0
Jan 2009	WTP eff (post Cl2)	0	0	1	4	1	0	0	0	0
Jan 2009	Verde River @ Beeline (dup)	0	0	1	3	3	0	2	0	0
Jan 2009	Wastewater effluent	477	0	342	36	3430	86	222	0	19
Jan 2009	wastewater effluent (post UV)	450	0	216	30	1960	117	233	0	10

Sampling Time	Sample Name	Erythromycin	Trimetho	Ibuprofen	Naproxen	Dilantin	Triclosan	Diclofenac	TBBA	Suclralose
Dec 2008	CAP Canal @ 7th Street	1	2	0	0	6	2	0	0	714
Dec 2008	Verde River @ Beeline	0	1	0	0	0	0	0	0	0
Dec 2008	Verde River @ Beeline (dup)	0	1	0	0	1	0	0	0	128
Jan 2009	field blank	1	0	0	0	1	1	0	0	0
Jan 2009	lab blank	1	1	0	0	1	0	0	0	0
Jan 2009	CAP - Wadell Canal	0	2	0	0	1	0	0	0	< 0
Jan 2009	WTP Influent	1	2	0	0	1	0	0	0	< 0
Jan 2009	WTP eff (before Cl2)	0	2	0	0	0	0	0	0	0
Jan 2009	WTP eff (post Cl2)	0	0	0	0	2	3	7	0	0
Jan 2009	Verde River @ Beeline (dup)	0	2	0	0	3	3	0	0	42
Jan 2009	Wastewater effluent	86	222	0	19	228	50	274	0	34200
Jan 2009	wastewater effluent (post UV)	117	233	0	10	189	48	125	0	42900