Regional Water Quality NEWSLETTER

DATE: Report for January 2008
Sampling conducted January 7 & 8 2008

From the Phoenix, Tempe, 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. More rain around sampling time this month. A detailed accounting of runoff is presented.
2. MIB & geosmin levels are < 5 ng/L throughout the system, and illustrates how rapidly MIB and geosmin can degrade. It was only in September 2007 when geosmin concentrations were above 100 ng/L in Saguaro Lake.
3. Dissolved organic carbon concentrations are reported, and illustrates that runoff events (e.g., lower verde river) contain not only elevated turbidity but also elevated DOC.

Table 1 Summary of WTP Operations

	Verde WTP	Union Hills	24th Street WTP	N.Tempe J.G. Martinez	Deer Valley	Glendale Cholla WTP [3]	Val Vista	South Tempe	Chandler WTP
Location	**Verde River**	**CAP**	**Arizona Canal System**				**South Canal System**		
PAC Type and Dose	None	None	None	Off-line for maintenance and construction	Off-line during sampling	None	None	None	Off-line for construction
Copper Sulfate	None	None	None			None	None	None	
PreOxidation	Yes	None	None			2 ppm Cl2	1 ppm Cl2	None	
Alum Dose Alkalinity pH	75 80-180 7.6-8.0	6.8 [1] 133/124 8.0	40 181/161 7.4			21 160 7.5	43 164 7.8	30 168 8.4	
Finished water DOC DOC removal[2]									
WTP plant comments						Plant off-line starting Jan 8th thru Jan 23rd			
Recommendations									

[1] Ferric chloride instead of alum
[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

Northside dry-up details (Saturday, Jan. 5 through Monday, Feb. 3, 2008)

Portions of the Arizona, Grand and Crosscut canals on the north side of the Salt River will be drained for annual maintenance and construction activities. Many of Salt River Project's northside irrigation customers will not receive water from the canals during the dry-up.

The affected areas include Scottsdale, Paradise Valley, Phoenix, Glendale, Peoria and north Tempe.

During this dry-up, weed-eating white amur fish that are used to control aquatic vegetation in the canals will be relocated to other areas of the canal system. The herding and relocation of the fish will be conducted during the first few days of the dry-up schedule, starting Saturday morning. SRP now utilizes white amurs throughout its 131-mile Valley canal system.

Rainfall causes challenges for water treatment

1. Rain falls and causes runoff

Rain gauges at the SRP operated reservoirs reported 0.4 to 0.76 inches of rain from the last storms (see table)

Table – Summary of daily precipitation amounts (inches)

Location	1/6/08	1/7/08	1/8/08	total
Salt River System				
Roosevelt Lake	0.46	0.30	0	0.76
Saguaro Lake	0.21	0.12	0	0.33
Verde River System				
Horseshoe Lake	0.24	0.24	0	0.48
Bartlett Lake	0.14	0.19	0	0.43

SRP reduced the release rate of water from Bartlett Lake once it started to rain (Figure 1) because runoff enters the Verde River downstream of the reservoir by draining the Rio Verde area and Sycamore Creek (Figures 2 and 3). While only 100 cfs was being released from Bartlett Lake, flow in the Verde River near Scottsdale/Fountain Hills peaked at over 3000 cfs.

Figure 1

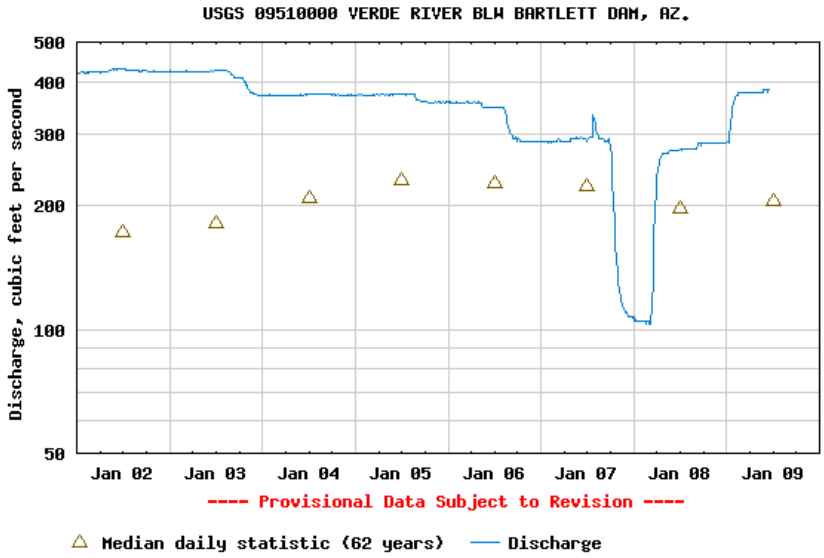


Figure 2

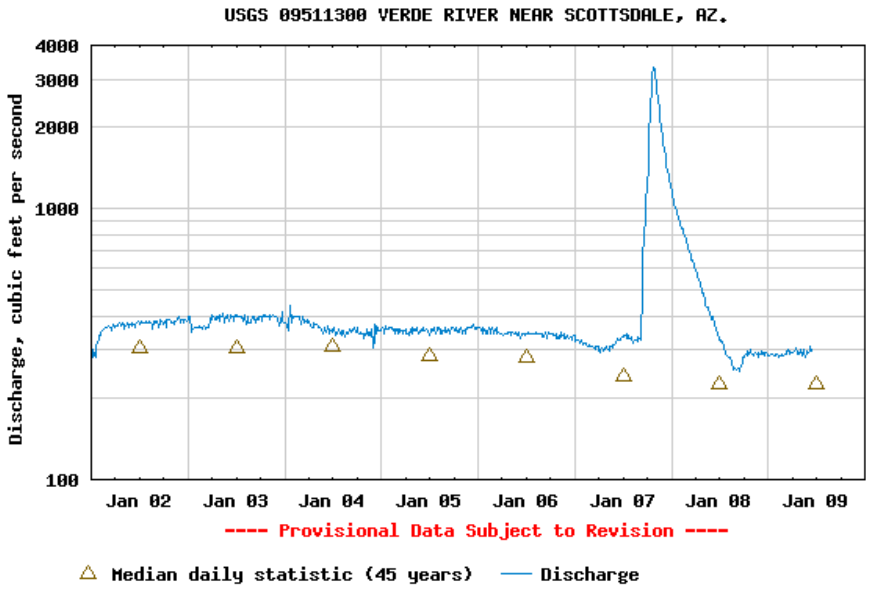
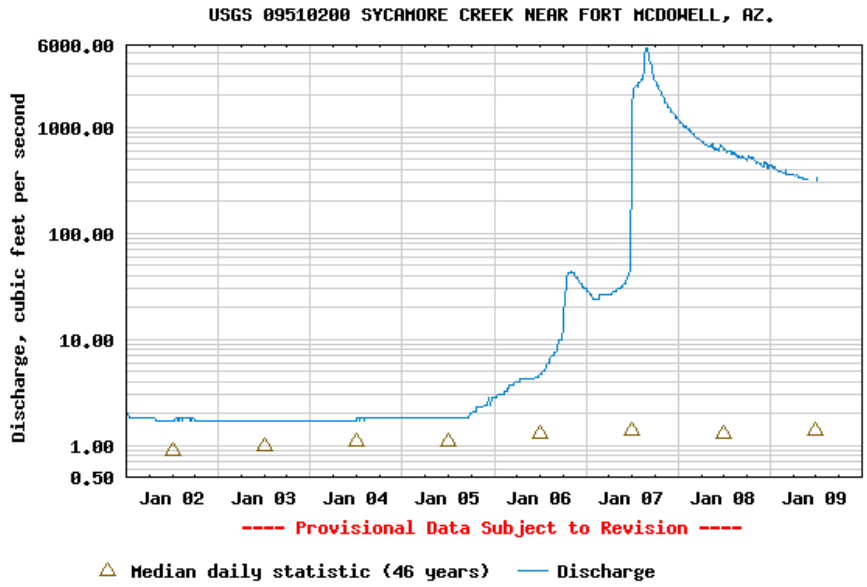
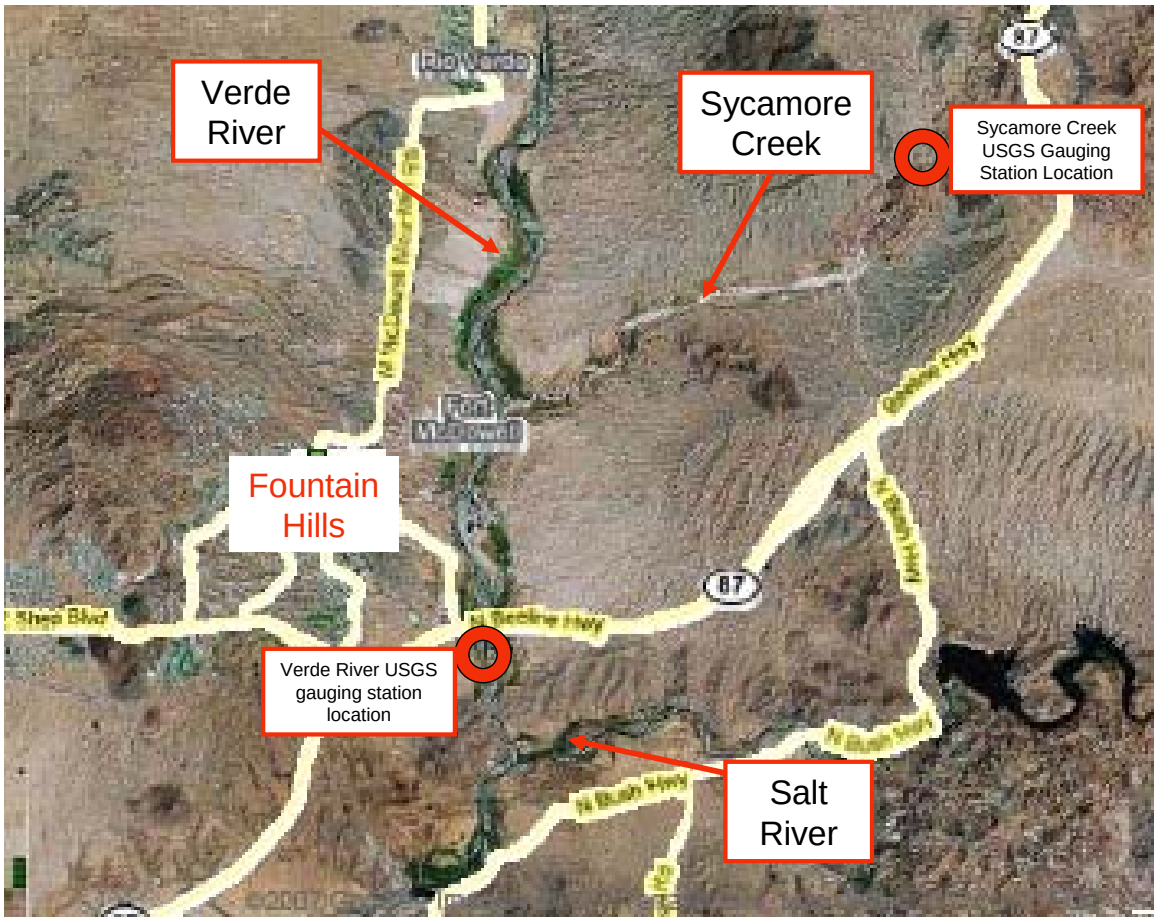


Figure 3 – some of this will infiltrate in a floodplan before reaching the Verde River

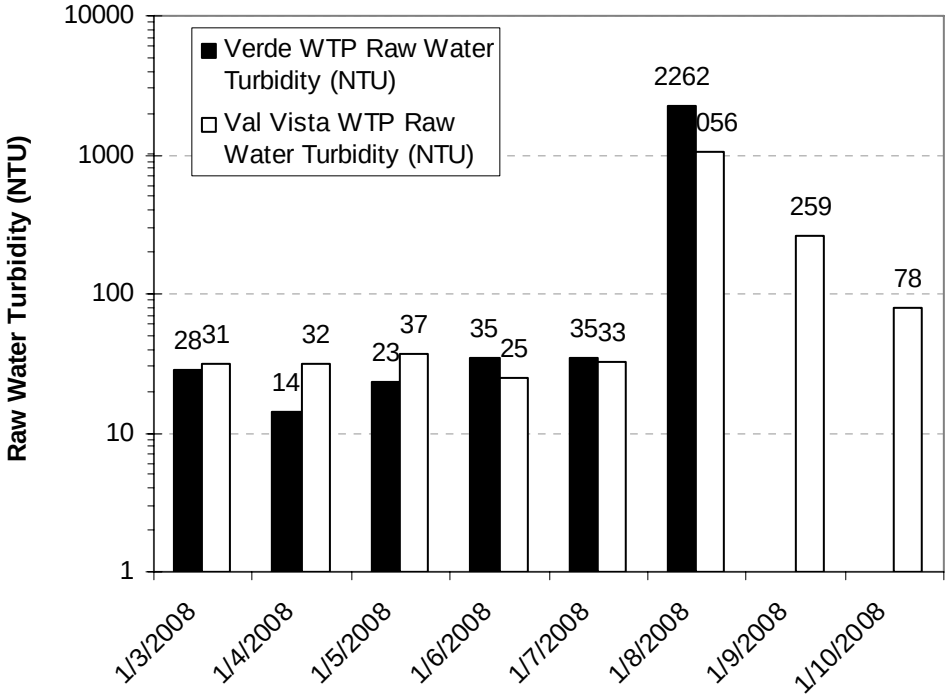




Locations of key features in lower Verde River drainage

2. Runoff carries turbidity

Flows in Sycamore creek are very turbid, and this can be a major source of turbidity, along with other inlets to the lower Verde River. The Verde WTP, located on the Verde River below Fountain Hills, operated by City of Phoenix is among the first WTPs to experience turbidity events after/during rain events. Figure 4 summarizes turbidity data for the Verde WTP (on the Verde River) and Val Vista WTP (on SRP South Canal) for several days before and during the storm. The maximum turbidities were 2262 and 1056 NTU at the Verde and Val Vista WTPs, respectively.



Other on the SRP system did not report high turbidities through Jan 8th, because the "pulse" had not yet reached their facilities which are located further downstream on the canal systems. All raw water turbidity values were below 1.3 NTU at the Union Hills WTP, which is on the CAP canal system.

3. Runoff leads to rapid changes in other water quality

In addition to causing high turbidity, WTPs experience rapid changes in pH and alkalinity during runoff events. In one day for some WTPs alkalinity varied between 80 and nearly 190 mg/L CaCO3. This causes significant challenges to alum dosing. The table below summarizes these significant and rapid changes in water quality for just one WTP:

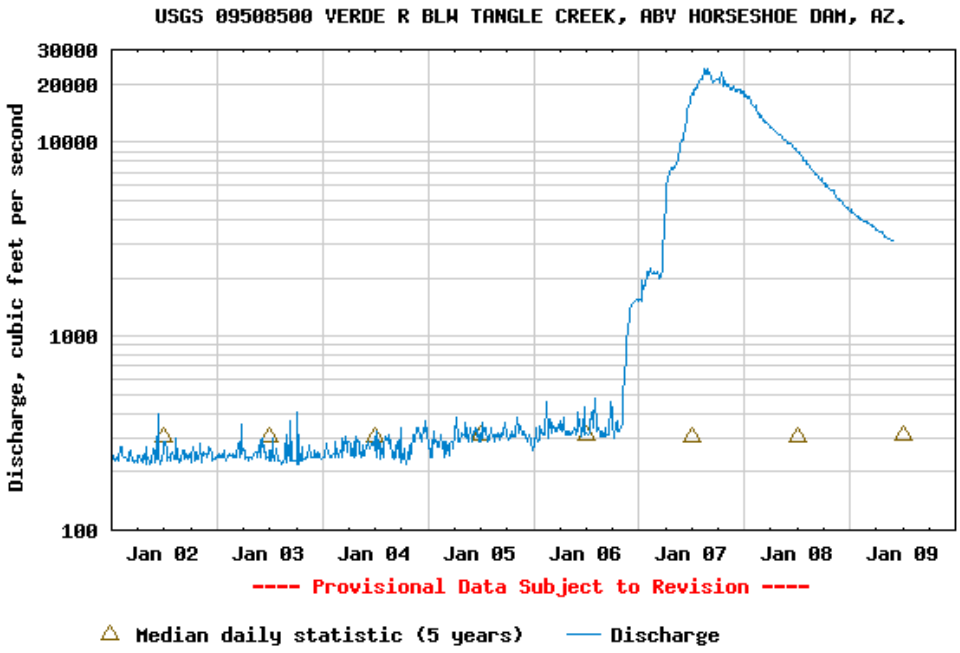
Coagulation:

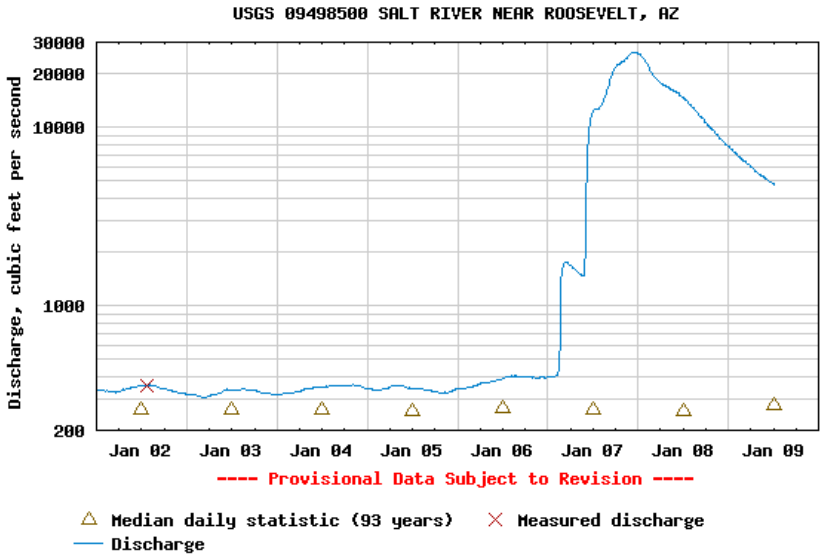
Date	Alum	Alkalinity	pH during Coagulation	Raw NTU
January 7, 2008	43	164	7.8	32.5
January 8, 2008	128	162	7.8	1056.2
January 9, 2008	70	190	7.3	259
January 10, 2008	65	110	7.5	78

4. Rain is good though because it fills reservoirs

Obviously without rain now, we would have less during the summer. The following graphs show that significant inflows have occurred in the Verde River, Salt River and to a lesser extent Aqua Fria River (flows into Lake Pleasant). As a result the reservoirs storage volume has increased over the past month, as summarized in the Table below:

System	December 13, 2007	January 13, 2008
Salt River Reservoirs	58% capacity (1.18 million acre-feet)	65% (1.32 million acre-feet)
Verde River Reservoirs	51% (0.15 million acre-feet)	70% (0.20 million acre-feet)




USGS 09498500 SALT RIVER NEAR ROOSEVELT, AZ
Discharge, cubic feet per second
30000
20000
10000
1000
200
Jan 02
Jan 03
Jan 04
Jan 05
Jan 06
Jan 07
Jan 08
Jan 09
---- Provisional Data Subject to Revision ----
Median daily statistic (93 years)
Measured discharge
Discharge

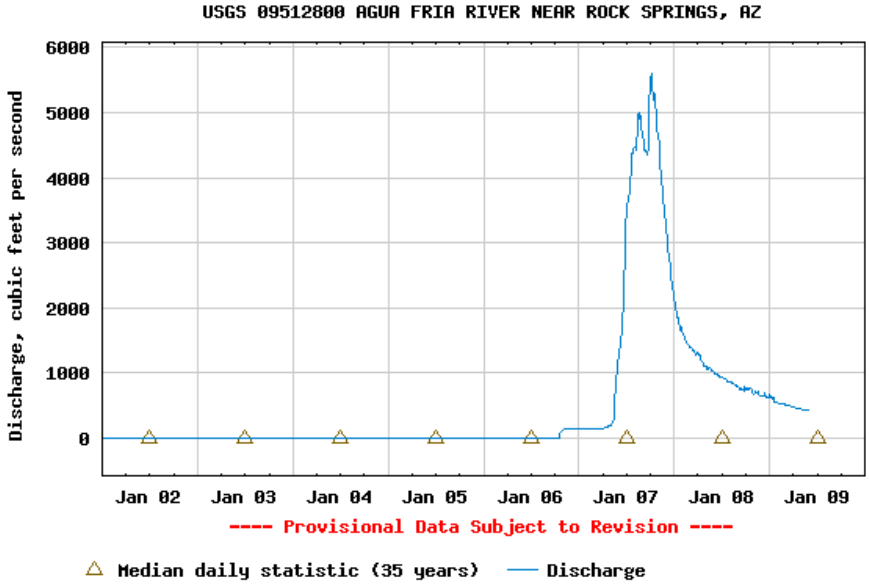

USGS 09512800 AGUA FRIA RIVER NEAR ROCK SPRINGS, AZ
Discharge, cubic feet per second
6000
5000
4000
3000
2000
1000
0
Jan 02
Jan 03
Jan 04
Jan 05
Jan 06
Jan 07
Jan 08
Jan 09
---- Provisional Data Subject to Revision ----
Median daily statistic (35 years)
Discharge

Table 2 - Water Treatment Plants – January 7, 2008

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

Table 3 - Canal Sampling – January 7, 2007

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	2.1	<2.0
	CAP Canal at Cross-connect	<2.0	<2.0	<2.0
AZ Canal	Salt River @ Blue Pt Bridge	3.0	<2.0	<2.0
	Verde River @ Beeline	2.3	2.4	<2.0
	AZ Canal above CAP Cross-connect			
	AZ Canal below CAP Cross-connect	<2.0	<2.0	<2.0
	AZ Canal at Highway 87			
	AZ Canal at Pima Rd.	<2.0	2.0	<2.0
	AZ Canal at 56th St.	<2.0	<2.0	<2.0
	AZ Canal - Inlet to 24th Street WTP	<2.0	<2.0	<2.0
	AZ Canal - Central Avenue	<2.0	<2.0	<2.0
	AZ Canal - Inlet to Deer Valley WTP	<2.0	<2.0	<2.0
	AZ Canal - Inlet to Glendale WTP	<2.0	<2.0	<2.0
South and Tempe Canals	South Canal below CAP Cross-connect	<2.0	<2.0	<2.0
	South Canal at Val Vista WTP	<2.0	<2.0	<2.0
	Head of the Tempe Canal	<2.0	<2.0	<2.0
	Tempe Canal - Inlet to Tempe's South Plant	<2.0	<2.0	<2.0
	Chandler WTP – Inlet			

Table 4 - Reservoir Samples – January 8, 2008

Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant	Eplimnion			
Lake Pleasant	Hypolimnio			
Verde River @ Beeline		**2.3**	**2.4**	**<2.0**
Bartlett Reservoir	Epilimnion			
Bartlett Reservoir	Epi-near dock			
Bartlett Reservoir	Hypolimnio			
Salt River @ BluePt Bridge		**3.0**	**<2.0**	**<2.0**
Saguaro Lake	Epilimnion	**<2.0**	**<2.0**	**<2.0**
Saguaro Lake	Epi - Duplicate	**<2.0**	**<2.0**	**<2.0**
Saguaro Lake	Epi-near doc	**<2.0**	**<2.0**	**<2.0**
Saguaro Lake	Hypolimnio	**<2.0**	**2.2**	**<2.0**
Verde River at Tangle				
Havasu				

Table 5 - SRP/CAP OPERATIONS

Values in cfs, for January 7, 2008

System	SRP Diversions	CAP
Arizona Canal	78	70
South Canal	270	26
Pumping	115	0
Total	463	96

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: 242 cfs.

Table 6 - Water Treatment Plants – January 07, 2008

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN	DOC removal (%)
24th Street WTP Inlet	4.83	0.163	3.4	1.042	
24th Street WTP Treated	3.99	0.096	2.4	1.012	17
Deer Valley Inlet	3.98	0.107	2.7	0.706	
Deer Valley WTP Treated					
Val Vista Inlet	4.35	0.158	3.63	1.217	
Val Vista WTP Treated –East	3.12	0.067	2.15	1.169	28
Val Vista WTP Treated -West					
Union Hills Inlet	2.73	0.037	1.36	0.695	
Union Hills Treated	2.34	0.019	0.81	0.696	14
Tempe North Inlet					
Tempe North Plant Treated					
Tempe South WTP	3.47	0.104	3.00	1.327	
Tempe South Plant Treated	3.07	0.085	2.77	1.199	12
Chandler WTP Inlet					
Chandler WTP Treated					
Glendale WTP Inlet	3.84	0.100	2.6	0.806	
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)

Table 7 - Canal Sampling – January 7, 2008

System	Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
CAP	Waddell Canal	2.63	0.037	1.4	0.606
	Union Hills Inlet	2.73	0.037	1.36	0.695
	CAP Canal at Cross-connect	2.63	0.036	1.37	0.595
AZ Canal	Salt River @ Blue Pt Bridge	3.81	0.083	2.18	0.317
	Verde River @ Beeline	5.76	0.256	4.44	2.317
	AZ Canal above CAP Cross-connect				
	AZ Canal below CAP Cross-connect	2.81	0.036	1.28	0.612
	AZ Canal at Highway 87				
	AZ Canal at Pima Rd.	5.05	0.162	3.21	2.780
	AZ Canal at 56th St.	4.88	0.172	3.52	1.398
	AZ Canal - Inlet to 24th Street WTP	4.83	0.163	3.37	1.042
	AZ Canal - Central Avenue	5.15	0.162	3.15	1.036
	AZ Canal - Inlet to Deer Valley WTP	3.98	0.107	2.69	0.706
	AZ Canal - Inlet to Glendale WTP	3.84	0.100	2.60	0.806
South and Tempe Canals	South Canal below CAP Cross-connect	4.40	0.164	3.73	1.295
	South Canal at Val Vista WTP	4.35	0.158	3.63	1.217
	Head of the Tempe Canal	2.53	0.085	3.36	1.024
	Tempe Canal - Inlet to Tempe's South Plant	3.47	0.104	3.00	1.327
	Chandler WTP – Inlet				

Table 8 - Reservoir Samples – January 7, 2008

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Lake Pleasant	Eplimnion	2.66	0.039	1.47	1.006
Lake Pleasant	Hypolimnion	2.95	0.041	1.39	1.119
Verde River @ Beeline		5.76	0.256	4.44	2.317
Bartlett Reservoir	Epilimnion	Road was flooded and we could not access reservoir			
Bartlett Reservoir	Epi-near dock				
Bartlett Reservoir	Hypolimnion				
Salt River @ BluePt Bridge		3.81	0.083	2.18	0.317
Saguaro Lake	Epilimnion	5.85	0.112	1.91	0.412
Saguaro Lake	Epi - Duplicate	5.94	0.113	1.90	0.310
Saguaro Lake	Epi-near doc				
Saguaro Lake	Hypolimnion	5.58	0.112	2.01	0.266
Verde River at Tangle					
Havasu		2.51	0.035	1.39	1.005