TECHNICAL MEMORANDUM-

Results of Cyanobacteria and Microcystin Monitoring in the Vicinity of the Klamath Hydroelectric Project: November 14nd, 22th, and 29th 2011

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Introduction

This technical memorandum summarizes the latest results of public health monitoring during 2011 for cyanobacteria species and the associated toxin microcystin in Copco and Iron Gate reservoirs in PacifiCorp's Klamath Hydroelectric Project (Project) and at one monitoring station in the Klamath River below Iron Gate Dam. This monitoring is particularly focused on *Microcystis aeruginosa* (MSAE), a cyanobacterium that is known to produce microcystin, with a recent history of summertime blooms in Copco and Iron Gate reservoirs. This monitoring also estimates the presence of other potentially-toxigenic cyanobacteria, including *Anabaena* spp. and *Planktothrix (Oscillatoria)* spp. This monitoring is being conducted pursuant to Interim Measure 15, Water Quality Monitoring Activities, contained in the Klamath Hydroelectric Settlement Agreement (KHSA) executed between the United States Department of Interior, the states of California and Oregon, PacifiCorp, and other parties.

The results addressed in this memorandum are specifically for samples collected on November 14nd, 22th, and 29th, 2011 but also include results from prior sampling events. Subsequent memoranda will be prepared approximately every two weeks to report the results of continued monitoring.

Methods

PacifiCorp is conducting phytoplankton sampling for laboratory analysis of potentially toxigenic cyanobacteria, notably MSAE, and microcystin at four sites in Copco and Iron Gate reservoirs and one site below Iron Gate Dam (listed in Table 1), including:

- Four shoreline sites in coves in Copco and Iron Gate reservoirs (i.e., two cove sites in each reservoir).

- One Klamath River site below Iron Gate Dam near the hatchery bridge.

Samples are planned to be taken at shoreline locations in the reservoirs once in May and August; and twice per month in June, July, October, and November. Samples for the river site below Iron Gate Dam are scheduled to be collected twice per month in June, July and October and weekly in August and September but may change due to river conditions. Sampling in the river would increase when the potential for blooms exists.

Phytoplankton samples from the river sites are taken as grab samples offshore according to the standard operating procedure (SOP) developed by the Klamath Blue Green Algae Working Group (http://www.kbmp.net/collaboration/klamath-hydroelectric-settlement-agreement-monitoring). Additional samples at open water sites in Copco and Iron Gate reservoirs, including a grab sample at 0.5 m depth and an integrated sample over 8 m depth, will be collected as part of the baseline water quality monitoring.

Samples for potentially toxic phytoplankton are preserved in Lugol's solution and sent to Aquatic Analysts in Friday Harbor, Washington for analysis. The laboratory analysis of phytoplankton speciation and abundance is performed on prepared microscope slides of filtered samples using phase contrast microscopy. Species are counted as algal units of cell, filament, or colony depending on the natural growth form of the species. Algal forms are identified to species or otherwise to the lowest practicable taxonomic level. Biovolumes are estimated by multiplying the cell counts by the average geometric dimensions of the cells for a given phytoplankton taxon. Results for cyanobacteria species are reported as individual cells per milliliter.

Samples for determination of microcystin toxin are placed in a cooler on ice and shipped to the EPA Region 9 Laboratory in Richmond, California. The samples are analyzed using the competitive Enzyme-Linked ImmunoSorbent Assay (ELISA) method based on the EnviroLogix QuantiPlate Kit for microcystins. The quantitation limit is 0.18 µg/L or parts per billion (ppb). This test method does not distinguish between the specific microcystin congeners, but detects their presence to differing degrees. That is, ELISA test results yield one value as the sum of all measurable microcystin variants.

Table 1. Sites of cyanobacteria and microcystin public health monitoring in Copco and Iron Gate reservoirs and the Klamath River during 2011.

Location	Approximate River Mile	Site ID
Copco Reservoir at Mallard Cove ramp	201.5	CRMC
Copco Reservoir at Copco Cove ramp	200.0	CRCC
Iron Gate Reservoir at Camp Creek ramp	192.8	IRCC
Iron Gate Reservoir at John Williams campground	192.4	IRJW
Klamath River below Iron Gate dam near hatchery bridge	189.7	KRBI

Results

Four samples were collected, from shoreline stations in Copco and Iron Gate reservoirs on both November 14nd, 22th, and 29th, 2011. Aliquots were sent to the EPA Region 9 laboratory for analysis for Microcystin via ELISA, to Aquatic Analysts for cyanobacteria species identification and enumeration, and held for potential subsequent analysis for microcystin via LCMS.

The results of cyanobacteria species identification and enumeration are summarized in Table 2.

The Klamath River below Iron Gate dam was posted with public health advisories on September 2nd, 2011. The public health sampling results showed that the algal blooms were below the California posting guidelines by October 6, 2011 (SWRCB 2010).The public health advisories remained in effect until November 28, 2011.

Copco and Iron Gate reservoirs were posted with public health advisory signs on August 17th, 2011. Since the reservoirs have been posted, public health sampling at the reservoir locations has been discontinued until the blooms have visibly diminished and data are need for de-posting purposes. Public health sampling in the reservoirs resumed in November. While cell counts were above the posting guidelines for the November 14 sampling event, subsequent sampling has shown that the algae concentrations have greatly diminished and are far below the posting guidelines.

Table 2. Summary of cyanobacteria public health monitoring on November 14nd, 22nd and 29th, 2011.

Date	Sample	Location	Species	Biovolume (µm³/mL)	Cells/mL	Microcystin (µg/L)
11/14/11	KR11874	CRMC	*Aphanizomenon flos-aquae*	17,870	284	*
11/14/11	KR11875	CRCC	*Aphanizomenon flos-aquae*	73,076,850	1,159,950	*
11/14/11	KR11875	CRCC	*Microcystis aeruginosa*	1,466,667	183,333	*
11/14/11	KR11876	IRCC	*Microcystis aeruginosa*	4,100	513	*
11/14/11	KR11877	IRJW	*Microcystis aeruginosa*	5,237,613	654,702	*
11/14/11	KR11877	IRJW	*Aphanizomenon flos-aquae*	3,555,571	56,438	*
11/22/11	KR11878	CRMC	*Microcystis aeruginosa*	7,687	961	*
11/22/11	KR11879	CRCC	None	0	0	*
11/22/11	KR11880	IRCC	*Microcystis aeruginosa*	55,024	6,878	*
11/22/11	KR11881	IRJW	*Microcystis aeruginosa*	36,987	4,623	*
11/29/11	KR11882	CRMC	*Aphanizomenon flos-aquae*	175,890	2,792	*
11/29/11	KR11882	CRMC	*Microcystis aeruginosa*	7,731	966	*
11/29/11	KR11882	CRMC	*Anabaena sp.*	7,302	107	*
11/29/11	KR11883	CRCC	*Aphanizomenon flos-aquae*	2,611	41	*
11/29/11	KR11884	IRCC	*Microcystis aeruginosa*	219	27	*
11/29/11	KR11885	IRJW	*Microcystis aeruginosa*	3,292	411	*

*The results of microcystin analysis have not been released at the time this memo was composed. Upon release, these results will be presented in a subsequent memo.

References

SWRCB. 2010. Cyanobacteria in California Recreational Water Bodies: Providing Voluntary Guidance about Harmful Algal Blooms, Their Monitoring, and Public Notification. July 2010. Document provided as part of Blue-green Algae Work Group of State Water Resources Control Board (SWRCB) and Office of Environmental Health and Hazard Assessment (OEHHA).

Appendix 1
Cumulative Species data for 2011 Public Health Samples

Date	Sample	Location	Species	Biovolume, $\mu m^3/mL$	Cells/mL	Microcystin by ELISA (µg/L)
05/24/11	KR11800	CRMC	None	0	0	ND
05/24/11	KR11801	CRCC	None	0	0	ND
05/24/11	KR11802	IRCC	None	0	0	ND
05/24/11	KR11803	IRJW	None	0	0	ND
05/24/11	KR11804	CRCC	None	0	0	0.19
06/06/11	KR11806	CRMC	*Anabaena flos-aquae*	9,623	144	ND
06/06/11	KR11807	CRCC	None	0	0	ND
06/06/11	KR11808	IRCC	None	0	0	ND
06/06/11	KR11809	IRJW	None	0	0	ND
06/06/11	KR11812	KRBI	None	0	0	ND
06/22/11	KR11813	CRMC	*Aphanizomenon flos-aquae*	49,869	792	0.16
06/22/11	KR11813	CRMC	*Microcystis aeruginosa*	1,277	160	0.16
06/22/11	KR11814	CRCC	*Anabaena flos-aquae*	378,226	5,645	0.16
06/22/11	KR11814	CRCC	*Aphanizomenon flos-aquae*	201,984	3,206	0.16
06/22/11	KR11815	IRCC	*Aphanizomenon flos-aquae*	23,588	374	ND
06/22/11	KR11815	IRCC	*Anabaena sp.*	2,572	38	ND
06/22/11	KR11815	IRCC	*Anabaena flos-aquae*	1,267	19	ND
06/22/11	KR11815	IRCC	*Microcystis aeruginosa*	1,210	151	ND
06/22/11	KR11816	IRJW	None	0	0	ND
07/05/11	KR11820	CRMC	None	0	0	ND
07/05/11	KR11821	CRCC	None	0	0	ND
07/05/11	KR11822	IRCC	*Oscillatoria sp.*	1,268	20	ND
07/05/11	KR11823	IRJW	*Aphanizomenon flos-aquae*	2,208	35	ND
07/05/11	KR11823	IRJW	*Anabaena flos-aquae*	7,044	105	ND
07/05/11	KR11824	KRBI	*Aphanizomenon flos-aquae*	13,708	218	ND
07/18/11	KR11827	CRMC	*Anabaena flos-aquae*	131,944	1,969	ND
07/18/11	KR11828	CRCC	*Anabaena flos-aquae*	3,082,134	46,002	0.57
07/18/11	KR11828	CRCC	*Aphanizomenon flos-aquae*	623,338	9,894	0.57
07/18/11	KR11829	IRCC	*Anabaena flos-aquae*	506,274	7,556	0.36
07/18/11	KR11829	IRCC	*Aphanizomenon flos-aquae*	18,170	288	0.36
07/18/11	KR11829	IRCC	*Anabaena sp.*	2,451	36	0.36
07/18/11	KR11829	IRCC	*Microcystis aeruginosa*	8,652	1,082	0.36
07/18/11	KR11830	IRJW	*Aphanizomenon flos-aquae*	1,186,477	8,762	0.30
07/18/11	KR11830	IRJW	*Anabaena flos-aquae*	587,073	18,833	0.30
07/18/11	KR11830	IRJW	*Anabaena sp.*	20,221	297	0.30
07/18/11	KR11833	KRBI	*Aphanizomenon flos-aquae*	6,899	110	ND
07/18/11	KR11833	KRBI	*Anabaena flos-aquae*	3,252	49	ND
07/18/11	KR11833	KRBI	*Microcystis aeruginosa*	498	62	ND
08/08/11	KR11834	CRMC	*Microcystis aeruginosa*	772,802	96,600	15
08/08/11	KR11834	CRMC	*Aphanizomenon flos-aquae*	94,014	1,492	15
08/08/11	KR11834	CRMC	*Anabaena flos-aquae*	27,773	415	15
08/08/11	KR11835	CRCC	*Microcystis aeruginosa*	67,717,650	8,464,706	***
08/08/11	KR11835	CRCC	*Aphanizomenon flos-aquae*	6,712,571	106,549	***
08/08/11	KR11835	CRCC	*Anabaena flos-aquae*	16,694,893	249,178	***
***Bottle broken during shipping						

Date	Sample	Location	Species	Biovolume, $\mu m^3/mL$	Cells/mL	Microcystin (µg/L)
08/08/11	KR11836	IRCC	*Microcystis aeruginosa*	180,818	22,602	3.9
08/08/11	KR11836	IRCC	*Anabaena flos-aquae*	1,242,838	18,550	3.9
08/08/11	KR11836	IRCC	*Aphanizomenon flos-aquae*	98,828	1,569	3.9
08/08/11	KR11837	IRJW	*Microcystis aeruginosa*	4,510,000	563,750	180
08/08/11	KR11837	IRJW	*Aphanizomenon flos-aquae*	2,927,400	46,467	180
08/08/11	KR11837	IRJW	*Anabaena flos-aquae*	457,833	6,833	180
08/08/11	KR11840	KRBI	*Aphanizomenon flos-aquae*	43,396	689	0.19
08/08/11	KR11840	KRBI	*Anabaena flos-aquae*	7,082	106	0.19
08/22/11	KR11841	CRMC	*Microcystis aeruginosa*	4,007,067	500,883	74
08/22/11	KR11841	CRMC	*Aphanizomenon flos-aquae*	129,150	2,050	74
08/22/11	KR11842	CRCC	*Microcystis aeruginosa*	39,425,446	4,928,181	3,600
08/22/11	KR11842	CRCC	*Aphanizomenon flos-aquae*	1,300,595	20,644	3,600
08/22/11	KR11843	IRCC	*Microcystis aeruginosa*	169,355	21,169	4.5
08/22/11	KR11843	IRCC	*Aphanizomenon flos-aquae*	54,120	859	4.5
08/22/11	KR11844	IRJW	*Aphanizomenon flos-aquae*	121,783,997	1,933,079	8.8
08/22/11	KR11844	IRJW	*Gloeotrichia echinulata*	10,071,593	148,112	8.8
08/22/11	KR11847	KRBI	*Microcystis aeruginosa*	114,649	14,331	2.3
08/22/11	KR11847	KRBI	*Aphanizomenon flos-aquae*	79,756	1,266	2.3
08/22/11	KR11847	KRBI	*Anabaena flos-aquae*	3,313	49	2.3
09/07/11	KR11848	KRBI	*Microcystis aeruginosa*	401,058	50,132	5.8
09/07/11	KR11848	KRBI	*Aphanizomenon flos-aquae*	837,436	13,293	5.8
09/15/11	KR11849	KRBI	*Microcystis aeruginosa*	195,433	24,429	4.7
09/15/11	KR11849	KRBI	*Aphanizomenon flos-aquae*	295,969	4,698	4.7
09/22/11	KR11850	KRBI	*Microcystis aeruginosa*	244,395	30,549	7.8
09/22/11	KR11850	KRBI	*Aphanizomenon flos-aquae*	89,725	1,424	7.8
09/22/11	KR11850	KRBI	*Anabaena* sp.	4,035	59	7.8
09/28/11	KR11851	KRBI	*Microcystis aeruginosa*	441,054	55,132	12
09/28/11	KR11851	KRBI	*Aphanizomenon flos-aquae*	92,404	1,467	12
09/28/11	KR11851	KRBI	*Anabaena* sp.	38,402	565	12
10/06/11	KR11852	KRBI	*Microcystis aeruginosa*	112,504	14,063	4.1
10/06/11	KR11852	KRBI	*Aphanizomenon sp.*	8,364	123	4.1
10/19/11	KR11853	CRMC	*Microcystis aeruginosa*	8,252,392	1,031,549	550
10/19/11	KR11853	CRMC	*Aphanizomenon flos-aquae*	600,678	9,535	550
10/19/11	KR11854	CRCC	*Microcystis aeruginosa*	3,309,599	413,700	170
10/19/11	KR11854	CRCC	*Aphanizomenon flos-aquae*	2,043,401	32,435	170
10/19/11	KR11855	IRCC	*Microcystis aeruginosa*	2,311,138	288,892	250
10/19/11	KR11856	IRJW	*Microcystis aeruginosa*	32,906,540	4,113,318	2,600
10/19/11	KR11857	KRBI	*Microcystis aeruginosa*	65,785	8,223	6.3
10/19/11	KR11857	KRBI	*Aphanizomenon flos-aquae*	10,682	170	6.3
10/26/11	KR11859	CRCC	*Microcystis aeruginosa*	3,062,204	382,775	190
10/26/11	KR11859	CRCC	*Anabaena sp.*	146,503	2,154	190

Date	Sample	Location	Species	Biovolume, $\mu m^3/mL$	Cells/mL	Microcystin (µg/L)
10/26/11	KR11859	CRCC	*Aphanizomenon flos-aquae*	45,244	718	190
10/26/11	KR11860	IRCC	*Microcystis aeruginosa*	48,799	6,100	2.5
10/26/11	KR11861	IRJW	*Microcystis aeruginosa*	60,330,492	7,541,311	6,100
10/26/11	KR11864	KRBI	*Microcystis aeruginosa*	61,413	7,677	4.8
10/26/11	KR11858**	CRMC	*Aphanizomenon flos-aquae*	18,152,750	288,139	3,100
10/26/11	KR11858**	CRMC	*Microcystis aeruginosa*	2,700,989	337,624	3,100
10/26/11	KR11858**	CRMC	*Anabaena sp.*	851,889	12,528	3,100
11/02/11	KR11866	CRMC	*Aphanizomenon flos-aquae*	752,137,313	11,938,688	460
11/02/11	KR11866	CRMC	*Microcystis aeruginosa*	4,441,667	555,208	460
11/02/11	KR11867	CRCC	*Microcystis aeruginosa*	780,640	97,580	4.4
11/02/11	KR11867	CRCC	*Aphanizomenon flos-aquae*	1,043,135	16,558	4.4
11/02/11	KR11868	IRCC	*Microcystis aeruginosa*	1,081,331	135,166	19
11/02/11	KR11869	IRJW	*Microcystis aeruginosa*	10,680,203	1,335,025	4,200
11/02/11	KR11869	IRJW	*Aphanizomenon flos-aquae*	4,864,182	77,209	4,200
11/02/11	KR11869	IRJW	*Anabaena sp.*	833,370	12,255	4,200
11/08/11	KR11870	CRMC	*Aphanizomenon flos-aquae*	1,383,924,324	21,967,053	*
11/08/11	KR11871	CRCC	*Aphanizomenon flos-aquae*	128,039,860	2,032,379	*
11/08/11	KR11871	CRCC	*Anabaena sp.*	10,440,170	153,532	*
11/08/11	KR11872	IRCC	*Microcystis aeruginosa*	51,896	6,487	*
11/08/11	KR11872	IRCC	*Aphanizomenon flos-aquae*	332,782	5,282	*
11/08/11	KR11873	IRJW	*Microcystis aeruginosa*	3,126,933	390,867	*
11/08/11	KR11873	IRJW	*Aphanizomenon flos-aquae*	5,009,107	79,510	*
11/08/11	KR11873	IRJW	*Anabaena sp.*	3,998,199	58,797	*
11/14/11	KR11874	CRMC	*Aphanizomenon flos-aquae*	17,870	284	*
11/14/11	KR11875	CRCC	*Aphanizomenon flos-aquae*	73,076,850	1,159,950	*
11/14/11	KR11875	CRCC	*Microcystis aeruginosa*	1,466,667	183,333	*
11/14/11	KR11876	IRCC	*Microcystis aeruginosa*	4,100	513	*
11/14/11	KR11877	IRJW	*Microcystis aeruginosa*	5,237,613	654,702	*
11/14/11	KR11877	IRJW	*Aphanizomenon flos-aquae*	3,555,571	56,438	*
11/22/11	KR11878	CRMC	*Microcystis aeruginosa*	7,687	961	*
11/22/11	KR11879	CRCC	None	0	0	*
11/22/11	KR11880	IRCC	*Microcystis aeruginosa*	55,024	6,878	*
11/22/11	KR11881	IRJW	*Microcystis aeruginosa*	36,987	4,623	*
11/29/11	KR11882	CRMC	*Aphanizomenon flos-aquae*	175,890	2,792	*
11/29/11	KR11882	CRMC	*Microcystis aeruginosa*	7,731	966	*
11/29/11	KR11882	CRMC	*Anabaena sp.*	7,302	107	*
11/29/11	KR11883	CRCC	*Aphanizomenon flos-aquae*	2,611	41	*
11/29/11	KR11884	IRCC	*Microcystis aeruginosa*	219	27	*
11/29/11	KR11885	IRJW	*Microcystis aeruginosa*	3,292	411	*

**Identified as KR11865 in previous memo

Appendix 2

Laboratory Data Sheets November 14nd, 2011 Public Health Sampling

Phytoplankton Sample Analysis

Sample:	Klamath Basin
Sample Site:	KR 11874
Sample Depth:	
Sample Date:	14-Nov-11
Total Density (#/mL):	9
Total Biovolume (um^3/mL):	17,870
Trophic State Index:	21.2

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent	Group
1	Aphanizomenon flos-aquae	9	100.0	17,870	100.0	bluegreen

Aphanizomenon flos-aquae cells/mL = 284

Note: Toxic Algae Only

Aquatic Analysts **Sample ID:** PN81

Phytoplankton Sample Analysis

Sample:	Klamath Basin
Sample Site:	KR 11875
Sample Depth:	
Sample Date:	14-Nov-11
Total Density (#/mL):	68,108
Total Biovolume (um^3/mL):	74,543,517
Trophic State Index:	80.9

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent	Group
1	Aphanizomenon flos-aquae	64,442	94.6	73,076,850	98.0	bluegreen
2	Microcystis aeruginosa	3,667	5.4	1,466,667	2.0	bluegreen

Aphanizomenon flos-aquae cells/mL = 1,159,950

Microcystis aeruginosa cells/mL = 183,333

Note: Toxic Algae Only

Aquatic Analysts **Sample ID:** PN82

Phytoplankton Sample Analysis

Sample:	Klamath Basin
Sample Site:	KR 11876
Sample Depth:	
Sample Date:	14-Nov-11
Total Density (#/mL):	5
Total Biovolume (um^3/mL):	4,100
Trophic State Index:	11.8

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent	Group
1	Microcystis aeruginosa	5	100.0	4,100	100.0	bluegreen

Microcystis aeruginosa cells/mL = 513

Note: Toxic Algae Only

Aquatic Analysts **Sample ID:** PN83

Phytoplankton Sample Analysis

Sample:	Klamath Basin
Sample Site:	KR 11877
Sample Depth:	
Sample Date:	14-Nov-11
Total Density (#/mL):	7,517
Total Biovolume (um^3/mL):	8,793,185
Trophic State Index:	65.5

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent	Group
1	Microcystis aeruginosa	4,197	55.8	5,237,613	59.6	bluegreen
2	Aphanizomenon flos-aquae	3,320	44.2	3,555,571	40.4	bluegreen

Aphanizomenon flos-aquae cells/mL = 56,438

Microcystis aeruginosa cells/mL = 654,702

Note: Toxic Algae Only

Aquatic Analysts **Sample ID:** PN84

Laboratory Data Sheets November 22nd, 2011 Public Health Sampling

Phytoplankton Sample Analysis

Sample:	Klamath Basin
Sample Site:	KR 11878
Sample Depth:	
Sample Date:	22-Nov-11
Total Density (#/mL):	15
Total Biovolume (um^3/mL):	7,687
Trophic State Index:	15.6

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent	Group
1	Microcystis aeruginosa	15	100.0	7,687	100.0	bluegreen

Microcystis aeruginosa cells/mL = 961

Note: Toxic Algae Only

Aquatic Analysts **Sample ID:** PN85

Phytoplankton Sample Analysis

Sample:	Klamath Basin
Sample Site:	KR 11879
Sample Depth:	
Sample Date:	22-Nov-11
Total Density (#/mL):	<2
Total Biovolume (um^3/mL):	
Trophic State Index:	

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent	Group
1	No Toxic Algae Present	<2				

Note: Toxic Algae Only

Aquatic Analysts **Sample ID:** PN86

Phytoplankton Sample Analysis

Sample:	Klamath Basin
Sample Site:	KR 11880
Sample Depth:	
Sample Date:	22-Nov-11
Total Density (#/mL):	20
Total Biovolume (um^3/mL):	55,024
Trophic State Index:	29.0

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent	Group
1	Microcystis aeruginosa	20	100.0	55,024	100.0	bluegreen

Microcystis aeruginosa cells/mL = 6,878

Note: Toxic Algae Only

Aquatic Analysts **Sample ID:** PN87

Phytoplankton Sample Analysis

Sample:	Klamath Basin
Sample Site:	KR 11881
Sample Depth:	
Sample Date:	22-Nov-11
Total Density (#/mL):	149
Total Biovolume (um^3/mL):	36,987
Trophic State Index:	26.2

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent	Group
1	Microcystis aeruginosa	149	100.0	36,987	100.0	bluegreen

Microcystis aeruginosa cells/mL = 4,623

Note: Toxic Algae Only

Aquatic Analysts **Sample ID:** PN88

Laboratory Data Sheets November 29nd, 2011 Public Health Sampling

Phytoplankton Sample Analysis

Sample:	Klamath Basin
Sample Site:	KR 11882
Sample Depth:	
Sample Date:	29-Nov-11
Total Density (#/mL):	247
Total Biovolume (um³/mL):	190,923
Trophic State Index:	37.9

	Species	Density #/mL	Density Percent	Biovolume um³/mL	Biovolume Percent	Group
1	Aphanizomenon flos-aquae	140	56.5	175,890	92.1	bluegreen
2	Microcystis aeruginosa	97	39.1	7,731	4.0	bluegreen
3	Anabaena sp.	11	4.3	7,302	3.8	bluegreen

Aphanizomenon flos-aquae cells/mL =	2,792
Microcystis aeruginosa cells/mL =	966
Anabaena sp. cells/mL =	107

Note: Toxic Algae Only

Aquatic Analysts **Sample ID:** PN89

Phytoplankton Sample Analysis

Sample:	Klamath Basin
Sample Site:	KR 11883
Sample Depth:	
Sample Date:	29-Nov-11
Total Density (#/mL):	5
Total Biovolume (um³/mL):	2,611
Trophic State Index:	9.3

	Species	Density #/mL	Density Percent	Biovolume um³/mL	Biovolume Percent	Group
1	Aphanizomenon flos-aquae	5	100.0	2,611	100.0	bluegreen

Aphanizomenon flos-aquae cells/mL =	41

Note: Toxic Algae Only

Aquatic Analysts **Sample ID:** PN90

Phytoplankton Sample Analysis

Sample:	Klamath Basin
Sample Site:	KR 11884
Sample Depth:	
Sample Date:	29-Nov-11
Total Density (#/mL):	3
Total Biovolume (um^3/mL):	219
Trophic State Index:	1.4

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent	Group
1	Microcystis aeruginosa	3	100.0	219	100.0	bluegreen

Microcystis aeruginosa cells/mL = 27

Note: Toxic Algae Only

Aquatic Analysts **Sample ID:** PN91

Phytoplankton Sample Analysis

Sample:	Klamath Basin
Sample Site:	KR 11885
Sample Depth:	
Sample Date:	29-Nov-11
Total Density (#/mL):	27
Total Biovolume (um^3/mL):	3,292
Trophic State Index:	10.5

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent	Group
1	Microcystis aeruginosa	27	100.0	3,292	100.0	bluegreen

Microcystis aeruginosa cells/mL = 411

Note: Toxic Algae Only

Aquatic Analysts **Sample ID:** PN92