REGIONAL WATER QUALITY NEWSLETTER

DATE: Report for July 2010 Sampling conducted June 28-29, 2010

A Phoenix, Tempe, Glendale, Peoria, CAP, SRP – ASU Regional Water Quality Partnership

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

DISTRIBUTION: Ronald.Feathers@chandleraz.gov; ACTarvers@FTMCDOWELL.ORG; mary.reker@phoenix.gov; knghiem@csaei.com; Kandis.Knight@asu.edu; gary_moore@tempe.gov; sandra_dewittie@tempe.gov; kspooner@citlink.net; bardizzone@carollo.com; wtrask@mwdh2o.com; jnafsey@mwdh2o.com; JJWilliams@GLENDALEAZ.com; raghunatha.komaragiri@phoenix.gov; mxerxis@scottsdaleaz.gov; mnguyen@ndep.nv.gov; RussellGRhodes@MissouriState.edu; paul.kinshella@phoenix.gov; brian.fayle@phoenix.gov; paul.zelenka@phoenix.gov; patricia.puryear@phoenix.gov; Wontae.Lee@hdrinc.com; Pedram.Shafieian@asu.edu; Daisuke.Minakata@asu.edu; Billt@gilbert.az.us; Braden.Allenby@asu.edu; Rittmann@asu.edu; Jeffrey.Stuck@amwater.com; nina.miller@amwater.com; wayne.janis@asu.edu; jim.holway@asu.edu; gober@asu.edu; rscott@glendaleaz.com; safischer@fs.fed.us; aimee.conroy@phoenix.gov; alan.martindale@cityofmesa.org; allison.shepherd@phoenix.gov; antoniot@ci.gilbert.az.us; arrw716@earthlink.net; awirtz@fs.fed.us; bakerenv@earthlink.net; bardizzone@carollo.com; bhenning@cap-az.com; btalabi@scottsdaleaz.gov; bkmoorhe@srpnet.com; BobCarlson@scwater.com; bonnie.smith@phoenix.gov; Bradley_fuller@tempe.gov; brian.fayle@phoenix.gov; brian.k.watson@phoenix.gov; carl.meyer@phoenix.gov; carlos.padilla@phoenix.gov; cseidel@dswa.net; chennemann@carollo.com; chris.rounseville@phoenix.gov; christenson.kara@epa.gov; cwilson@scottsdaleaz.gov; D'Ann.O'Bannon@phoenix.gov; diwanski@goodyearaz.gov; dempster@asu.edu; dlopez@fs.fed.us; drcrosby@cap-az.com; dwalker@Ag.arizona.edu; dxprigge@srpnet.com; edna.bienz@phoenix.gov; erin.pysell@phoenix.gov; mario_esparza_soto@hotmail.com; francisco.gonzalez@phoenix.gov; frank.blanco@phoenix.gov; gjloomis@fs.fed.us; GMaseeh@PIRNIE.COM; Gregg.Elliott@srpnet.com; goelliot@srpnet.com; grant_osburn@tempe.gov; Greg.Ramon@Phoenix.Gov; gtday@amwater.com; GThelin@carollo.com; guy.carpenter@hdrinc.com; huqiang@asu.edu; jdoller@carollo.com; jeffrey.van.hoy@phoenix.gov; jennifer.calles@phoenix.gov; jjwilliams@glendaleaz.com; josh_berdeaux@msn.com; kremmel@ci.glendale.az.us; laxman.devkota@phoenix.gov; lroberts@buckeyeaz.gov; luis.manriquez@phoenix.gov; Marisa.Masles@asu.edu; mark.roye@phoenix.gov; matthew.rexing@cityofmesa.org; maureen.hymel@phoenix.gov; mdehaan@dswa.net; Mdew1@mail.ci.tucson.az.us; mhelton@scottsdaleaz.gov; Michael_Bershad@tempe.gov; Milton.Sommerfeld@asu.edu; MURPHYSP@wattsind.com; nicoleta.buliga@phoenix.gov; ANUNEZ@SCOTTSDALEAZ.GOV; paul.burchfield@phoenix.gov; paulwestcott@appliedbiochemists.com; pdent@cap-az.com; pfenner@fs.fed.us; Randy.Gottler@phoenix.gov; raymond.schultz@phoenix.gov; robert_eck@ci.mesa.az.us; ron.jennings@phoenix.gov; rsgooch@srpnet.com; rscott@glendaleaz.com; rcarpenter@glendaleaz.com; sgrendahl@SCOTTSDALEAZ.GOV; shan.miller@phoenix.gov; sherman_mccutcheon@tempe.gov; SRot@ci.glendale.az.us; srottas@cap-az.com; sacquafredda@dswa.net; steven.schoen@phoenix.gov; susan.potter@phoenix.gov; tara_ford@tempe.gov; terrance.piekarz@phoenix.gov; tgillogly@carollo.com; THockett@GLENDALEAZ.com; thomas.martin@phoenix.gov; thomasdempster@hotmail.com; tjeffer1@ci.tucson.az.us; tkacerek@cap-az.com; tom.doyle@phoenix.gov; Tom_Hartman@tempe.gov; troy.hayes@phoenix.gov; vlee@carollo.com; waerma@bv.com; walid.alsmadi@phoenix.gov; warrens@sgm-inc.com; wes.taylor@phoenix.gov; wtaylor@mwdh2o.com; William.Hughes@cityofmesa.org; swilson@scottsdaleaz.gov; yu.chu.hsu@phoenix.gov; Yongsheng.Chen@asu.edu; keli@asu.edu; jcritt@asu.edu; uiyer@glendaleaz.com; Michael.Helton@amwater.com; Keith.Greenberg@amwater.com; harry.brown@AMwater.com; mnguyen@ndep.nv.gov; bzachman@dswa.net; hdurbin@dswa.net;paul.zelenka@phoenix.gov; agrochowski@cap-az.com; bradley_fuller@tempe.gov; JBryck@PIRNIE.COM; Susanne.Neuer@asu.edu; Mohan.Seetharam@asu.edu; Chao-An.Chiu@asu.edu; tammy.perkins@phoenix.gov; ZChowdhury@PIRNIE.COM; Shari.Lange@phoenix.gov; nmegonnell@calgoncarbon-us.com; Cynthia.Bain@peoriaaz.gov; Ryan.Rhoades@CH2M.com; jim.kudlinski@srpnet.com; Gambatese.Jason@epamail.epa.gov; charolotte.jones@phoenix.gov; Graham.Symmonds@gwresources.com; scott.lee@gwresources.com; dswilliams@dswa.net; kowolf@srpnet.com; allison.shepherd@phoenix.gov; grant_osburn@tempe.gov; michael_bershad@tempe.gov; thomas.martin@phoenix.gov; carl.meyer@phoenix.gov; ben.hill@phoenix.gov; Ray.Schultz@phoenix.gov; *mdhubble@srpnet.com;* paul.zelenka@phoenix.gov; tom.doyle@phoenix.gov; bradley_fuller@tempe.gov; RScott@GLENDALEAZ.com; chris.rounseville@phoenix.gov; Norman_Clark@tempe.gov; steve.lutringer@amwater.com; kmckinne@amwater.com; anupa.jain@chandleraz.gov; chris.kincaid@chandleraz.gov; larry.duffy@chandleraz.gov; lori.mccallum@chandleraz.gov; nancy.milan@chandleraz.gov; robert.goff@chandleraz.gov; victoria.sharp@chandleraz.gov; wendy.chambers@chandleraz.gov; wes.cannon@chandleraz.gov; JJWilliams@GLENDALEAZ.com; mgross@carollo.com; JYoung@mail.maricopa.gov; kim.eberenz@gwresources.com; CHe@carollo.com; PChao@carollo.com; Tom.Sands@srpnet.com; jamohler@asu.edu; John.Woolschlager@asu.edu; Craig_Caggiano@tempe.gov; kobrickjd@cdm.com; Calkins.John@azdeq.gov; ekaupanger@mail.maricopa.gov; CMeyer@carollo.com; AnnDenise.Taylor@SRPMIC-nsn.gov; greg.robinson@phoenix.gov; lsjohnso@srpnet.com; ; gnbrusse@srpnet.com; Pierre.Herckes@asu.edu; Rolf.Halden@asu.edu; aramarui@dswa.net; macler.bruce@epa.gov; Amy.Miguel@srpmic-nsn.gov; meyerdw@bv.com; greg.ramon@phoenix.gov; yuchu.hsu@phoenix.gov; rwyatt@glendaleaz.com; pete@kroopnick.com; brooke.mayer@asu.edu; tony.mardam@hdrinc.com; Philip_Brown@Tempe.gov; paul.mally@amwater.com; michael.kennedy@mesaaz.gov; terri.baack@phoenix.gov; landrews@glendaleaz.com; cynthia.seelhammer@phoenix.gov; catherine.webster@phoenix.gov; mshapiro@cap-az.com; jperkins@scottsdaleaz.gov; melinda.jacobson@phoenix.gov; bpaulson@scottsdaleaz.gov; dhenderson@scottsdaleaz.gov; mboettcher@sottsdaleaz.gov; cwhitmer@sottsdaleaz.gov; susan.kinkade@phoenix.gov ; LPassantino@PIRNIE.COM; jshaw@pirnie.com; norman_clark@tempe.gov; kris.erickson@phoenix.gov; Gregory.Dehmlow@peoriaaz.gov; neal.megonnell@jacobi.net; Gregory.Dehmlow@peoriaaz.gov; wof@cox.net; clingerrc@cdm.com; Daniel.Candelaria@CH2M.com; bhg@azdeq.gov; Kim.Caggiano@mesaaz.gov; alan.martindale@mesaaz.gov; matthew.rexing@mesaaz.gov; mary_reker@hotmail.com; michelled@wwengineers.com; Dan.Quintanar@tucsonaz.gov; ALutringer@GLENDALEAZ.com; cbrown@usbr.gov; nicholas.silides@mesaaz.gov; brian.biesemeyer@peoriaaz.gov; Linda.Bezy-Botma@peoriaaz.gov; jamie.ashby@srpnet.com; Raymond.Schultz@peoriaaz.gov; chassert@scottsdaleaz.gov; gcarpenter@carollo.com; CharlotteSmith.us@gmail.com; aghosh@dswa.net; tyler.sawyer@asu.edu; cmitchell@scottsdaleaz.gov; hilary.hartline@phoenix.gov

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, but levels are rapidly increasing in the reservoirs. Saguaro Lake has 20 to 50 ng/L of MIB.
2. Our next WORKSHOP for our regional water quality project (September 17, 2010: 830am – 11am; Phoenix City Hall Assembly Room A/B) – feel free to suggest topics you want to hear about. Please RSVP if you plan to attend by September 1st to p.westerhoff@asu.edu
3. Using smaller diameter Powder Activated Carbon may remove THM precursors and T&O compounds more effectively.
4. It may be less expensive for utilities to purchase alternative water supplies from SRP to reduce chemical operating costs to meet summertime THM levels.

Table 1a Summary of WTP Operations February 1, 2010

	Verde WTP	Union Hills	24^{th} Street WTP	N.Tempe J.G. Martinez	Deer Valley	Glendale Cholla WTP [3]	Peoria Greenway WTP	Val Vista	South Tempe	Chandler WTP
	Verde River	CAP Canal	Arizona Canal					South Canal		
PAC Type and Dose	None	None	25 ppm Calgon WPH	Aqua Nuchar 16 ppm		None			MeadWest Vaco 20 ppm	None
Copper Sulfate	1.5 ppm	None	0.3 ppm	None		None			None	None
PreOxidation	none	0.4 ppm chlorine	none	None		1.5 ppm chlorine			None	None
Alum Dose Alkalinity pH	32 ppm 142/124 6.9	8 ppm [1] 123 7.2	60 ppm 141/119 6.85	45 138 7.4		20 ppm 142 6.8			40 ppm 120 7.4	36 ppm 140 7.5
Finished water DOC DOC removal[2]		2.7 mg/L 20%	1.8 59%	2.7 mg/L 38%	2.4 mg/L 47%	2.8 mg/L 38%	3.2 mg/L 28%	2.1 50%	2.3 mg/L 39%	
Average turbidity over last 7 days	6 ntu	0.6 ntu	4-10 ntu	4-9 ntu		9.9 ntu			4 ntu	6 ntu
Notes from operators	On the CAP Canal – several comments of off-odors have been reported **We have occasionally noticed some odors at raw water. We continue to see large amounts of dead algae, and have had excessive dead Asian clams at our canal intake.**									

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

24^{th} street WTP plans to switch to ferric chloride sometime in the spring of 2011

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

System	SRP Diversions	CAP
Arizona Canal	641	0
South Canal	528	0
Pumping	76	0
Total	1245	0

- **SRP is releasing water from both Verde and Salt River Systems**. Salt River release from Saguaro Lake: 516 cfs; Verde River release from Bartlett Lake: 700 cfs.
- **SRP reservoirs are 92% 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:	971 cfs (Hassayampa pump station)
Flow from Lake Pleasant into CAP canal:	1225 cfs
Lake Pleasant Capacity	65% full

CAP plans to stop releases from Lake Pleasant on September 4, 2010 and use 100% Colorado River Water. This is being done to minimize the risk of elevated T&O levels which seasonally occur in Lake Pleasant from being released into the CAP canal and WTPs located along the canal.

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 below 10 ng/L in the canals, but levels are rapidly increasing in the reservoirs.

Table 2 - Water Treatment Plants – August 2, 2010

Sample Description	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
24th Street WTP Inlet	5.5	9.2	11.2
24th Street WTP Treated	<2.0	<2.0	<2.0
Deer Valley Inlet	4.3	9.7	3.9
Deer Valley WTP Treated	<2.0	3.8	2.2
Val Vista Inlet	4.2	3.9	2.3
Val Vista WTP Treated –East	2.9	2.2	3.1
Val Vista WTP Treated -West	<2.0	<2.0	2.1
Union Hills Inlet	<2	<2	<2
Union Hills Treated	<2.0	<2.0	<2.0
Tempe North Inlet	4.3	5.7	5.3
Tempe North Plant Treated	3.1	4.1	<2.0
Tempe South WTP	<2.0	3.0	<2.0
Tempe South Plant Treated	<2.0	<2.0	<2.0
Greenway WTP Inlet	11.0	3.6	<2.0
Greenway WTP Treated	4.3	6.0	5.6
Glendale WTP Inlet	4.9	8.6	5.2
Glendale WTP Treated	<2.0	<2.0	<2.0

The highest T&O levels are at Greenway WTP, located on the SRP Arizona Canal. They use ozonation and GAC-filter caps to treat the water.

Table 3 - Canal Sampling – August 2, 2010				
System	Sample Description			
CAP	Waddell Canal	<2.0	<2.0	<2.0
	CAP Canal at Cross-connect	<2.0	<2.0	<2.0
	Salt River @ Blue Pt Bridge	10.4	5.1	5.8
	Verde River @ Beeline	<2.0	3.3	3.7
AZ	AZ Canal above CAP Cross-connect			
Canal	AZ Canal below CAP Cross-connect	3.7	4.1	8.5
	AZ Canal at Highway 87	3.7	4.2	3.4
	AZ Canal at Pima Rd.			
	AZ Canal at 56th St.	5.0	5.2	2.6
	AZ Canal - Inlet to 24th Street WTP	5.5	9.2	11.2
	AZ Canal - Central Avenue	4.8	11.2	5.7
	AZ Canal - Inlet to Deer Valley WTP	4.3	9.7	3.9
	AZ Canal - Inlet to Glendale WTP	4.9	8.6	5.2
South	South Canal below CAP Cross-connect	3.9	3.7	3.3
and	South Canal at Val Vista WTP	4.2	3.9	2.3
Tempe	Head of the Tempe Canal	3.6	3.7	3.5
Canals	Tempe Canal - Inlet to Tempe's South Plant	<2.0	3.0	<2.0

Table 4 - Reservoir Samples – August 3, 2010				
Sample Description	Location	MIB (ng/L)	Geosmin (ng/L)	Cyclocitral (ng/L)
Lake Pleasant (July10)	Eplimnion	<2.0	<2.0	7.4
Lake Pleasant (July10)	Hypolimnion	<2.0	<2.0	<2.0
Verde River @ Beeline		<2.0	3.3	3.7
Bartlett Reservoir	Epilimnion	<2.0	3.1	<2.0
Bartlett Reservoir	Epi-near dock	<2.0	3.1	<2.0
Bartlett Reservoir	Hypolimnion	3.3	4.0	<2.0
Salt River @ BluePt Bridge		10.4	5.1	5.8
Saguaro Lake	Epilimnion	50.4	8.0	3.2
Saguaro Lake	Epi - Duplicate	50.1	6.5	3.3
Saguaro Lake	Epi-near dock	31.1	7.9	3.1
Saguaro Lake	Hypolimnion	24.8	4.0	<2.0
Lake Havasu				
Verde River at Tangle Creek (June10)		<2.0	<2.0	<2.0

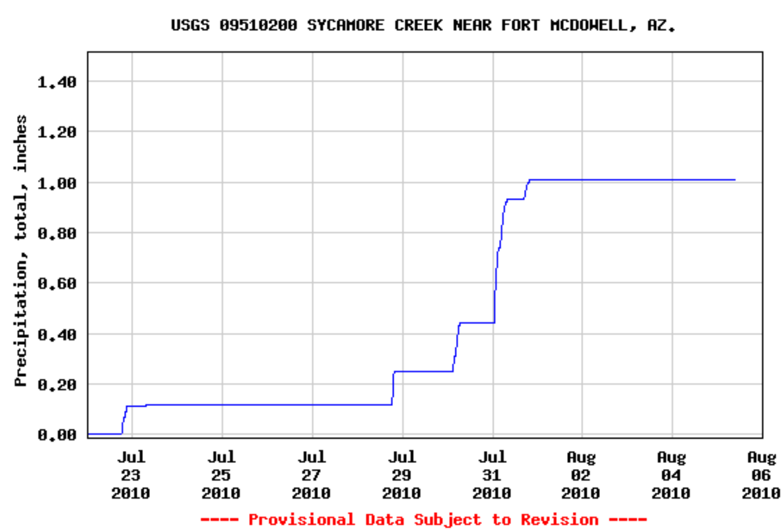
Saguaro Lake releases water from deep in the lake (i.e., hypolimnion). Algae that produce T&O tend to live in the sunlight-impacted upper layers (epilimnion). Levels of MIB were also high last month. Right now SRP is blending Salt and Verde River water – if this were to change then considerably higher levels of MIB would be in the SRP canal system.

Additional Taste and Odor Sampling on CAP Canal

Over the last week there was noticeable odors in water from the CAP canal located downstream of the CAP diversion into the SRP canal; that is the last location we normally monitor (see above). So in conjuction with CAP and the Town of Gilbert additional samples were collected. Data below indicates there was not a major influx of taste and odor compounds from the Ironwood Road and CAP canal location downstream to the Town of Gilbert inlet.

CAP samples collected on 8/3/2010				
	Milepost	**MIB (ng/L)**	**Geosmin (ng/L)**	**Cyclocitral (ng/L)**
Ironwood	203.1	<2.0	<2.0	2.6
UNRD	208.2	<2.0	2.9	2.7
Queen Creek	212.3	<2.0	<2.0	3.4
Mesa TO	195.3	<2.0	<2.0	2.4
Salt Gila	190.6	<2.0	<2.0	7.5
Town of Gilbert, SV-WTP, Air relief valve, pre strainer		<2.0	<2.0	<2.0

Over the time period of the noticeable odors, and increased turbidity and weeds in the CAP canal by others, considerable rainfall had occurred. Below is an example over the last week where nearly 1 inch of rain fell in the area of Fountain Hills. It is possible that runoff into the CAP canal in the area of the CAP canal and the 202 Freeway may have occurred.



Organic Matter in Water Treatment Plants

Table 2 - Water Treatment Plants – August 02, 2010						
Sample Description	**DOC (mg/L)**	**UV254 (1/cm)**	**SUVA (L/mg-m)**	**TDN**		**DOC removal (%)**
24th Street WTP Inlet	4.51	0.112	2.48	0.35		
24th Street WTP Treated	1.84	0.018	0.98	0.19		59
Deer Valley Inlet	4.43	0.115	2.60	0.44		
Deer Valley WTP Treated	2.35	0.033	1.42	0.26		47
Val Vista Inlet	4.28	0.114	2.67	0.25		
Val Vista WTP Treated –East	2.27	0.040	1.77	0.19		47
Val Vista WTP Treated -West	2.01	0.032	1.60	0.18		53
Union Hills Inlet	3.40	0.070	2.00	0.70		
Union Hills Treated	2.70	0.034	1.25	0.59		20
Tempe North Inlet	4.26	0.111	2.61	0.28		
Tempe North Plant Treated	2.65	0.046	1.74	0.68		38
Tempe South WTP	3.81	0.101	2.64	0.61		
Tempe South Plant Treated	2.30	0.038	1.66	0.21		39
Greenway WTP Inlet		sample	not	valid		
Greenway WTP Treated	3.22	0.055	1.71	0.42		~28
Glendale WTP Inlet	4.46	0.120	2.69	0.33		
Glendale WTP Treated	2.77	0.044	1.57	0.27		38

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)

Union hills WTP was experiencing issues with their presedimentation basins and samples were not collected.

Organics in Canals

Sample Description	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Waddell Canal	**3.36**	**0.069**	**2.06**	**0.69**
CAP Canal at Cross-connect	**3.40**	**0.070**	**2.00**	**0.70**
Salt River @ Blue Pt Bridge	**4.76**	**0.110**	**2.31**	**0.31**
Verde River @ Beeline	**3.99**	**0.120**	**3.00**	**0.29**
AZ Canal above CAP Cross-connect	**not**	**able to**	**access**	
AZ Canal below CAP Cross-connect	**4.26**	**0.113**	**2.64**	**0.28**
AZ Canal at Highway 87	**4.28**	**0.113**	**2.63**	**0.26**
AZ Canal at Pima Rd.	**road**	**closed**		
AZ Canal at 56th St.	**4.27**	**0.112**	**2.61**	**0.29**
AZ Canal - Inlet to 24th Street WTP	**4.51**	**0.112**	**2.48**	**0.35**
AZ Canal - Central Avenue	**4.22**	**0.113**	**2.67**	**0.30**
AZ Canal - Inlet to Deer Valley WTP	**4.43**	**0.115**	**2.60**	**0.44**
AZ Canal - Inlet to Glendale WTP	**4.46**	**0.120**	**2.69**	**0.33**
AZ Canal - Inlet to Greenway WTP				
South Canal below CAP Cross-connect	**4.23**	**0.113**	**2.68**	**0.30**
South Canal at Val Vista WTP	**4.28**	**0.114**	**2.67**	**0.25**
Head of the Tempe Canal	**4.17**	**0.114**	**2.73**	**0.29**
Tempe Canal - Inlet to Tempe's South Plant	**3.81**	**0.101**	**2.64**	**0.61**
Chandler WTP – Inlet				

Organics in Lakes

Table 4 - Reservoir Samples – August 02, 2010

Reservoir sampling will be conducted only monthly. CAP is sampling Lake Pleasant on slightly different days than the other reservoirs.

Sample Description	Location	DOC (mg/L)	UV254 (1/cm)	SUVA (L/mg-m)	TDN
Lake Pleasant - June 29, 2010	Eplimnion	**4.25**	**0.07**	**1.59**	**0.32**
Lake Pleasant - June 29, 2010	Hypolimnion	**3.37**	**0.07**	**2.04**	**0.76**
Verde River @ Beeline		**3.99**	**0.120**	**3.00**	**0.29**
Bartlett Reservoir	Epilimnion	**6.21**	**0.105**	**1.68**	**0.28**
Bartlett Reservoir	Hypolimnion	**4.77**	**0.121**	**2.52**	**0.39**
Salt River @ BluePt Bridge		**4.76**	**0.110**	**2.31**	**0.31**
Saguaro Lake	Epilimnion	**5.39**	**0.106**	**1.97**	**0.45**
Saguaro Lake	Epi - Duplicate	**5.70**	**0.110**	**1.92**	**0.49**
Saguaro Lake	Hypolimnion	**6.06**	**0.117**	**1.93**	**0.73**
Verde River at Tangle	Jun-10	**1.26**	**0.03**	**2.71**	**0.13**

Super-Powdered Activated Carbon (S-PAC)

?? SIZE MATTERS ??

What is it? Super-powder activated carbon (S-PAC) is smaller in diameter than conventional powder activated carbon (PAC). S-PAC can also be called sub-micron PAC. S-PAC and PAC are comprised of the exact same material, S-PAC is just pulverized further. S-PAC may have mean diameters of 0.5 to 0.7 um, compared to PAC which commonly have mean diameters of 15 to 30 um. Some commercial PACs do have smaller sizes (around 5um), including Darco INSUL, Norit SA Super, Norit SA UF.

Why should you care? Studies are showing that simply using S-PAC can lead to 3 to 10 times higher removal of dissolved organics, UV254 materials and probably THM precursors. This is GREAT! The reason behind this is probably related to pore-blockage. That is organics clog, precipitate, and/or aggregate *inside* the very small pores which comprise activated carbon. So, having smaller particles allows more pores and more internal surface area to be utilized for adsorbing the THM precursors. S-PAC would also remove MIB and Geosmin equally as well as PAC.

What are the issues? Because of its smaller size, it may not settle out as well in presedimentation systems (S-PAC slower settling than PAC). However, adding S-PAC together with alum or ferric has not been studied and may really help improve the ability to remove S-PAC as part of an overall treatment strategy. This may be one of focus areas for this coming year.

We want your feedback – what do you think of the below approach to managing water?

We are finalizing a project with SRP:

Sources for Municipal Disinfection By-Product Control

The purpose of this report is to provide information to Salt River Project on:

(1) the historic differences in water quality for the Salt and Verde River,
(2) the embedded costs to Tempe Water Treatment Plant,
(3) the potential benefits for mixing different sources to meet a TTHM goal, and
(4) the recommendations of Arizona State University on how to use this information and model to further provide source control for disinfection by-products.

Based on water treatment models for disinfection by-product control, historic water quality data and a model was developed to represent the inherent cost to a water treatment plant. Below are some initial findings.

Salt River Project provides its customers with source water from the Salt and Verde watersheds. During the summer months SRP releases primarily from the Salt River to meet the demand for electricity during summer months. The quality of the Verde River in relation to the production of disinfection by-products (DBPs) is more favorable for municipalities. Due to this, several cities have expressed interest in paying for the more preferable water during the summer months in hopes of enabling them to more reading meet DBP regulations.

Tempe JGM Water Treatment Plant will be used as a case study to assess the potential costs associated with this preferred water. A series of models have been developed to assess the potential blends of water to the Arizona Canal enabling them to more readily meet DBP regulations.

TTHM Formation Salt vs. Verde Rivers

The underlying assumption of this study was that the Verde River had fewer DBP precursors and therefore using this water would result in fewer TTHMs (at the max tap). Further analysis was performed in an effort to quantify the magnitude of our assumption. Water quality data from 2007-2009 for Salt and Verde Rivers were used along with a common chemical dosage to model the resulting TTHMs. The chemical doses were held constant for all trials to the following dosages:

- PAC: 15 mg/l
- Alum: 55 mg/l
- Sulfuric Acid: 10 mg/l

	TTHM (Max Tap) ug/l			HAA6 (Max Tap) ug/l		
	Salt River	Verde River	% decrease	Salt River	Verde River	% decrease
July '07	58.3	31.9	45%	41.0	24.7	40%
Aug. '07	52.5	35.3	33%	37.5	26.9	28%
Sept. '07	54.3	33.8	38%	38.6	26.0	33%
Oct.'07	49.5	28.7	42%	35.7	22.7	37%

Table 1

Other raw water parameters that were held constant for both water sources include the pH (7.5), bromide concentration (100 μg/l), and temperature (28° Celsius). The maximum time that the water is within the system (max tap) was set to 2 days. Table 2 depicts the resulting TTHMs and HAA6 concentrations for each scenario. Using source water from the Verde River could have ultimately decreased the TTHM concentration in July 2007 by up to 45%, with the above chemical dosage.

Arizona Canal Mix Ratios

The previous section displayed the extent to which the Verde River can aid in reducing the TTHM concentrations for WTPs. The next step was to look further into the impacts of different blends (or mixes) of SRP source water. Several scenarios were run for different treatment conditions. Each scenario held constant the same raw water parameters that were constant in the previous section. The chemical dosage is located on the bottom right hand corner of Figure 3. The TTHM goal was set to 80% of the USEPA regulation, making the TTHM goal 64 μg/l. Figure 3 displays how an increase in Verde River water within the Arizona Canal can enable a WTP to reach their TTHM goal without increasing the treatment costs. For the case in point, during July 2007 if Tempe WTP was using 100% Salt River water they would have been endanger of not meeting USEPA regulations and far above the TTHM goal. Increasing the mix ratio to 50% Salt and 50% Verde River would have enabled Tempe WTP to meet the TTHM goal without increasing the chemical costs.

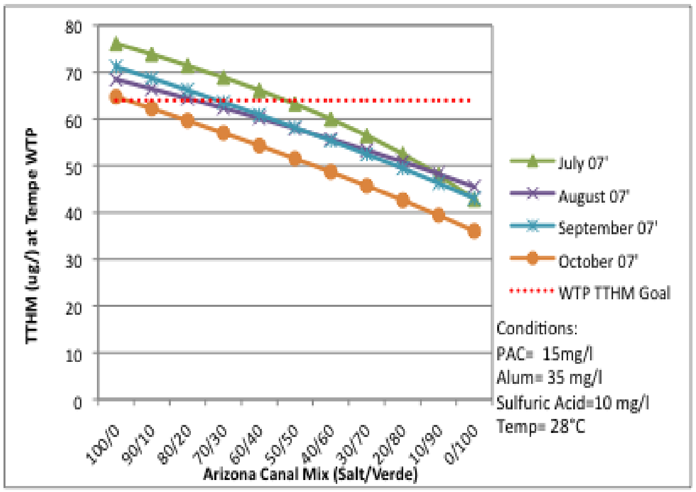


Figure 1

The appendix contains several additional graphs with scenarios of varying chemical dosages. The commonality between all of them is the obvious decrease in TTHMs correlating to an increase in Verde River water. It is important to note that the higher ratios of Verde River may not be attainable due to the constraints on supply.

Water Treatment Cost Analysis

An analysis was completed to quantify the "value" of the Verde River water. As displayed in the previous section the Verde River proved to be able to enable the WTP to meet TTHM standards. Enabling the WTP to meet the standards by using the preferred water saves the WTP money on the chemical costs. To find the inherited value of the Verde River water the graph in Figure 4 was generated. Figure 4 displays a breakdown of the embedded costs for Tempe WTP to meet the TTHM goal with different mix ratios of Salt to Verde River. From the standpoint of the WTP, the optimum solution in order for them to minimize total costs would be to obtain 100% Verde River influent. As stated earlier, the supply constraints of Verde River may not enable SRP to meet this newfound high demand. Any increase in Verde River water will decrease the total embedded costs to Tempe. It would prove to be more beneficial for Tempe if the Verde River is at least 60% of the source water. At 60% you see a large dip in the treatment costs associated with meeting the TTHM goal.

Furthermore, this graph displays to SRP that the value of the preferred water is higher than the delivery costs and offset hydropower costs that would be charged to the municipalities in an effort to break even. There lies the possibility of an increase in the profit margin for higher mixes of Verde source water.

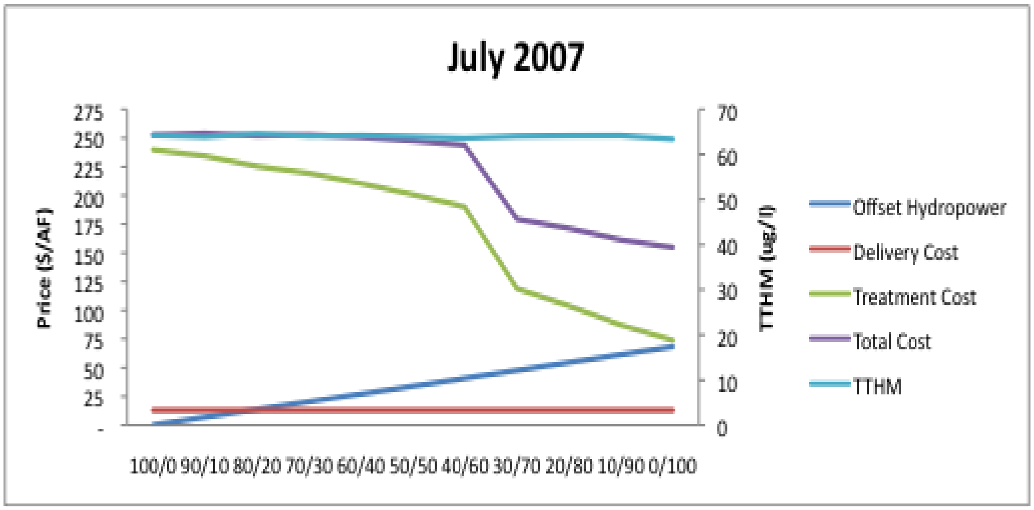


Figure 2

Figure 4 shows that to maintain a THM level that is 80% of the MCL can be achieved either by paying for treatment (chemical costs) or paying SRP for a higher quality water to be released from a reservoir. The "offset hydropower" costs are associated with lost revenue from hydropower generation. Our goal was to come up with "order of magnitude" estimates of treatment versus hydropower offset costs. From our ongoing analysis it appears feasible for SRP to consider this tradeoff. More on this topic will be presented at our September 17th workshop and we will demonstrate the model we developed.