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SVWQC

October 19, 2010

Pamela Creedon, Executive Director
Central Valley Regional Water Quality Control Board
10200 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670-6114

RE: Determination Request – Upper Feather River Watershed Group
Dissolved Oxygen and pH Management Plan

Dear Ms. Creedon:

The Upper Feather River Watershed Group (UFRWG) of the Sacramento Valley Water Quality Coalition (SVWQC) exemplifies the local grassroots, collaborative effort to address water quality issues described in SVWQC's *Regional Plan for Action.* The local leadership of the UFRWG secured both funding and partnerships to address the limited exceedances of water quality objectives for dissolved oxygen (DO), pH and E. Coli that have been detected in the Sierra, American and Indian Valleys.

To this extent, the UFRWG developed a special monitoring project to identify the factors determining DO and pH levels, and thus exceedances, at Sierra Valley (above Grizzly Creek) and Indian Valley monitoring locations. This project was conducted in collaboration with the University of California Cooperative Extension and the UC Davis, which collected samples during the 2008 irrigation season (May-October).

As is documented in the attached Special Studies authored by Holly George, Kristen Dalldorf, Cindy Noble of the University of California Cooperative Extension, Carol Dobbas of the UFRWG, and Ken Tate of the University of California at Davis, **there is absolutely no evidence** that DO and/or pH exceedances are being driven by nutrients derived from agricultural activities. Trying to understand the natural, temporally dynamic, interacting factors driving DO and pH at this site is beyond the scope of the SVWQC's responsibility under the Irrigated Lands Regulatory Program (ILRP) Management Plan protocol.

Specifically, I call your attention to Page 3 of the Special Studies, which documents that nitrogen, phosphorus and dissolved organic carbon levels were **extremely low** and in the case of Indian Valley below detection levels. As the report states in its conclusions, DO levels in Indian Valley are not driven by excessive nutrient levels which could stimulate aquatic plant and microbial oxygen demand. In Sierra Valley, while the diurnal fluctuation in DO and pH were indicative of aquatic plant photosynthesis and respiration, limited aquatic macrophytes were observed at this location.

The SVWQC views the findings and conclusions of the Special Studies as satisfying the DO and pH Management Plan requirements for Indian Creek and the Middle Fork Feather River (Sierra Valley). As is specified in the SVWQC's Criteria *for Completion of a Management Plan* it is requested that you review the attached Special Studies and make an official determination on the completeness of these management plans.

Sincerely,

Bruce Houdesheldt
Director of Regulatory Affairs
Northern California Water Association/Sacramento Valley Water Quality Coalition

Cc:	Joe Karkoski	Susan Fregien	Mark Cady	
	Russell Reid	Carol Dobbas	Ken Tate	Holly George
	Kristen Dalldorf	Claus Suverkropp	David Guy	

Special Monitoring of Dissolved Oxygen and pH in the Upper Feather River Watershed

Holly George, Kristen Dalldorf, Cindy Noble
University of California Cooperative Extension

Carol Dobbas
Upper Feather River Watershed Group

Ken Tate
University of California Davis

Reason for the Special Monitoring Study

During the 2006 and 2007 irrigation seasons, the dissolved oxygen (DO) water quality standard for cold water designation (7.0 mg/L) was exceeded (Table 1) at monitoring locations (Figure 1) below: 1) Indian Valley twice in 2006 and twice in 2007; and 2) Sierra Valley 5 times in 2006. There were no DO exceedences at monitoring locations below American Valley during either year, or Sierra Valley in 2007.

During the 2006 and 2007 irrigation seasons, the pH water quality standard (8.5) was exceeded at monitoring locations below Sierra Valley twice in 2006 and 4 times in 2007. There were no pH exceedences at monitoring locations below Indian or American Valley during either year.

NOTE: In 2006, the Sierra Valley monitoring location was located at the County Road A23 bridge on the Middle Fork Feather River (UFRW Site 11.0). In 2007, the Sierra Valley monitoring location was moved approximately 0.5 mile downstream, immediately upstream of the confluence of Grizzly Creek with the Middle Fork Feather River (UFRW Site 11.5). UFRW Site 11.0 was determined to be unrepresentative of the influence of agriculture on streamflow exiting Sierra Valley because: 1) it is located in a stagnant, pooled reach of the stream; 2) there is heavy recreational use due to access along County Road A23; and 3) discharge from grazed, irrigated pasture enters the Middle Fork Feather River below this site.

The DO and pH exceedences described above require: 1)development of a management plan for mitigation if the cause is clearly due to irrigated agriculture activities; or 2) or additional monitoring if the cause for the exceedences cannot be determined.

DO and pH levels in natural streams are determined by dynamic, interacting processes. These include aquatic plant photosynthesis and respiration, microbial decomposition of organic matter (respiration), excessive loading of dissolved and particulate nutrient and organic matter (N, P, C), flow velocity/mixing/residence time, water temperature, atmospheric pressure/elevation, and DO and pH levels in subsurface/ground water returning to the stream. A common suspect associated with excessively low DO and high pH is excessive aquatic plant growth due to nutrient (N and P) loading. During the day, aquatic plants (e.g., algae, macrophytes) conduct photosynthesis, which generates oxygen in water and raises pH via consumption of acidic carbon dioxide. During the night, aquatic plants conduct respiration which consumes oxygen in water and lowers pH by generating carbon dioxide. When aquatic plant growth is high there will be a strong 24 hour (diurnal) pattern in DO and pH with minimum readings for both constituents occurring at dawn (end of respiration) and maximum readings occurring during late afternoon-early evening (peak of photosynthesis). Dissolved oxygen and pH can also be driven by microorganisms as they convert organic matter to carbon dioxide, and consume oxygen in the process. The rate of microbial respiration decreases with temperature, so a 24 hour pattern in DO could be driven by the effect of daily temperature cycle on microbial respiration. Excessive loading of organic pollutants, or excessive aquatic plant biomass, can result in excessive microbial decomposition, affecting DO and pH levels. Dissolved oxygen is also affected by water temperature. As

water temperature increases, the amount of oxygen that water can contain (saturation) decreases. For example, at ~60 °F pure, saturated water at sea level has a dissolved oxygen concentration of ~9.8 mg/L. At ~85 °F, it is only ~7.5 mg/L at saturation. DO is also affected by mixing which creates turbulence and allows air to enter the water column through diffusion.

Data from 2006 and 2007 (Table 1) indicate that nitrogen and phosphorus levels were relatively low at both exceedence sites, particularly Indian Valley. Also that water temperatures were relatively high at both locations. Flow and mixing was minimal at both sites. Dissolved organic carbon concentrations were high at Sierra Valley, and low at Indian Valley. Dissolved organic carbon is more soluble at high pH, such as those observed at the Sierra Valley monitoring location. The 2006 Sierra Valley DO data was collected at a site with deep water (>4 ft), while the 2007 data was collected at a site with shallow water (<1 ft). Diffusion rates (transfer of oxygen between water and air) would be naturally lower at the deep water site, potentially accounting for differences observed between 2006 and 2007. Greater mixing also existed at the 2007 site.

These factors lead to uncertainty about the linkage between DO and pH exceedences and irrigated agriculture activities in UFRW. This report describes additional monitoring conducted during the 2008 irrigation season.

Special Monitoring Objective

The purpose of the special monitoring project was to collect diurnal data on DO and pH at UFRWG ILRP monitoring sites below Indian, American, and Sierra Valley across the 2008 irrigation season. Simultaneous measurement of factors such as water temperature and nutrient levels that potentially drive DO and pH was conducted to evaluate which factors might be causing exceedences.

Methods

Diurnal sample events were conducted over a 24 hour period once per month June through September 2008 at monitoring locations below American (UFRW Site 2), Indian (UFRW Site 6), and Sierra Valley (UFRW Site 11.5) (please see Figure 1, Table 2). This provided 4 complete diurnal profiles of DO and pH at each site, one per month (Jun, Jul, Aug, Sep). At each monitoring location, a diurnal sample event consisted of: 1) field measurements of DO (mg/L), percent oxygen saturation, pH, conductivity, water temperature, and discharge; and 2) collection of a stream water sample for determination of turbidity, total suspended solids, dissolved organic carbon, nitrate, ammonium, total nitrogen, ortho-phosphate, and total phosphorus. Samples were collected/data recorded early morning of day 1 (targeted between 6:00 and 7:00 am), mid morning (targeted between 10:00 and 11:00 am), mid afternoon (targeted between 2:00 and 3:00 pm), evening (targeted between 6:00 and 7:00 pm), and early morning of day 2(targeted between 6:00 and 7:00 am) (Table 2). Field measurements, water sample collection, water sample handling and hold time, and water sample analysis were conducted following methods described in the ILRP and SWAMP compliant QAPP for Proposition 50 funded project "Upper Feather River Watershed (UFRW) Irrigation Discharge Management Program" SWRCB Agreement 04-317-555-0 with the Regents of the University of California.

Results

Table 3 contains all field and laboratory data collected during this study. Figures 2, 3, and 4 illustrate diurnal patterns of DO, percent oxygen saturation, pH, and water temperature at each monitoring location June through September 2008. The pH water quality objective is not to exceed 8.5, and the DO water quality objective is not to fall below 7.0. These objectives are indicated in Figures 2 through 4. The water temperatures at which fresh water oxygen saturation (100%) results in a possible maximum DO of

7.0 mg/L at 3,500 ft (American and Indian Valley) and 5,000 ft (Sierra Valley) elevation are also indicated in these figures. Percent oxygen levels above 100%, or 7.0 mg/L, at these temperatures indicates that photosynthesis by aquatic plants could be significantly affecting DO and pH levels. Particularly if a pronounced diurnal pattern exists for DO.

American Valley pH levels never exceeded 8.5. DO levels from mid morning through evening were at or above 7.0 mg/L and near saturation (Figure 2, Table 3). Early morning DO levels in June, July, and August were at or below 7.0 mg/L. Water temperature did not exceed 27 C, the point at which temperature would limit DO below 7.0 mg/L. Nitrogen, phosphorus, TSS, and DOC levels were extremely low in all samples (Table 3), with N and P often below detection levels. There was relatively limited diurnal fluctuation in DO, certainly in pH. DO levels did not exceed 100% saturation.

Indian Valley pH levels never exceeded 8.5 (Figure 3, Table 3). DO levels June, July, and August were at or below 7.0 mg/L and below saturation in all months. DO levels in September were at or above 7.0 mg/L. Water temperature did not exceed 27 C, the point at which temperature would limit DO below 7.0 mg/L. Nitrogen, phosphorus, and DOC levels were extremely low in all samples (Table 3), with N and P often below detection levels. TSS was relatively high (mean = 21.8 mg/L) – compared to American Valley (mean = 7.8 mg/L). There was limited diurnal fluctuation in DO, certainly in pH. DO levels did not exceed 100% saturation.

Sierra Valley pH levels exceeded 8.5 during mid day in July, August, and September (Figure 4, Table 3). Mid day DO levels were at or above 7.0 mg/L in all months, with highest levels occurring August and September. Early morning DO levels were almost always below 7.0. Mid day water temperatures in August and September did exceed 24 C, the point at which temperature would limit DO below 7.0 mg/L. Nitrogen, and phosphorus levels were extremely low in all samples (Table 3), often below detection levels. TSS was relatively high (mean = 16.3 mg/L) – compared to American Valley, and DOC was high (mean = 11.1 ppm) compared to both American (mean = 1.1 ppm) and Indian Valley (mean = 2.1 ppm). There was significantly greater diurnal fluctuation in DO and pH compared to American and Indian Valleys, particularly as the irrigation season progressed. Mid day DO levels exceed 100% saturation during August and September.

Conclusions

DO levels were consistently below 7.0 mg/L at Indian Valley. This does not appear to be driven by excessive nutrient (N, P, DOC) levels which could stimulate aquatic plant and microbial oxygen demand. Relatively narrow diurnal fluctuation in DO and pH support this conclusion. Water temperature also does not appear to be the reason for low DO levels. Microbial oxygen demand could exist as microbes decompose particulate organic matter (POM). We determined that ~30% of TSS was volatile (a surrogate measure for POM) or an average of 7.0 mg/L VTSS for this location. Low flow could contribute to low DO levels. However, we monitored DO at 2 additional locations about 0.5 and 1.0 mile downstream of Indian Valley and found no significant recovery of DO with increased flow and turbulence through this bedrock/boulder cascade reach (data not shown).

Relatively significant diurnal fluctuation in DO and pH was observed at Sierra Valley. Daytime DO levels were commonly at or above 100% saturation. While this pattern is indicative of aquatic plant photosynthesis and respiration, we observed limited (<5% water or substrate surface coverage) aquatic macrophytes at the location. Very low nitrogen and phosphorus levels do not seem adequate to support excessive aquatic plant growth. DOC and VTSS levels were relatively high, and could create some microbial oxygen demand which contributes to diurnal DO and pH fluctuations. It is possible that algae

could account for the diurnal DO and pH swings – but we do not have direct measures from which to make such a conclusion.

Table 1. Dissolved oxygen, pH, total nitrogen, total phosphorus, dissolved organic carbon, total suspended solids, and water temperature at Sierra Valley and Indian Valley monitoring locations during 2006 and 2007 irrigation season.

Location	Sample Date	Sample Time	DO (mg/L)	pH	TN mg/L	TP mg/L	DOC mg/L	TSS mg/L	Water Temperature (F)
Sierra Valley*	5/23/2006	14:36	**5.8**	7.4	0.64	0.03	9.6	5.9	59.5
	6/6/2006	16:39	**6.4**	7.2	0.70	0.04	9.7	7.1	72.9
	7/11/2006	15:20	**5.0**	7.6	0.87	0.05	11.4	21.8	71.6
	8/8/2006	15:35	**5.4**	7.9	0.97	0.10	10.6	31.8	68.5
	9/5/2006	16:35	**6.5**	8.3	0.88	0.12	10.9	50.8	66.7
	9/26/2006	13:45	7.7	**8.7**	0.99	0.14	11.2	51.7	61.3
Indian Valley	5/23/2006	9:05	8.6	7.1	0.16	0.06	2.7	18.8	50.0
	6/6/2006	8:30	7.9	7.1	0.13	0.07	2.4	12.4	57.7
	7/11/2006	8:45	**6.5**	7.1	0.16	0.04	2.1	11.2	64.6
	8/8/2006	8:00	**6.6**	7.4	0.15	0.06	1.8	14.1	64.6
	9/5/2006	9:05	8.2	7.5	0.16	0.06	2.0	12.9	62.4
	9/26/2006	11:20	9.7	7.6	0.11	0.05	1.7	5.9	54.3
Sierra Valley*	5/8/2007	13:40	-	8.1	0.79	0.07	11.2	20.6	-
	6/5/2007	16:15	8.7	8.5	0.78	0.05	10.6	12.4	72.7
	7/10/2007	14:20	12.3	**9.2**	0.94	0.07	11.2	6.5	80.8
	8/7/2007	15:00	15.8	**9.8**	0.43	0.11	10.2	8.8	79.9
	9/4/2007	13:55	8.3	**8.9**	0.66	0.02	6.8	4.1	69.8
	10/2/2007	14:25	11.5	**9.0**	0.42	0.01	7.6	5.9	59.9
Indian Valley	5/8/2007	11:20	-	7.4	0.16	0.03	2.4	8.8	57.9
	6/5/2007	11:15	7.3	6.9	0.22	0.05	2.2	15.3	63.0
	7/10/2007	10:45	**6.6**	7.4	0.13	0.06	1.6	12.4	68.9
	8/7/2007	10:15	**5.7**	-	0.08	0.10	1.8	7.1	63.7
	9/4/2007	14:45	7.1	7.6	0.12	0.05	1.5	8.2	66.7
	10/2/2007	13:40	7.4	7.7	0.13	0.03	2.3	12.4	56.3

* Sierra Valley monitoring location during 2006 was at the County Road A23 bridge crossing the Middle Fork Feather River. This monitoring location was moved downstream ~0.5 mile in 2007, immediately above the confluence of Grizzly Creek with the Middle Fork Feather River.

Table 2. Diurnal sample events during 2008 and target sample collection times. During each diurnal sample event, monitoring locations below American, Indian, and Sierra Valley were each sampled over the course of one 24 period.

Sample Periods	Target Daily Sample Times
June 4-6	6-7 am (day 1)
July 1-3	10-11 am (day 1)
August 11-13	2-3 pm (day 1)
September 9-11	6-7 pm (day 1)
	6-7 am (day 2)

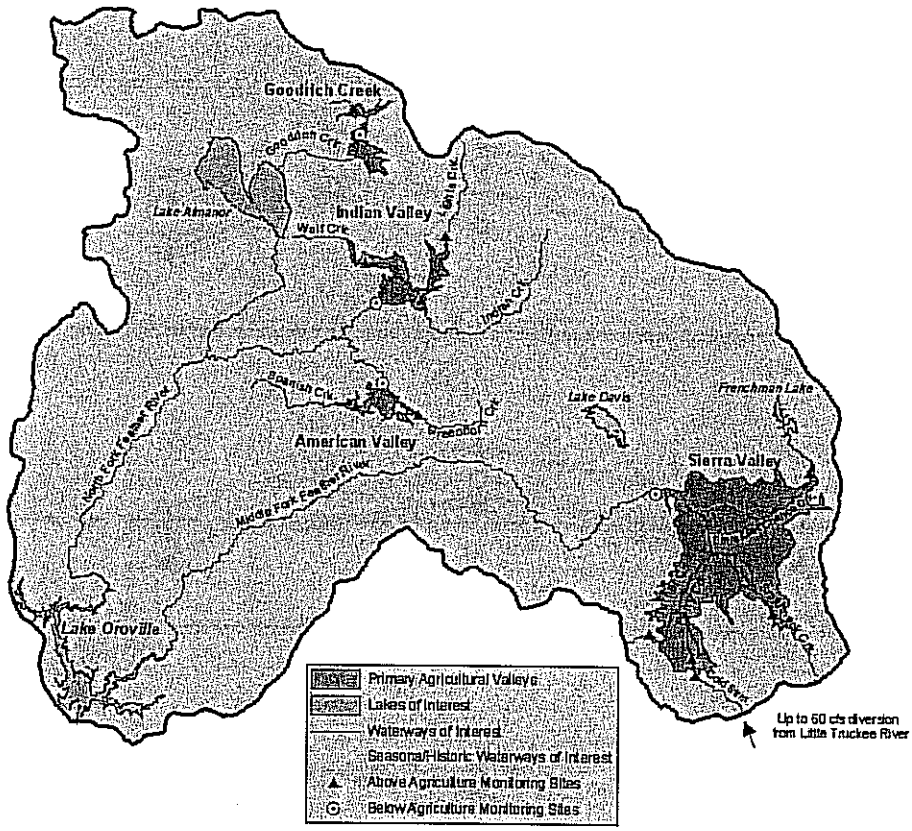

Figure 1. Upper Feather River Watershed sample locations below American (UFRW Site 2), Indian (UFRW Site 6), and Sierra Valley (UFRW Site 11.5) are shown in yellow.

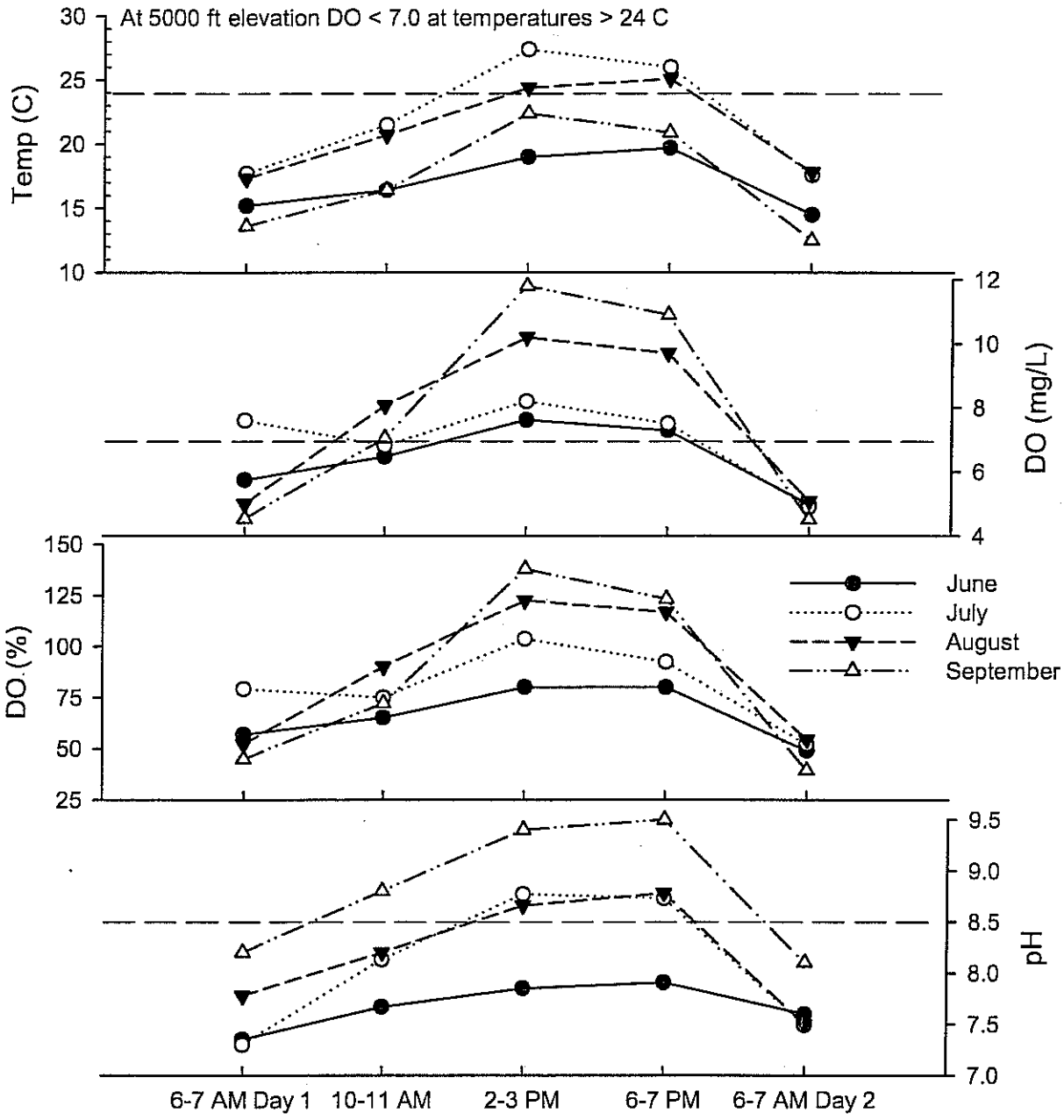

Figure 4. Water temperature, dissolved oxygen, and pH at the sample location below Sierra Valley during 4 twenty four hour sample periods in June, July, August, and September 2008.

Table 3. All field and laboratory data collected during this study. DO and pH exceedences are bolded.

Sample Information					Field Measured Data					Laboratory Determined from Field Collected Stream Water Samples									
Location	Month	Sample	Date	Time	Air Temp	Wat Temp	DO	DO	field pH	lab pH	Turbidity	EC	TSS	NH4-N	NO3-N	Total N	PO4-P	Total P	DOC
					C	C	mg/L	%			ntu	uS/cm	mg/L	ppm	ppm	ppm	ppm	ppm	ppm
American	Jun	6-7 A	6/5	6:55	4.4	11.8	7.03	65	7.4	7.7	2.2	101	2	0.014	0.041	0.191	<0.005	0.021	1.5
		10-1A	6/5	10:00	21	12.4	7.12	66	7.6										
		2-3 P	6/5	15:22	23	17.4	7.69	81	7.7	7.7	3.4	97	5	0.023	0.035	0.207	0.009	0.019	1.3
		6-7 P	6/5	18:57	17.5	18.3	6.95	74	7.6										
		6-7 A	6/6	6:34	5.8	13.1	6.53	62	7.2	7.5	4.6	108	7	0.012	0.043	0.222	<0.005	0.006	1.4
	Jul	6-7 A	7/2	7:05	7.8	16.7	6.1	63	7.3	7.5	5.2	139	6	0.013	0.070	0.065	0.007	<0.005	1.0
		10-11A	7/2	11:20	28.4	18.1	7.2	76	7.5										
		2-3 P	7/2	15:20	31	21.5	8.15	90	7.8	7.6	4.6	130	6	0.013	0.057	0.112	<0.005	<0.005	0.9
		6-7 P	7/2	7:05	22.6	21.8	7.67	88	7.8										
		6-7 A	7/3	7:05	9.4	16.7	5.8	60	7.4	7.5	5.9	137	9	0.013	0.072	0.033	<0.005	<0.005	0.9
	Aug	6-7 A	8/12	7:30	12.6	16.5	5.96	61	7.4	7.3	3.8	137	10	0.024	0.042	0.069	<0.005	<0.005	1.3
		10-11A	8/12	10:20	26	17.7	6.65	69	7.5										
		2-3 P	8/12	14:05	37.8	21.8	7.34	83	7.6	7.4	5.7	125	12	0.020	0.027	0.056	<0.005	<0.005	1.0
		6-7 P	8/12	18:00	33	23.8	7.87	92	8.0										
		6-7 A	8/13	7:10	10.4	16.8	5.85	60	7.3	7.4	6.6	141	12	0.022	0.056	0.096	<0.005	<0.005	0.9
	Sep	6-7 A	9/10	8:00	3.6	13.7	7.19	70	7.4	7.8	7.7	149	10	0.012	0.017	<0.007	<0.005	0.007	1.1
		10-11A	9/10	11:45	25.5	15.8	8.2	82	7.5										
		2-3 P	9/10	15:45	32	19.1	9.05	98	7.5	7.7	6.2	147	5	0.011	0.021	0.144	<0.005	0.014	1.1
		6-7 P	9/10	19:00	18.5	18.5	8.48	92	7.6										
		6-7 A	9/10	7:45	3	13.5	7.31	70	7.6	7.6	8.5	149	10	0.018	0.018	<0.007	<0.005	0.017	0.9
Indian	Jun	6-7 A	6/5	8:40	11.7	13.8	6.26	60	7.5	7.5	5.1	119	12	0.010	<0.007	0.238	0.018	0.050	2.2
		10-11 A	6/5																
		2-3 P	6/5	1:48	24.4	17.3	7.06	74	7.5	7.6	5.8	118	12	0.025	<0.007	0.207	0.018	0.057	2.3
		6-7 P	6/5	18:05	22.4	19.4	6.72	73	7.5										
		6-7 A	6/6	7:12	13	15.2	6.02	60	7.3	7.4	7.9	121	24	0.011	<0.007	0.175	0.015	0.061	2.2
	Jul	6-7 A	7/2	6:20	6.2	18.9	5.39	58	7.2	7.3	8.9	169	22	0.012	<0.007	0.538	0.017	0.046	1.7
		10-11 A	7/2	10:25	25.2	18.7	5.61	60	7.2										
		2-3 P	7/2	14:30	32	21.6	6.65	76	7.2	7.2	10.3	173	20	<0.007	<0.007	0.065	0.014	0.039	1.7
		6-7 P	7/2	18:30	29.2	23.9	6.7	80	7.2										
		6-7 A	7/3	6:20	9.2	18.6	5.27	56	7.3	7.2	9.6	168	22	0.010	<0.007	0.033	0.018	0.046	1.7
	Aug	6-7 A	8/12	6:41	16.2	20.1	5.25	58	7.2	7.3	12.6	167	36	0.027	<0.007	0.162	0.011	0.056	2.2
		10-11 A	8/12	9:35	17.7	20	4.95	54	7.4										
		2-3 P	8/12	15:05	37.5	23	6.5	77	7.2	7.3	8.9	177	25	0.009	<0.007	0.109	0.012	0.043	2.2
		6-7 P	8/12	18:30	33	23.7	7.3	87	7.4										
		6-7 A	8/13	6:28	9	20.8	5.05	57	7.2	7.3	8.0	173	32	0.011	<0.007	0.176	0.011	0.051	2.0
	Sep	6-7 A	9/10	7:00	3.4	15.8	6.62	67	7.1	7.5	13.7	202	23	0.017	<0.007	0.159	0.010	0.053	2.8

		10-11 A	9/10	10:55	27.4	16.8	6.98	72	7.3										
		2-3 P	9/10	14:50	31.7	19.9	7.97	88	7.2	7.4	11.9	200	17	0.020	<0.007	0.028	0.010	0.053	2.2
		6-7 P	9/10	18:25	23.1	20.5	8.21	91	7.3										
		6-7 A	9/11	6:55	0.7	15.9	7.84	80	7.3	7.4	12.3	192	17	0.014	<0.007	0.013	0.010	0.048	1.9
Sierra	Jun	6-7 A	6/4	7:09		15.2	5.75	57	7.4	7.7	6.5	161	14	0.037	<0.007	1.090	0.028	0.066	16.7
		10-11 A	6/4	10:42		16.4	6.47	65	7.7										
		2-3 P	6/4	14:57	16	19	7.62	80	7.9	8.0	5.9	159	12	0.033	<0.007	1.090	0.018	0.061	16.2
		6-7 P	6/4	18:22		19.7	7.29	80	7.9										
		6-7 A	6/5	6:30	0.7	14.5	4.98	49	7.6	7.8	6.4	162	12	0.028	<0.007	1.153	0.024	0.063	16.5
	Jul	6-7 A	7/1	7:00	10.3	17.7	7.6	79	7.3	7.5	6.4	190	11	0.022	<0.007	0.680	0.027	0.054	9.7
		10-11 A	7/1	10:28	25	21.5	6.81	75	8.1										
		2-3 P	7/1	3:15	29.8	27.4	8.2	104	8.8	8.4	9.9	177	15	0.019	<0.007	0.648	0.022	0.052	9.4
		6-7 P	7/1	18:30	28.3	26	7.5	93	8.7										
		6-7 A	7/2	6:56	10.2	17.6	4.9	52	7.5	7.8	6.8	195	12	0.013	<0.007	0.696	0.027	0.052	9.4
	Aug	6-7 A	8/11	7:18	8.7	17.3	5	52	7.8	7.8	8.5	193	17	0.043	<0.007	0.653	<0.005	0.039	9.3
		10-11 A	8/11	11:55	28.6	20.7	8.06	90	8.2										
		2-3 P	8/11	14:40	31	24.4	10.2	123	8.7	7.9	10.3	181	26	0.026	<0.007	0.693	<0.005	0.039	9.7
		6-7 P	8/11	18:10	25.4	25.1	9.7	117	8.8										
		6-7 A	8/12	7:00	10.7	17.8	5.09	55	7.5	7.8	7.0	194	15	0.025	<0.007	0.720	0.007	0.041	9.5
	Sep	6-7 A	9/9	7:20	4.4	13.6	4.54	45	8.2	7.9	8.4	195	12	0.024	<0.007	0.537	<0.005	0.024	8.9
		10-11 A	9/9	10:25	24.4	16.4	7.05	72	8.8										
		2-3 P	9/9	14:30	27.8	22.4	11.8	138	9.4	8.8	24.1	156	33	0.034	<0.007	0.609	<0.005	0.024	9.1
		6-7 P	9/9	18:20	21.1	20.9	10.9	123	9.5										
		6-7 A	9/10	7:22	2.2	12.5	4.51	39	8.1	8.4	11.7	186	17	0.018	<0.007	0.522	<0.005	0.029	8.8