City of San Diego Public Utilities Department
Dreissena Mussel Annual 2009 Report

Introduction

In accordance with Fish and Game Code Section 2301, the Draft City of San Diego Public Utilities Department Dreissena Mussel Response and Control Plan was submitted for review and is currently under revision. In fulfillment of the request of DFG to supply them with all activities related to dreissena mussels, the city is submitting this annual report. It is also the City's expectation that this report will suffice for the reporting requirements of its scientific collection permit.

Monitoring Results

To date, all City of San Diego owned reservoirs that receive water from the Colorado River Aqueduct have been confirmed to contain veligers (planktonic life stage) and adult dreissena mussels. These reservoirs are El Capitan, Miramar, Murray, Lower Otay and San Vicente. Since these reservoirs are positive for dreissenids, the goal of the City's monitoring program is to enumerate the settlement rates within these reservoirs with one foot square ABS plates. All substrate are deployed between the water body's average transparence (Secchi disk reading) and the top of the thermocline. The City also owns four reservoirs that are not connected to the Colorado River Aqueduct, Barrett, Hodges, Morena and Sutherland Reservoirs. Veliger and adult population monitoring is being conducted on Hodges, Morena and Sutherland which allow private water craft. Veliger monitoring is conducted with the use of a Wildco Plankton net (conical plankton-tow net, 63 μm pore size, 0.25 m diameter net opening, removable, weighted cod-end piece) which is lowered through the water column and allowed to rest at the desired depth for 60 seconds before it is raised slowly back to the surface. The sample is then condensed and stored in a labeled container and transported back to the City's Water Quality Laboratory where it undergoes centrifugation. After centrifugation the concentrated sample/pellet at the bottom of the centrifuge tube is removed and placed in a marked 50 milliliter vial. Sub-samples of this sample are then examined using a cross polarizing microscope under 40x magnification. . Since no private water crafts are permitted at Barrett and the reservoir does not receive Colorado River Aqueduct water, Barrett Reservoir is at minimum risk of being colonized by Dreissenid mussels and is currently only being monitored with substrates. Table 1 identifies the locations of the monitoring substrates within each of the City's reservoirs of the adult monitoring.

Table 1
Substrate Monitoring Locations

	Substrate Location			Substrate Type
Reservoir/Monitoring Location #	Inlet/Outlet Tower	Public Dock/ Launch Ramp	Raw Water Inlet	ABS Plates
El Capitan QM1	X			X
El Capitan QM2		X		X
Barrett QM1		X		X
Hodges QM1		X		X
Hodges QM2	X			X
Miramar QM1	X			X
Miramar QM2		X		
Miramar QM3 (Sample site abandoned due to poor location)			X	X
Morena QM1		X		X
Murray QM1	X			X
Murray QM2		X		X
Otay QM1	X			X
Otay QM2		X		X
Sutherland QM1		X		X
San Vicente QM1	X			X
San Vicente QM2 (Sample site removed due to construction)		X		X
San Vicente QM3			X	X

Non-Infested Water bodies

Barrett Reservoir

In May of 2009 the City complied with a request by DFG to install a monitoring substrate in Barrett reservoir which is only monitored for adult settlement. Since its deployment, this substrate has been examined monthly with no quagga mussels being detected (Table 2).

Table 2

Barrett Reservoir 2009 Dreissena Substrate Results

Reservoir	Sample Site	Sample Date	Value (/Ft^2)	Comments
Barrett	BA_QM_1	6/18/2009	A	Substrate was installed in May of 2009 per DFG request.
	BA_QM_1	7/9/2009	A	
	BA_QM_1	8/13/2009	A	
	BA_QM_1	9/3/2009	A	
	BA_QM_1	10/8/2009	A	
	BA_QM_1	11/5/2009	A	
	BA_QM_1	12/17/2009	A	

A= Absent; NS =Not Sampled

Table 3

Lake Hodges, Morena and Sutherland 2009 Dreissena Veliger Sampling Results

Reservoir	Sample Date	Sample Location	Value (veligers/L)	Comments
Hodges	3/2/2009	Near Public Dock/ Launch Ramp	A	5790 Liters sampled.
	4/27/2009	Near Public Dock/ Launch Ramp	A	3300 Liters sampled.
	6/1/2009	Near Public Dock/ Launch Ramp	A	5300 Liters sampled.
	7/20/2009	Near Public Dock/ Launch Ramp	A	4450 Liters sampled.
	9/9/2009	Near Public Dock/ Launch Ramp	A	5300 Liters sampled.
	10/26/2009	Near Public Dock/ Launch Ramp	A	8500 Liters sampled.
	11/16/2009	Near Public Dock/ Launch Ramp	A	8900 Liters sampled.
Morena	5/7/2009	Near Public Dock/ Launch Ramp	A	5300 Liters sampled.
	7/8/2009	Near Public Dock/ Launch Ramp	A	4450 Liters sampled.
	10/7/2009	Near Public Dock/ Launch Ramp	A	9800 Liters sampled.
Sutherland	2/4/2009	Near Public Dock/ Launch Ramp	A	3855 Liters sampled.
	4/16/2009	Near Public Dock/ Launch Ramp	A	5300 Liters sampled.
	7/6/2009	Near Public Dock/ Launch Ramp	A	4450 Liters sampled.
	11/2/2009	Near Public Dock/ Launch Ramp	A	6700 Liters sampled.

A= Absent

Hodges Reservoir

Hodges Reservoir has two monitoring substrates. The city has had a substrate deployed at the end of the public dock in Hodges since 2007. In August 2009 the City complied with a request by San Diego County Water Authority to add an addition substrate near the new inlet/outlet structure being built. The structure will transport water to and from Olivenhain Reservoir, which has shown to be infested with quagga mussels. Both substrates have been examined monthly with no quagga mussels being detected (Table 4).

Veliger monitoring was conducted 7 times at Hodges reservoir near the public dock and boat launch ramp. The 7 samples taken from Hodges were split into two subsamples; one which was analyzed by the City and the other was supplied to Santa Fe Irrigation District which was analyzed by Scripps Institute of Oceanography. The results of these 7 samples (from the City and Scripps) were negative for the presence of Dreissena veligers (Table 4). Hodges was also sampled monthly by the City for San Diego County Water Authority (SDCWA). These sampling events were independent of the sampling events listed in Table 3 and were collected near the new inlet/outlet structure. The City was only responsible for the plankton tows (sample collection), not for the analysis of these samples. SDCWA sent these samples to Scripps Institute of Oceanography for analysis and all samples were reported as negative.

Table 4

Hodges Reservoir 2009 Dreissena Substrate Results

Reservoir	Sample Site	Sample Date	Value (/Ft^2)	Comments
Hodges	HG_QM_1	1/20/2009	A	
	HG_QM_1	2/17/2009	A	
	HG_QM_1	3/23/2009	A	
	HG_QM_1	4/20/2009	A	
	HG_QM_1	5/18/2009	A	
	HG_QM_1	6/22/2009	A	
	HG_QM_1	7/20/2009	A	
	HG_QM_2	8/24/2009	A	HG_QM_2 located near new influent/effluent structure; was installed in August 2009 per CWA request.
	HG_QM_1	9/21/2009	A	
	HG_QM_2	9/21/2009	A	
	HG_QM_1	10/19/2009	A	
	HG_QM_2	10/19/2009	A	
	HG_QM_1	11/23/2009	A	
	HG_QM_2	11/23/2009	A	
	HG_QM_1	12/21/2009	A	
	HG_QM_2	12/21/2009	A	

A= Absent; NS =Not Sampled

Morena Reservoir

Morena Reservoir has one monitoring substrate which is deployed at the end of the public dock. The substrate was visited 12 times this year but only examined 11 since it was missing on one sampling occasion. When a substrate is missing a new one is installed as soon as possible. 11 examinations were negative for quagga mussels (Table 5).
Veliger monitoring was conducted 3 times at Morena Reservoir with all samples testing negative for presence of Dreissena veligers (Table 3).

Table 5

Morena Reservoir 2009 Dreissena Substrate Results

Reservoir	Sample Site	Sample Date	Value (/Ft^2)	Comments
Morena	MO_QM_1	1/9/2009	NS	Substrate missing
	MO_QM_1	2/5/2009	A	
	MO_QM_1	3/3/2009	A	
	MO_QM_1	4/9/2009	A	
	MO_QM_1	5/7/2009	A	
	MO_QM_1	6/3/2009	A	
	MO_QM_1	7/8/2009	A	
	MO_QM_1	7/20/2009	A	
	MO_QM_1	8/13/2009	A	
	MO_QM_1	9/3/2009	A	
	MO_QM_1	10/7/2009	A	
	MO_QM_1	11/4/2009	A	
	MO_QM_1	12/3/2009	A	

A= Absent; NS =Not Sampled

Sutherland Reservoir

Sutherland Reservoir has one monitoring substrate which is deployed at the end of the public dock. Sutherland was visited monthly with 4 unsuccessful sampling events due to the substrate being missing (Table 6). All sampling events produced negative results for the presence of adult dreissena mussels on these substrates.

Veliger monitoring was conducted 4 times at Sutherland Reservoir with all samples testing negative for the presence of Dreissena veligers (Table 3).

Table 6

Sutherland Reservoir 2009 Dreissena Substrate Results

Reservoir	Sample Site	Sample Date	Value (/Ft^2)	Comments
Sutherland	SU_QM_1	1/7/2009	A	
	SU_QM_1	2/4/2009	A	
	SU_QM_1	3/5/2009	A	
	SU_QM_1	4/8/2009	A	
	SU_QM_1	5/5/2009	NS	Substrate missing
	SU_QM_1	6/1/2009	NS	Substrate missing
	SU_QM_1	7/6/2009	A	
	SU_QM_1	8/12/2009	A	
	SU_QM_1	9/1/2009	NS	Substrate missing
	SU_QM_1	10/5/2009	NS	Substrate missing
	SU_QM_1	11/2/2009	A	
	SU_QM_1	12/10/2009	A	

A= Absent; NS =Not Sampled

Infested Water Bodies

El Capitan Reservoir

El Capitan Reservoir has two monitoring substrates; one deployed near the inlet/outlet tower and the second deployed at the end of the public dock. The substrates were examined 11 times this year and the results are located in Table 7. It is interesting to note that a large settlement of quagga mussels occurred in February when water temperatures in El Capitan are the coldest (13^{o}C). This could be due to the fact that large amounts of imported water were being stored into El Capitan or that the resident mussels had a significant winter spawn.

Miramar Reservoir

Miramar Reservoir had three monitoring substrate for the majority of 2009. One was deployed near the inlet/outlet tower, the second was deployed at the end of the public dock and the third was located near the new raw water inlet. The third substrate (located near the new inlet structure) was removed in August of 2009 because of maintenance issues and the potential as a navigational hazard (it keep drifting around the reservoir). The substrates were examined 10 times in 2009 and the results are posted in table 8.

Table 7

El Capitan Reservoir 2009 Dreissena Substrate Results

Reservoir	Sample Site	Sample Date	Value (/Ft^2)	Comments
El Capitan	EC_QM_1	1/21/2009	A	
	EC_QM_2	1/21/2009	A	
	EC_QM_1	2/19/2009	4750	All newly settled; size 1-5mm
	EC_QM_2	2/19/2009	430	All newly settled; size 1-5mm
	EC_QM_1	3/25/2009	P	29 mussels on nylon rope @19 (most on knot); 1-3mm in length
	EC_QM_2	3/25/2009	A	
	EC_QM_1	4/23/2009	A	14 mussels attached to line of first generation substrate.
	EC_QM_2	4/23/2009	A	6 suspected mussels attached to substrate; destroyed during removal for microscopic confirmation.
	EC_QM_1	5/20/2009	14	All newly settled; size 1- 4mm
	EC_QM_2	5/20/2009	3	All newly settled; size 1-3mm
	EC_QM_1	6/23/2009	4	8 mussels on bottom 2 feet of poly. rope.
	EC_QM_2	6/23/2009	P	2 mussels on bottom foot of poly. rope; 0 on ABS Plate
	EC_QM_1	7/22/2009	1	
	EC_QM_2	7/22/2009	A	
	EC_QM_1	8/26/2009	A	
	EC_QM_2	8/26/2009	A	
	EC_QM_1	9/23/2009	A	
	EC_QM_2	9/23/2009	A	
	EC_QM_1	10/21/209	0.5	
	EC_QM_2	10/21/2009	A	
	EC_QM_1	11/25/2009	A	
	EC_QM_2	11/25/2009	A	

A= Absent; P= Present, NS= Not sampled

Murray Reservoir

Murray Reservoir has two monitoring substrates; one deployed near the inlet/outlet tower, the second deployed from the end of the public dock. The substrates were examined 11 times in 2009 and the results are posted in Table 9.

Table 8

Miramar Reservoir 2009 Dreissena Substrate Results

Reservoir	Sample Site	Sample Date	Value (/Ft^2)	Comments
Miramar	MM_QM_1	1/6/2009	P	1 on abs plate, 2 @15' and 2 @ 2' on Poly. Rope.
	MM_QM_2	1/6/2009	P	1 @25' on Poly. Rope.
	MM_QM_3	1/6/2009	A	
	MM_QM_1	2/10/2009	A	
	MM_QM_2	2/10/2009	A	
	MM_QM_3	2/10/2009	A	
	MM_QM_1	4/7/2009	A	
	MM_QM_2	4/7/2009	A	
	MM_QM_3	4/7/2009	A	
	MM_QM_1	5/12/2009	A	
	MM_QM_2	5/12/2009	A	
	MM_QM_3	5/12/2009	A	
	MM_QM_1	6/11/2009	P	1 mussel on Poly. rope @ 30 feet
	MM_QM_2	6/11/2009	P	1 mussel on Trex plate @ 20 feet
	MM_QM_3	6/11/2009	0.5	
	MM_QM_1	7/7/2009	A	
	MM_QM_2	7/7/2009	1	
	MM_QM_3	7/7/2009	A	
	MM_QM_1	8/11/2009	A	
	MM_QM_2	8/11/2009	7.5	
	MM_QM_3	8/11/2009	A	
	MM_QM_1	9/22/2009	0.5	
	MM_QM_2	9/22/2009	8.5	
	MM_QM_1	10/20/2009	7.5	
	MM_QM_2	10/20/2009	4.5	
	MM_QM_1	11/25/2009	0.5	
	MM_QM_2	11/25/2009	7.5	

A= Absent; P= Present, NS= Not sampled

Lower Otay Reservoir

Lower Otay Reservoir has two monitoring substrates; one deployed near the inlet/outlet tower, the second is deployed from the end of the public dock. The substrates were visited monthly with two unsuccessful sampling events at the public dock sampling location due to the substrate being missing. The results of the substrate sampling are located in Table 10.

Table 9

Murray Reservoir 2009 Dreissena Substrate Results

Reservoir	Sample Site	Sample Date	Value (/Ft^2)	Comments
Murray	MU_QM_1	1/22/2009	A	
	MU_QM_2	1/22/2009	A	
	MU_QM_1	2/18/2009	A	
	MU_QM_2	2/18/2009	A	
	MU_QM_1	4/21/2009	5	
	MU_QM_2	4/21/2009	A	
	MU_QM_1	5/19/2009	0.5	
	MU_QM_2	5/19/2009	A	
	MU_QM_1	6/24/2009	1	
	MU_QM_1	7/21/2009	1	
	MU_QM_2	7/21/2009	A	
	MU_QM_1	8/18/2009	1	
	MU_QM_2	8/18/2009	A	
	MU_QM_1	9/22/2009	P	1 mussel attached to line
	MU_QM_2	9/22/2009	A	
	MU_QM_1	10/21/2009	1	
	MU_QM_2	10/21/2009	A	
	MU_QM_1	11/24/2009	A	
	MU_QM_2	11/24/2009	A	
	MU_QM_1	12/23/2009	A	
	MU_QM_2	12/23/2009	A	

A= Absent; P= Present, NS= Not sampled

San Vicente Reservoir

Originally, San Vicente Reservoir had three sampling substrates located at the following locations: outlet tower, at the end of the public dock and in the reservoir near were the raw water inlet creek empties into San Vicente. Due to construction for the dam raising project, San Vicente was closed to the public in September of 2008 and most infrastructures (docks, buoys, etc.) were removed from the lake. This lead to the elimination of the substrate at the public dock and the inconsistent sampling of substrate three located near the raw water inlet creek. The substrates were examined monthly 11 times during 2009 with no mussels being present. Very few quagga mussels have been found in San Vicente Reservoir, even with the drastic draw down of the water level for construction purposes which exposed land that was at depths that quagga mussels would be expected to colonize few have been found. Also, the examination of the removed docks and other infrastructure (objects that you would expect to find mussel colonizing) from the reservoir produced few to none upon examination. One reason could be the small amount of imported water that has been stored in San Vicente due to construction needs. Also,

the raw water entering San Vicente Reservoir cascades down a 100 foot rocky creek before entering the reservoir which might damage the veligers.

Table 10

Otay Reservoir 2009 Dreissena Substrate Results

Reservoir	Sample Site	Sample Date	Value (/Ft^2)	Comments
Otay	OT_QM_1	1/20/2009	P	1 on Poly. Rope @ 20'
	OT_QM_2	1/20/2009	A	none on Portland type Sub.; ABS plates missing
	OT_QM_1	2/17/2009	A	
	OT_QM_2	2/17/2009	A	
	OT_QM_1	3/23/2009	P	1 on poly. rope @ 12 feet deep
	OT_QM_2	3/23/2009	A	
	OT_QM_1	4/20/2009	A	
	OT_QM_2	4/20/2009	NS	Substrate Missing
	OT_QM_1	5/18/2009	A	
	OT_QM_2	5/18/2009	NS	Substrate Missing
	OT_QM_1	6/22/2009	4	52 mussels on last foot of rope; all newly settled
	OT_QM_2	6/22/2009	A	
	OT_QM_1	7/20/2009	16	
	OT_QM_2	7/20/2009	2	
	OT_QM_1	8/17/2009	22	
	OT_QM_2	8/17/2009	2	
	OT_QM_1	9/21/2009	A	
	OT_QM_2	9/21/2009	1	
	OT_QM_1	10/19/2009	A	
	OT_QM_2	10/19/2009	A	
	OT_QM_1	11/23/2009	P	16 found on Rope
	OT_QM_2	11/23/2009	P	2 found on Rope
	OT_QM_1	12/22/2009	A	
	OT_QM_2	12/22/2009	A	

A= Absent; P= Present, NS= Not sampled

Observations

During 2009 the populations of quagga mussels have increased in all the City's reservoirs that have been infested. This statement is supported by diver observations, observations of the shoreline and observations during water drawdown's exposing shoreline and infrastructure. This statement is especially true at El Capitan and to a lesser degree Lower Otay reservoir. The food sources at both these reservoirs are optimal for quagga mussel growth. Both these reservoirs have large green algae populations that the quagga mussels feed on. Also, mussels from El Capitan and Lower Otay -Reservoirs are noticeable larger/huskier then mussels observed from the City's other infested reservoirs. The only infested reservoir that does not follow this trend of increased populations of quagga mussel is San Vicente. As stated above San Vicente has

received very little imported water since 2007 and the water level was drawn down approximately 40 feet over this time for construction associated with the raising of its dam. Since the water quality parameters of San Vicente are suitable for quagga mussel growth, we believe that the factors listed above as well as the 100 foot plunge down a rocky creek the veligers have to travel just prior to entering the reservoir, have had a negative effect on their growth/survival in San Vicente.

Table11

San Vicente Reservoir 2009 Dreissena Substrate Results

Reservoir	Sample Site	Sample Date	Value (/Ft^2)	Comments
San Vicente	SV_QM_1	1/21/2009	A	
	SV_QM_1	2/19/2009	A	
	SV_QM_1	3/25/2009	A	
	SV_QM_1	4/22/2009	A	
	SV_QM_1	5/20/2009	A	
	SV_QM_1	6/24/2009	A	
	SV_QM_3	6/24/2009	A	
	SV_QM_1	7/22/2009	A	
	SV_QM_1	8/19/2009	A	
	SV_QM_1	9/23/2009	A	
	SV_QM_1	10/20/2009	A	
	SV_QM_1	11/24/2009	A	
	SV_QM_3	11/24/2009	A	

A= Absent; P= Present, NS= Not sampled

Veliger Monitoring of the Imported Water Aqueduct

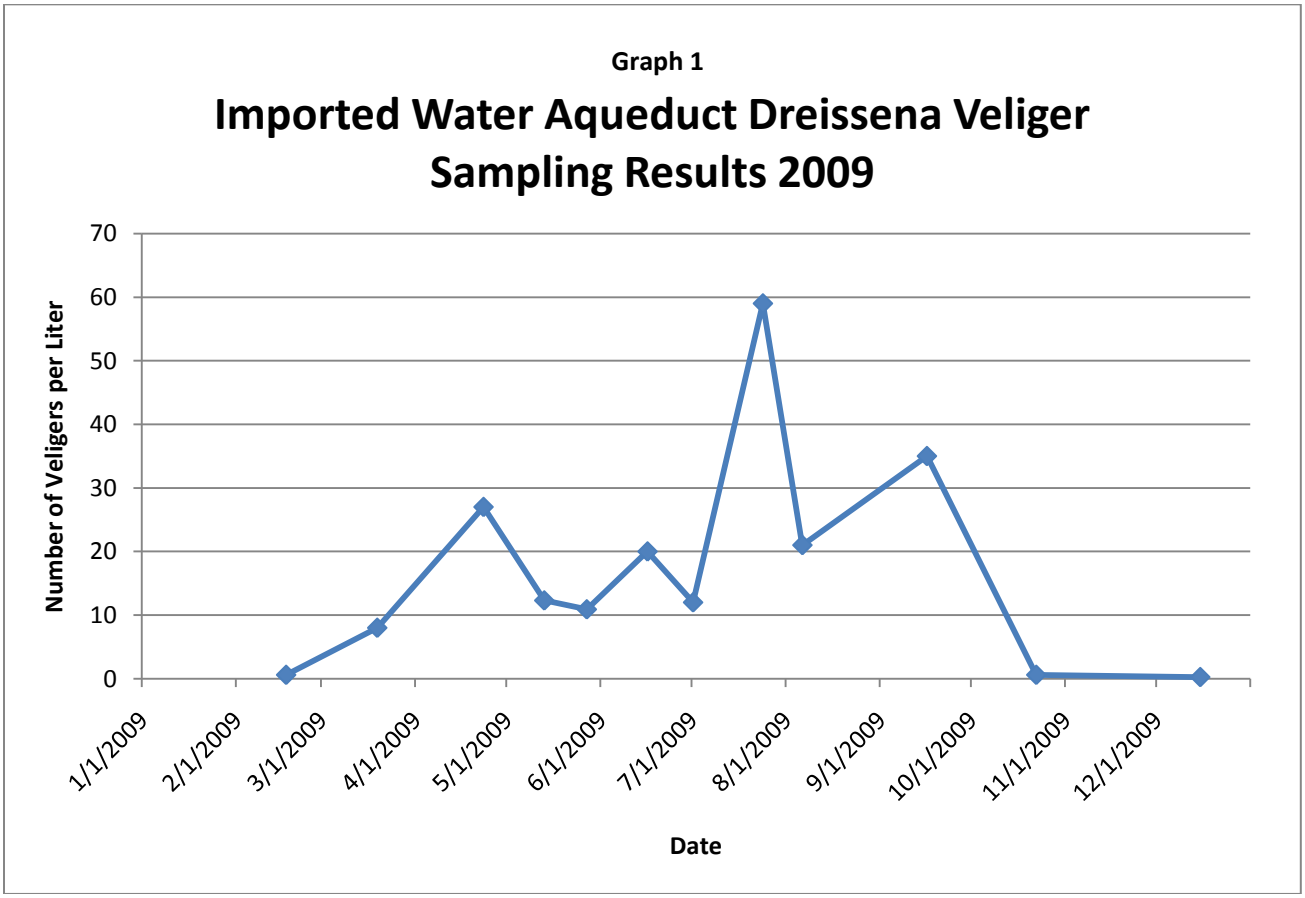
The City is also monitoring the imported water supply system to track changes in veliger density's that are entering City reservoirs and treatment plant facilities. The raw water supply system (sample taken from the S.D. County Water Authority Imported Water Pipeline entering Alvarado WTP) was monitored 12 times in 2009 (Table12). The veliger data in graph 1 shows the variability in veligers densities throughout the year. However, it is clear that the warmer months do produce greater number of veligers in the imported water aqueduct.

Table 12

Imported Water Aqueduct Dreissena Veliger Sampling Results 2009

Sample Location	Sample Date	Value (veligers/L)	Comments
S.D. County Water Authority Imported Water Pipeline entering Alvarado WTP	2/17/2009	0.6	297 Liters sampled
	3/19/2009	8	280 liters sampled
	4/23/2009	27	225 Liters sampled
	5/13/2009	12.3	265 Liters sampled
	5/27/2009	10.9	270 Liters sampled
	6/16/2009	20	255 Liters sampled
	7/1/2009	12	262 Liters sampled
	7/24/2009	59	195 Liters sampled
	8/6/2009	21	170 Liters sampled
	9/16/2009	35	120 Liters sampled
	10/22/2009	0.6	150 Liters sampled
	12/15/2009	0.25	141 Liters sampled

A= Absent



Control and Containment

Boating and Recreational Activities

Private boats are not allowed to moor over night at any City of San Diego reservoir. All owners/operators of private boats are required to remove their vessel from the reservoir at the end of each day. This procedure reduces the likelihood of Quagga attaching themselves to the outside of any private vessel.

Reservoir employees have been directed to provide educational materials to the boating community and general public. Handouts are given to each vessel operator/owner who enters all recreation areas.

All launch ramps and pay stations at infested reservoirs are posted with clearly visible signs stating that Quagga mussels have been found in this reservoir and, before leaving, all private boaters must do the following:

- Empty and dry any buckets. Do not reuse suspect bait.
- Drain any water through the vessel's hull plug and ensure the area is dry.
- Drain all water from ballast tanks.
- Drain and dry all water from lower outboard unit.
- Clean and dry any live-wells aboard the vessel.

Non-infested water bodies of the City's water supply system include Sutherland, Hodges, Morena, Barrett, and Upper Otay Reservoirs. Private boating is not allowed at Barrett or Upper Otay Reservoirs.

Private boating is allowed at Sutherland, Hodges and Morena Reservoirs. For these three reservoirs, boat inspection policies and procedures that are outline in greater detail in the City's Response and Control Plan Document are being followed.

Chemical and Physical Control

Currently the City has not implemented chemical control strategies to mitigate the spread of quagga mussels into its reservoirs or to protect its infrastructure.
The City will use Best Management Practices (BMPs) for release of water from an infested body, pipeline, etc. Currently the City is filtering all discharges whose water could contain veliger.

In Lake Controls

All City owned reservoirs undergo thermal stratification which begins in spring and ends in late fall or early winter. Once thermal stratification is established anoxic conditions are formed in the hypolimnion (bottom portion) of the reservoir. Studies conducted by the City Water Quality Laboratory, as well as Metropolitan Water District, show that mussels cannot survive these

conditions. This natural phenomenon creates a death zone in the reservoirs were quagga mussels cannot survive. Table 13 shows the results of our survivability study at Lower Otay Reservoir. 100% mortality was recorded on day 25th day of study for the mussels suspended in the hypolimnion (were dissolved oxygen concentrations were 0.50 mg/L) of Lower Otay Reservoir.

Table 13

Survival of *Dreissena bugensis* at three depth in Lower Otay Reservoir and Corresponding Dissolved Oxygen Concentrations

Date	Day	Depth: 4 meters			Depth: 8 meters			Depth: 16 meters		
		# Alive	% Survival	D.O.	# Alive	% Survival	D.O.	# Alive	% Survival	D.O.
8/11/2008	0	20	100	8.68	20	100	2.28	20	100	0.24
8/12/2008	1	19	95	9.14	20	100	2.86	20	100	0.24
8/13/2008	2	18	90	9.01	20	100	2.46	20	100	0.16
8/14/2008	3	18	90	8.81	20	100	2.82	20	100	0.14
8/15/2008	4	17	85	9.18	20	100	2.62	19	95	0.27
8/16/2008	5	17	85	9.91	20	100	2	18	90	0.36
8/17/2008	6	17	85	9.54	20	100	1.82	15	75	0.45
8/18/2008	7	17	85	9.55	20	100	2.11	14	70	0.27
8/19/2008	8	17	85	9.44	20	100	1.84	12	60	0.19
8/20/2008	9	17	85	9.83	20	100	2.08	11	55	0.37
8/21/2008	10	17	85	8.34	19	95	1.65	9	45	0.18
8/22/2008	11	17	85	8.05	19	95	1.46	8	40	0.25
8/23/2008	12	17	85	8.94	19	95	1.13	7	35	0.27
8/24/2008	13	17	85	8.85	19	95	1.1	6	30	0.31
8/25/2008	14	17	85	8.08	19	95	1.31	5	25	0.02
8/26/2008	15	17	85		19	95		5	25	
8/27/2008	16	17	85	8.15	19	95	0.64	5	25	0.02
8/28/2008	17	17	85	8.21	19	95	0.61	5	25	0.02
8/29/2008	18	17	85	8.1	19	95	0.76	4	20	
9/1/2008	21	17	85	9.89	19	95	0.91	1	5	
9/2/2008	22	17	85	9.37	18	90	1.1	1	5	0.35
9/5/2008	25	17	85	9.69	17	85	1.28	0	0	0.46
		Average DO Concentration		8.99	Average DO Concentration		1.66	Average DO Concentration		0.24

Decontamination

The City of San Diego Public Utilities Department has taken numerous precautions to ensure that mussels are not spread as a result of our monitoring activities. All City staff involved with mussels will be formally trained on laboratory procedures and the potential consequences of improper release/disposal of mussel, water or equipment.

All mussels collected on the substrates by the Water Quality Biologists are either put back in the reservoir or transferred back to our laboratory for identification and then preserved in a 70% ethanol solution or destroyed with a 1:10 bleach to water solution. Veligers discovered during analysis of our reservoirs and raw water pipelines are destroyed with a 1:10 bleach to water solution after analysis in the laboratory.

Field equipment must be decontaminated to prevent transfer of organisms within and between systems. The plankton net, cod-end piece and affiliated rope are decontaminated by high power spraying with freshwater for approximately 2 minutes. The clean sampling equipment is then allowed to dry at least three days before next use.

All infrastructures removed from City owned water bodies that are known to contain quagga mussels are cleaned/decontaminated on site and allowed to desiccate for an appropriate period of time before they are transported to other City owned water bodies or disposed of.

The City of San Diego's Water Quality Laboratory property is a 24 hour secured facility and only Department employees have access. Any visitors to our laboratory must check in with a guard and be issued an id card by one of our staff. All research activities would be secured in the Source Water group's lab area within the Water Quality Laboratory. Activities involving live mussels will be conducted in double contained systems. Once experiments are concluded any specimens, water and equipment will be neutralized with a 1:10 bleach to water solution for 30 minutes prior to disposal. During 2009 no laboratory experiments involving mussels were conducted in our laboratory.