

Cruise Report

2013 RMP Water Cruise

Contract No. 1048

September 18th, 2013

Submitted to:

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1. Introduction

This report details activities associated with the annual Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP) water cruise. The RMP water sampling program was redesigned in 2002 to adopt a randomized sampling design at thirty-one sites in place of the twenty-six “spine of the Estuary” stations sampled previously. The 2013 annual sampling continued implementation of the randomized strategy, but as first implemented beginning with the 2007 cruise, the number of sites sampled continued at twenty-two stations sampled in the dry season of alternate years.

2. Cruise Report

2.1. Objectives

All sampling was conducted from the *RV Turning Tide*. The objectives of the sampling effort were to collect the following:

Real-time Data Collection

1. Real-time data over the duration of sampling for conductivity, temperature, optical back scatterance (OBS), and dissolved oxygen (DO) by AMS (1 meter CTD cast for duration of sampling, followed by a full water column profile where water depth allows).
2. Water samples from 22 sites for on-board (field meter) measurement of DO, pH, salinity, conductivity, and temperature by SFEI.
3. Document current and recent weather conditions at each site.

Total Fraction

Unfiltered water samples from 22 sites (and 2 replicates) for Brooks Rand, Ltd. (BRL) for analysis of **total**:

4. Trace metals suite (Cd, Co, Cu, Fe, Mn, Ni, Pb, Zn) by ICP-MS
5. Ag by APDC
6. Hg by CVAFS
7. MeHg by ethylation/CVAFS
8. As and Se by column chelation and ICP-MS
9. Whole water samples from 22 sites (and 2 replicates) for analysis of CN by Central Contra Costa Sanitary District (Central San)
10. Whole water samples from 22 sites (and 2 replicates) for analysis of Cu and Ni by City of San Jose
11. Whole water samples from 22 sites (and 2 replicates) for analysis of SSC by EBMUD
12. Whole water grab samples from 10 sites (and one replicate) for analysis of orthophosphate flame retardants by Chen Laboratory at Southern Illinois University (SIU)
13. Whole water samples from 10 sites for analysis of total Fipronil by CDFW Water Pollution Control Laboratory (WPCL).
14. Whole water grab samples from 2 sites for analysis of OH-BDE by Arnold Laboratory at University of Minnesota (UMN).

Particulate Fraction

15. Two particulate (filter) samples from 22 sites (and 2 replicates, 6 blanks) for POC analysis by ALS Environmental (ALS, formerly Columbia Analytical Services, Inc.).
16. Particulate (filter) samples from 22 sites (and 2 replicates) for pigment (chlorophyll-a, phaeophytin) analysis by EBMUD.

Dissolved Fraction

17. Water dissolved samples from 22 sites (and 2 replicates) for dissolved organic carbon (DOC) analysis by ALS.

Filtered (using pre-cleaned 0.45µm cartridge filter) water samples from 22 (and 2 replicates and 1 field blank) sites for Brooks Rand, Ltd. (BRL) for analysis of **dissolved**:

18. Trace metals suite (Cd, Co, Cu, Fe, Mn, Ni, Pb, Zn) by ICP-MS
19. Ag by APDC
20. Hg by CVAFS
21. MeHg by ethylation/CVAFS
22. As and Se by column chelation and ICP-MS

Filtered (using same 0.45µm cartridge as above for BRL) water samples from 22 sites (and 2 replicates) for EBMUD for analysis of dissolved:

23. Ammonia
24. Salinity
25. Hardness

Filtered (using same 0.45µm cartridge as above for BRL) water samples from 22 sites (and 2 replicates) for ALS for analysis of dissolved:

26. Nitrate/nitrite
27. Phosphate
28. Silica

29. Filtered water samples (using same 0.45µm cartridge as above for BRL) from 22 sites (and 2 replicates and one field blank) for analysis of Cu and Ni by City of San Jose

2.2. Personnel

The personnel and work assignments for this cruise are shown in **Error! Reference source not found.**

Table 1. Personnel for 2013 RMP Water Cruise

Name	Affiliation	Duties
Amy Franz	SFEI	Field Sampling (7/30, 8/2, 8/7, 8/8)
Meg Sedlak	SFEI	Field Sampling (7/30, 7/31, 8/5)
Don Yee	SFEI	Field Sampling (7/30 – 8/1)
Ellen Willis-Norton	SFEI	Field Sampling (7/31, 8/2, 8/5, 8/6)
David Gluchowski	SFEI	Field Sampling (8/1, 8/7, 8/8)
Becky Sutton	SFEI	Field Sampling (8/1)
Adam Wong	SFEI	Field Sampling (8/2, 8/6)
Mike Weaver	SFEI	Field Sampling (8/5)
Emily Novick	SFEI	Field Sampling (8/7, 8/8)
R. Eastman	SFEI	Field Sampling (8/2)
Julian Damashek	Stanford	Special Study (8/5 – 8/8)
K. Christie	Stanford	Special Study (8/6)
Kade Pettie	Stanford	Special Study (8/7)
Rebecca Isquith	AMS	Cruise Manager (7/30 – 8/2)
Traci Linder	AMS	Cruise Manager (8/5 – 8/8)
Paul Salop	AMS	Cruise Manager, Field Sampling (7/30, 8/5)
Bryan Bemis	AMS	Logistics (7/29, 8/8)
Chris Vallee	USBR	<i>RV Turning Tide</i> , Skipper
Norbert Vanden Branden	USBR	<i>RV Turning Tide</i> , Mate (7/30 – 8/2, 8/5)
Trevor Violette	USBR	<i>RV Turning Tide</i> , Mate (8/5 – 8/8)

2.3. Sampling Activities

Sampling activities for the 2013 RMP Water Cruise are shown in **Error! Reference source not found.**

Table 2. Sampling Activities for 2013 RMP Water Cruise

Date	Time	Activity
July 29, 2013	1100-1700	SFEI and AMS personnel mobilized all sampling gear aboard vessel <i>R/V Turning Tide</i> at Redwood City Marina.
July 30, 2013	0700-0717	SFEI and AMS personnel mobilized all remaining sampling gear aboard vessel at Redwood City Marina. Conducted safety briefing and departed for LSB060W.
	0804-1056	Sampled LSB060W and Field Blanks, departed for LSB058W.
	1115-1217	Sampled LSB058W, departed for LSB056W.
	1230-1345	Sampled LSB056W, departed for Redwood City Marina.
	1440-1500	Arrived Redwood City Marina and demobilized vessel. SFEI personnel transported CN samples to SFEI. Mr. Salop retained all remaining samples for transport to AMS.
July 31, 2013	0700-0714	SFEI and AMS personnel mobilized all sampling gear aboard vessel at Redwood City Marina. Conducted safety briefing and departed for LSB055W.
	0803-0950	Sampled LSB055W, departed for LSB057W.
	1002-1125	Sampled LSB057W, departed for BA30.
	1143-1258	Sampled BA30, departed for Redwood City Marina.

Date	Time	Activity
	1345-1400	Arrived Redwood City Marina and demobilized vessel. SFEI personnel transported CN and OH-BDE samples to SFEI. Ms. Linder retrieved all remaining samples for transport to AMS.
Aug 1, 2013	0700-0712	SFEI and AMS personnel mobilized all sampling gear aboard vessel at Redwood City Marina. Conducted safety briefing and departed for SB066W.
	0741-0929	Sampled SB066W, departed for SB064W.
	1023-1240	Sampled SB064W, departed for SB065W.
	1254-1454	Sampled SB065W, departed for San Leandro Marina.
	1530-1600	Arrived San Leandro Marina and demobilized vessel. Aloha Transportation transported sampling personnel to Redwood City to retrieve personal vehicles. SFEI personnel transported CN samples to SFEI. Aloha Transportation (Aloha) retrieved all remaining samples for transport to AMS.
Aug 2, 2013	0700-0716	SFEI and AMS personnel mobilized all sampling gear aboard vessel at San Leandro Marina. Conducted safety briefing and departed for CB038W.
	0753-0930	Sampled CB038W, departed for CB036W.
	0958-1126	Sampled CB036W, departed for BC10.
	1138-1251	Sampled BC10, departed for Emeryville Marina.
	1315-1345	Arrived Emery Cove Yacht Harbor and demobilized vessel. Aloha Transportation transported sampling personnel to San Leandro to retrieve personal vehicles. SFEI personnel transported CN samples to SFEI. Aloha retrieved all remaining samples for transport to AMS.
Aug 5, 2013	0700-0726	Mobilized sampling gear aboard vessel at Emery Cove Yacht Harbor. Conducted safety briefing and departed for BC20.
	0854-1040	Sampled BC20, departed for CB037W.
	1139-1313	Sampled CB037W, departed for Emeryville Marina.
	1341-1404	Arrived Emery Cove Yacht Harbor and demobilized vessel. SFEI personnel transported whole water samples to SFEI. Mr. Salop retrieved all remaining samples for transport to AMS.
Aug 6, 2013	0700-0715	Mobilized sampling gear aboard vessel at Emery Cove Yacht Harbor. Conducted safety briefing and departed for SPB037W.
	0819-1015	Sampled SPB037W, departed for SPB036W.
	1044-1311	Sampled SPB036W, departed for SPB038W.
	1336-1506	Sampled SPB038W, departed for Benicia Marina.
	1600-1630	Arrived Benicia Marina, Benicia, and demobilized vessel. Aloha transported sampling personnel to Emeryville to retrieve personal vehicles. SFEI personnel transported CN samples to SFEI. Aloha retrieved all remaining samples for transport to AMS.
Aug 7, 2013	0700-0725	Mobilized sampling gear aboard vessel at Benicia Marina and departed for SU044W.
	0757-0938	Sampled SU044W, departed for SU045W.
	0950-1000	Skipper determined that conditions would not allow for safe transit to SU045W, so station is aborted. Depart for replacement station SU047W.
	1040-1213	Sampled SU047W, departed for SU046W.
	1251-1402	Sampled SU046W, departed for Driftwood Marina.

Date	Time	Activity
	1430-1500	Arrived Driftwood Marina, Oakley, and demobilized vessel. Aloha transported sampling personnel to Benicia to retrieve personal vehicles. SFEI personnel transported CN samples to SFEI. Aloha retrieved all remaining samples for transport to AMS.
Aug 8, 2013	0700-0715	Mobilized sampling gear aboard vessel at Driftwood Marina and departed for BG20.
	0737-0900	Sampled BG20, departed for BG30.
	0933-1113	Sampled BG30, departed for Driftwood Marina.
	1130-1230	Arrived Driftwood Marina. Demobilized vessel of all water cruise samples and sampling equipment. SFEI personnel transported CN and OH-BDE samples to SFEI AMS personnel retrieved all remaining samples and sampling equipment for transport to AMS.

2.4. Discussion

As described in the cruise plan, one target site for 2013, LSB059W, was removed from the site list for 2013 due to its location between the Dumbarton Bridge and railroad bridge to the south (Figure 1). It was replaced for 2013 with site LSB0060W.



Figure 1. Location of Target Location of LSB059W.

The sample ID system for all samples was as follows:

RMP-13WC-XXXX

Where:

RMP	=	Project
13	=	Cruise Year
WC	=	Matrix (Water Cruise)
XXXX	=	Unique ID number

As in previous years, SFEI staff recorded a profile of standard water quality parameters for the duration of sampling, and a snapshot of these records was recorded on the field datasheets. At three stations (BA30, LSB055W, and LSB057W), staff was unable to get the pH meter to calibrate properly. Data for pH will be available for these three stations throughout the duration of the cast through the Sea-Bird CTD (delivered separately).

The container containing the Chl-a sample collected at site SB065W was broken in transport from the vessel and deemed unusable. After discussion with SFEI and EBMUD, it was decided to use the backup POC filter sample collected at the site in its place. Therefore, sample ID RMP-13WC-1371 has been re-assigned to analysis of Chl-a by EBMUD. This sample has had collection comments added within the sample ID spreadsheet to reflect this, but has not yet been qualified. Loss of the backup filter assigned to POC analysis not affect results of POC reported by ALS (reported associated with POC filter #1 at the site, RMP-13WC-1370).

One site contained within the site list for the cruise was dropped during cruise implementation. At site SU045W, which required transit of approximately 1 nautical mile over a 5' (MLLW) flat, the captain determined environmental conditions present precluded safe access within the available time window. This site was therefore dropped and replaced with site SU047W.

Shortly after completion of the cruise, AMS was notified by Da Chen of the breakage of multiple sample containers collected for analysis of OP flame retardants due to a storage issue at the laboratory. Samples that were reported as broken were collected at sites LSB055W, LSB058W, LSB060W, SB065W, SB066W, and BLIND 3 (field duplicate for field sample collected at LSB060W). There was no attempt made to replace the compromised samples associated with the current sampling effort.

2.5. Sampling Sites

2013 RMP Water Cruise sampling sites are listed in Table 3. All samples collected are listed in Table 4. Sample containers and sample handling procedures are summarized in Table 5. Weather conditions encountered at time of sampling are shown in Table 6. Snapshot of water quality parameters recorded from SFEI YSI meter are shown in

Table 7.

Table 3. 2013 RMP Water Cruise Site Coordinates and Water Depth. Sample depths are not corrected for tidal action.

Site Code	Latitude		Longitude		Depth (m)
	Target	Actual	Target	Actual	
BA30	37.51375	37.51416	-122.13461	-122.13558	4.6
BC10	37.82158	37.82232	-122.34950	-122.34940	6.1
BC20	37.79150	37.79199	-122.67333	-122.67404	27.8
BG20	38.05967	38.05983	-121.81127	-121.81085	10
BG30	38.02054	38.02041	-121.80627	-121.80537	10.7
CB036W	37.78990	37.78961	-122.34503	-122.34470	9.8
CB037W	37.85334	37.85417	-122.34639	-122.34626	3
CB038W	37.72551	37.72531	-122.27367	-122.27373	2.7
LSB055W	37.48405	37.48458	-122.11844	-122.11815	1.8
LSB056W	37.48483	37.48478	-122.08613	-122.08614	3.6
LSB057W	37.49582	37.49578	-122.10428	-122.10458	12.2
LSB058W	37.47377	37.47475	-122.09429	-122.09463	2.6
LSB060W	37.48782	37.48787	-122.09487	-122.09483	2.7
SB064W	37.61330	37.61362	-122.20157	-122.20180	3
SB065W	37.62014	37.6199	-122.23308	-122.23308	3
SB066W	37.52538	37.52519	-122.15204	-122.15136	12.8
SPB036W	38.00547	38.00562	-122.38678	-122.38651	3
SPB037W	38.01701	38.01686	-122.42147	-122.42175	6.1
SPB038W	38.03577	38.03585	-122.30250	-122.30240	4
SU044W	38.08613	38.08577	-122.05090	-122.05145	2.3
SU046W	38.07502	38.07495	-121.94886	-121.94905	3.4
SU047W	38.03975	38.03967	-122.11632	-122.11595	11.6

Table 4. 2013 RMP Water Samples Collected by Site.

SITECODE	CTD -AMS	Conventional WQ - SFEI	Trace Elements, T - BRL	Ag, As, Se, T - BRL	Hg, T - BRL	meHg, T - BRL	Cu, Ni, T – City of SJ	SSC, T (1L) - EBMUD	SSC, T (500ml) - EBMUD	CN, T (500ml) – Central San	Fipronil, T (1L) – WPCL	POC – ALS	Pigments, P - EBMUD	DOC – ALS	Trace Elements, D - BRL	Ag, As, Se, D - BRL	Hg, D - BRL	meHg, D - BRL	Cu, Ni, D – City of SJ	Ammonia, D - EBMUD	Nitrate, nitrite, phosphate, D - ALS	Silica, D - ALS	Salinity, Hardness – EBMUD	OP Flame Retardant, T -SIU	OH-BDE - UMN
Field Blank									1	1	1	6												1	
BC10	1	1	1	1	1	1	1	1	1	1		2	1	1	1	1	1	1	1	1	1	1	1	1	
BC20	1	1	1	1	1	1	1	1	1	1		3	1	1	1	1	1	1	1	1	1	1	1		
BG20	1	1	1	1	1	1	1	1	1	1		2	1	1	1	1	1	1	1	1	1	1	1		
BG30	1	1	1	1	1	1	1	1	1	1		2	1	1	1	1	1	1	1	1	1	1	1		1
BA30	1	1	1	1	1	1	1	1	1	1		2	1	1	1	1	1	1	1	1	1	1	1	1	
CB036W	1	1	1	1	1	1	1	1	1	1		2	1	1	1	1	1	1	1	1	1	1	1		
CB037W	1	1	1	1	1	1	1	1	1	1		2	1	1	1	1	1	1	1	1	1	1	1		
CB038W	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	
LSB055W	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1
LSB056W	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1		
LSB057W	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1		
LSB058W	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	
LSB060W	1	1	1	1	1	1	1	1	1	1		2	1	1	1	1	1	1	1	1	1	1	1	2	
SB064W	1	1	2	2	2	2	2	2	2	2	1	4	2	2	2	2	2	2	2	2	2	2	2		
SB065W	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
SB066W	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	
SPB036W	1	1	2	2	2	2	2	2	2	2	1	4	2	2	2	2	2	2	2	2	2	2	2		
SPB037W	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1		
SPB038W	1	1	1	1	1	1	1	1	1	1		2	1	1	1	1	1	1	1	1	1	1	1	1	
SU044W	1	1	1	1	1	1	1	1	1	1		2	1	1	1	1	1	1	1	1	1	1	1		
SU046W	1	1	1	1	1	1	1	1	1	1		2	1	1	1	1	1	1	1	1	1	1	1		
SU047W	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	
Total	22	22	24	24	24	24	24	24	24	25	11	30	24	24	25	25	25	25	25	24	24	24	24	12	2

Table 5. Containers and Sample Handling for 2013 RMP Water Cruise. (T=total, P=particulate, D=dissolved) Samples were stored on wet ice and in the dark, unless otherwise noted.

Sample	T/P/D	Lab	Containers per station	Handling Requirements
DO, cond, pH, temp, OBS	T	AMS	None	CTD deployment
DO, cond, pH, temp, sal	T	SFEI	None	Grab measurement on board vessel
Trace Elements Suite	T	BRL	1 x 500ml HDPE	Dup at 2 sites
Ag, As, Se	T	BRL	1 x 2L HDPE	Dup at 2 sites
MeHg	T	BRL	250 ml FLPE	No rinse; has 1-2 ml 50% H ₂ SO ₄ ; dup at 2 sites
THg	T	BRL	250 ml FLPE	Dup at 2 sites
Cu, Ni	T	City of SJ	500 ml HDPE	Dup at 2 sites
CN	T	Central San	1L HDPE	*Preserve with NaOH to a pH ≥ 12 (14 day hold if preserved)
SSC	T	EBMUD	1L and 500ml PE	7 day hold; dup at 2 sites
Fipronil	T	WPCL	1L amber glass	7 day hold; dup at 1 site
POC	P	ALS	Filters and containers (2 per site)	Field filtered; quick freeze -20C; dup at 2 sites
Pigments (Chlorophyll, phaeophytin)	P	EBMUD	40 ml amber vial	*Field filtered, preserve filter in 90% MeOH, amber vial in bubble bag, quick freeze -20C; 3 week hold; dup at 2 sites
DOC	D	ALS	250 ml HDPE	Field filtered (filtrate of POC sample); has 1-2ml H ₂ SO ₄ , dup at 2 sites
Trace Elements Suite	D	BRL	1 x 500ml HDPE	Dup at 2 sites
Ag, As, Se	D	BRL	1 x 2L HDPE	Dup at 2 sites
MeHg	D	BRL	250 ml FLPE	No rinse; has 1-2 ml 50% H ₂ SO ₄ ; dup at 2 sites
THg	D	BRL	250 ml FLPE	Dup at 2 sites
Cu, Ni	D	City of SJ	500 ml HDPE	Dup at 2 sites
Salinity, Hardness (<5ppt)	D	EBMUD	500 ml PE	Salinity @ all stations, 7 day hold (for salinity); dup at 2 sites
Ammonia	D	EBMUD	500 ml PE	*Quick freeze -20C; dup at 2 sites
Nitrate, nitrite, phosphate	D	ALS	250 ml PE	*Quick freeze -20C; dup at 2 sites
Silica	D	ALS	250 ml PE	*Quick freeze -20C; dup at 2 sites
Organophosphate Flame Retardants	T	SIU	4L glass	Grab sample, dup at 1 site
OH-BDE	T	UMN	4@4L glass	Hold on wet / blue ice; return to lab asap

Table 6. Weather Conditions for 2013 RMP Water Cruise.

Site	Sea State	Tide Stage & Current (kts)	Wind Speed (kts)	Wind Dir.	Cloud Cover, % Overcast	Comments
BC10	<1' seas	0.25, ebb	3	W	Clear	
BC20	Calm	0.5, east	2-5	NR	100%	
BG20	Moderate chop	0.5, ebb	11-15	NR	95%	
BG30	Moderate chop	1, ebb	11-14	NR	40%	
BA30	Calm	1, ebb	12	W	Clear	
CB036W	1' seas	0.25, flood	10	SW	40%	
CB037W	Calm	0.25, flood	11-13	NR	90%	
CB038W	Light chop	Light flood	5	N	100%	
LSB055W	Calm	Light ebb	<5	W	100%	
LSB056W	Calm	0.5, flood	15	NW	Clear	
LSB057W	Calm	0.5, ebb	8	NE	Clear	
LSB058W	Calm	0.5, ebb	>5	NW	Clear	
LSB060W	Calm	0.25, flood	>5	S	100%	Collected Blind3 here
SB064W	1' seas	0.25, flood	12	NW	Clear	Collected Blind1 here
SB065W	1-2' seas	Light ebb	15	NW	Clear	
SB066W	<1' seas	0.75, flood	NR	NW	Clear	
SPB036W	Calm	1.25, flood	11-13	NR	95%	Collected Blind2 here
SPB037W	Calm	0.1, ebb	5-8	NR	100%	
SPB038W	White caps	0.25, flood	13-17	NR	25%	
SU044W	Wind chop	0.25, ebb	11-14	NR	90%	
SU046W	Moderate chop	0.5, flood	12-15	NR	10%	
SU047W	Moderate chop	0.5, ebb	8-13 kts	NR	90%	

Table 7. Recorded Water Quality Parameters. All results recorded as snapshot from SFEI YSI meter deployed at approximately 1m depth for duration of sampling. NR=Not recorded.

Site	DO (%)	DO (mg/L)	Cond. (mS/cm)	Temp (°C)	pH	Salinity (ppt)	Comments
BC10	95.9	7.95	37.73	17.45	8.14	24.00	
BC20	NR	NR	NR	NR	NR	NR	
BG20	91.0	8.16	7.60	19.53	8.78	4.19	
BG30	90.6	8.13	4.33	20.0	8.65	2.31	
BA30	103.2	7.75	39.70	21.16	8.67	25.36	YSI pH out of calibration
CB036W	92.7	7.70	37.73	17.45	8.01	24.00	
CB037W	91.2	7.58	37.64	17.34	8.46	23.94	
CB038W	99.6	7.84	38.08	20.12	8.10	24.23	
LSB055W	82.7	6.35	38.76	21.22	8.29	24.73	YSI pH out of calibration
LSB056W	92.6	6.74	46.12	22.54	8.26	29.96	
LSB057W	97.0	7.37	39.66	21.59	7.91	25.34	YSI pH out of calibration
LSB058W	85.9	6.4	45.62	21.42	8.12	29.59	
LSB060W	86.2	6.34	48.16	21.37	8.03	31.45	
SB064W	93.7	7.40	37.54	20.14	7.81	23.86	
SB065W	98.3	7.66	37.56	20.69	7.80	23.86	
SB066W	91.9	7.10	37.83	21.13	8.10	24.05	
SPB036W	91.2	7.57	32.55	18.53	8.87	20.41	
SPB037W	92.3	7.66	30.99	18.90	8.81	19.32	
SPB038W	91.1	7.56	31.24	18.86	8.98	19.49	
SU044W	89.0	7.56	26.95	18.77	7.76	16.55	
SU046W	91.6	7.95	12.19	19.63	8.64	7.11	
SU047W	87.9	7.34	28.37	19.08	8.63	17.49	