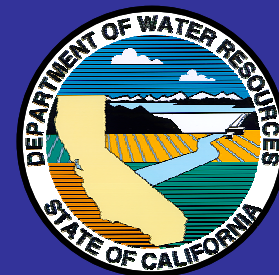


Changes to the Water Quality Compliance and Baseline Monitoring Program

Presented by Steve Ford, DWR & Erwin Van Nieuwenhuyse, USBR



Changes to Monitoring Program

Propose changes to Table 4 and Figure 2 in the 1995 Bay-Delta Plan:

- Baseline monitoring at 17 stations
- Sampling intervals for discrete baseline monitoring
- Compliance monitoring at 2 stations
- Table 4 and Figure 2 format

Rationale for Proposed Amendments

- Improve scientific basis and usefulness
 - ✓ Enhance monitoring at important ambient and flux stations
 - ✓ Enhance continuous monitoring
 - ✓ Enhance shallow water monitoring
 - ✓ Reduce tidal spring-neap bias
 - ✓ Improve QA/QC
- Improve monitoring efficiency by consolidating neighboring stations
- Improve safety



Development of Proposed Amendments

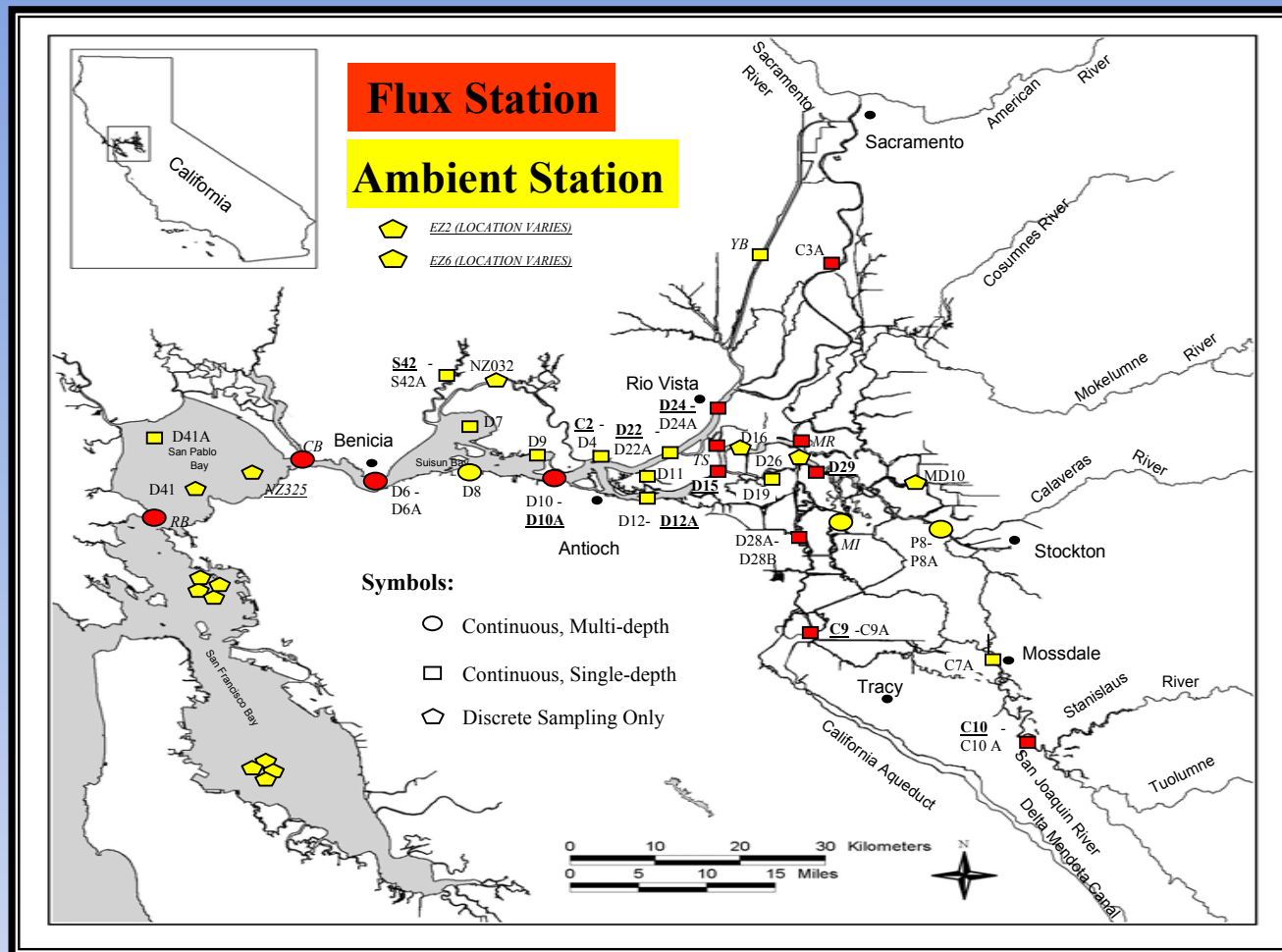
IEP-EMP Review Process

- EMP Review Core Team
- Subject Area Teams of local experts
- IEP Science Advisory Group
- Participants in three public meetings

(For review reports, see <http://www.iep.water.ca.gov/emp/>)

Proposed Monitoring Design

“Ambient” and “Flux” Stations



Proposed Changes

1. Identify compliance monitoring elements.
2. Add, re-establish, or move individual Baseline monitoring elements.
3. Remove one Baseline Station
4. Modify station numbers and descriptions for “Baseline Monitoring Stations”.
5. Modify sampling interval description for discrete sampling.
6. Modify Table 4.
7. Update Figure 2

Proposed Changes

1. Identify compliance monitoring elements at two “Compliance Monitoring Stations” (Stations C9 & D22)

Changes at “Compliance” and “Compliance & Baseline” Monitoring Stations

Station Number	Station Type	Station Description	Lat.	Long.	Cont. Recorder	Cont. Multiparameter	Discrete Physical/Chemical	Discr. Phytoplankton	Discr. Zooplankton	Discrete Benthos	Water Quality Objectives in 1995 B-D Plan	Rationale for Change
C9	●	West Canal @ Mouth of CC Forebay Intake	37.83075	-121.55703		Reinstate (Ongoing)	Reinstate	No change	Reinstate		CI (Table 1), EC (Table 2)	Water Quality Objective; Flux station (exports); Continuous data QA/QC
			37.82818	-121.55275					No change			
C10	●	San Joaquin River near Vernalis	37.67575	-121.265	No change	Add	Move from	Move from	Add		CI (Table 1), EC (Table 2), Flow (Table 3)	Flux station (imports); Southern “rim”; High productivity; Long & highly utilized data set; Improved safety at new location
			37.67934	-121.26472			Move to	Move to				
D10	●	Sacramento River @ Chipps Island	38.04288	-121.92011		No change	Reinstate				EC (Table 3, Footnote 14)	Continuous data QA/QC
			38.04631	-121.91829					No change			
D12	●	San Joaquin River @ Antioch Ship Channel	38.0177	-121.80273		No change	Reinstate				CI (Table 1)	Continuous data Qa/QC
			38.02162	-121.80638					No change			
D22	●	Sacramento River @ Emmaton	38.08406	-121.73912		Reinstate (Ongoing)					EC (Table 2)	Water Quality Objective (no operational change)
			38.08453	-121.73914					No change			
D24	●	Sacramento River below Rio Vista Bridge	38.15891	-121.68721		No change	Reinstate				Flow (Table 3)	Continuous data Qa/QC
			38.1555	-121.68113					No change			
D29	■ ▲	San Joaquin River @ Prisoners Point	38.05793	-121.55736		No change					EC (Table 3)	Important mid-Delta flux station, northern endpoint for Stockton Ship Channel D.O. monitoring.
			38.05793	-121.55736			Add	Add	Add			
S42	●	Suisun Slough 300' south of Volanti Slough	38.18053	-122.04696		No change	Reinstate	Reinstate			EC (Table 3)	Ecologically important tidal marsh habitat station with long-term monitoring history.
			38.18027	-122.04779					No change			

■ Compliance monitoring station

▲ Baseline monitoring station

● Compliance and baseline monitoring station

Compliance Monitoring

No change

Add

Reinstate

Move (from & to)

Changes at “Compliance” and “Compliance & Baseline” Monitoring Stations

Station Number	Station Type	Station Description	Lat.	Long.	Cont. Recorder	Cont. Multiparameter	Discrete Physical/Chemical	Discr. Phytoplankton	Discr. Zooplankton	Discrete Benthos	Water Quality Objectives in 1995 B-D Plan	Rationale for Change	
C9	●	West Canal @ Mouth of CC Forebay Intake	37.83075	-121.55703		Reinstate (Ongoing)					CI (Table 1), EC (Table 2)	Water Quality Objective; Flux station (exports); Continuous data QA/QC	
			37.82818	-121.55275									
D22	●	Sacramento River @ Emmaton	38.08406	-121.73912		Reinstate (Ongoing)					EC (Table 3, Footnote 14)	Flux station (imports); Southern “rim”; High productivity; Long & highly utilized data set; Improved safety at new location	
			38.08453	-121.73914									
D22	●	Sacramento River @ Emmaton	38.08406	-121.73912		Reinstate (Ongoing)					EC (Table 2)	Water Quality Objective (no operational change)	
			38.08453	-121.73914									

■ Compliance monitoring station

▲ Baseline monitoring station

● Compliance and baseline monitoring station

Compliance Monitoring

No change

Add

Reinstate

Move (from & to)

Proposed Changes

2. Add, re-establish, or move individual BASELINE monitoring elements at
 - a. One “Compliance Monitoring Station” (Station D29)
 - b. Seven “Compliance and Baseline Monitoring Stations” (Stations C9, C10, D10, D12, D22, D24, & S42)

Changes at “Compliance” and “Compliance & Baseline” Monitoring Stations

Station Number	Station Type	Station Description	Lat.	Long.	Cont. Recorder	Cont. Multiparameter	Discrete Physical/Chemical	Discr. Phytoplankton	Discr. Zooplankton	Discrete Benthos	Water Quality Objectives in 1995 B-D Plan	Rationale for Change
C9	●	West Canal @ Mouth of CC Forebay Intake	37.83075	-121.55703			Reinstate	No change	Reinstate			Water Quality Objective; Flux station (exports); Continuous data QA/QC
			37.82818	-121.55275					No change			
C10	●	San Joaquin River near Vernalis	37.67575	-121.265		Add	Move from	Move from				Flux station (imports); Southern “rim”; High productivity; Long & highly utilized data set; Improved safety at new location
			37.67934	-121.26472			Move to	Move to	Add			
D10	●	Sacramento River @ Chipps Island	38.04288	-121.92011			Reinstate					Continuous data QA/QC
			38.04631	-121.91829					No change			
D12	●	San Joaquin River @ Antioch Ship Channel	38.0177	-121.80273			Reinstate					Continuous data Qa/QC
			38.02162	-121.80638					No change			
D22	●	Sacramento River @ Emmaton	38.08406	-121.73912								Water Quality Objective (no operational change)
			38.08453	-121.73914					No change			
D24	●	Sacramento River below Rio Vista Bridge	38.15891	-121.68721			Reinstate					Continuous data Qa/QC
			38.1555	-121.68113					No change			
D29	■ ▲	San Joaquin River @ Prisoners Point	38.05793	-121.55736								Important mid-Delta flux station, northern endpoint for Stockton Ship Channel D.O. monitoring.
			38.05793	-121.55736			Add	Add	Add			
S42	●	Suisun Slough 300' south of Volanti Slough	38.18053	-122.04696			Reinstate	Reinstate				Ecologically important tidal marsh habitat station with long-term monitoring history.
			38.18027	-122.04779					No change			

■ Compliance monitoring station

▲ Baseline monitoring station

● Compliance and baseline monitoring station

Compliance Monitoring

No change

Add

Reinstate

Move (from & to)

Changes at “Compliance” and “Compliance & Baseline” Monitoring Stations

Station Number	Station Type	Station Description	Lat.	Long.	Cont. Recorder	Cont. Multiparameter	Discrete Physical/Chemical	Discr. Phytoplankton	Discr. Zooplankton	Discrete Benthos	Water Quality Objectives in 1995 B-D Plan	Rationale for Change
C9	●	West Canal @ Mouth of CC Forebay Intake	37.83075	-121.55703		Reinstate (Ongoing)	Reinstate	No change	Reinstate		CI (Table 1), EC (Table 2)	Water Quality Objective; Flux station (exports); Continuous data QA/QC
			37.82818	-121.55275					No change			
C10	●	San Joaquin River near Vernalis	37.67575	-121.265	No change	Add	Move from	Move from	Add		CI (Table 1), EC (Table 2), Flow (Table 3)	Flux station (imports); Southern “rim”; High productivity; Long & highly utilized data set; Improved safety at new location
			37.67934	-121.26472			Move to	Move to				
D10	●	Sacramento River @ Chipps Island	38.04288	-121.92011		No change	Reinstate				EC (Table 3, Footnote 14)	Continuous data QA/QC
			38.04631	-121.91829					No change			
D12	●	San Joaquin River @ Antioch Ship Channel	38.0177	-121.80273		No change	Reinstate				CI (Table 1)	Continuous data Qa/QC
			38.02162	-121.80638					No change			
D22	●	Sacramento River @ Emmaton	38.08406	-121.73912		Reinstate (Ongoing)					EC (Table 2)	Water Quality Objective (no operational change)
			38.08453	-121.73914					No change			
D24	●	Sacramento River below Rio Vista Bridge	38.15891	-121.68721		No change	Reinstate				Flow (Table 3)	Continuous data Qa/QC
			38.1555	-121.68113					No change			
D29	■ ▲	San Joaquin River @ Prisoners Point	38.05793	-121.55736		No change					EC (Table 3)	Important mid-Delta flux station, northern endpoint for Stockton Ship Channel D.O. monitoring.
			38.05793	-121.55736			Add	Add	Add			
S42	●	Suisun Slough 300' south of Volanti Slough	38.18053	-122.04696		No change	Reinstate	Reinstate			EC (Table 3)	Ecologically important tidal marsh habitat station with long-term monitoring history.
			38.18027	-122.04779					No change			

■ Compliance monitoring station

▲ Baseline monitoring station

● Compliance and baseline monitoring station

Compliance Monitoring

No change

Add

Reinstate

Move (from & to)

Proposed Changes

2. Add, re-establish, or move individual BASELINE monitoring elements at
 - c. Six “Baseline Monitoring Stations”
(Stations C3, D7, D9, D11, D19, D41A)

Changes at “Baseline” Monitoring Stations

Station Number	Station Type	Station Description	Lat.	Long.	Cont. Recorder	Cont. Multiparameter	Discrete Physical/Chemical	Discr. Phytoplankton	Discr. Zooplankton	Discrete Benthos	Water Quality Objectives in 1995 B-D Plan	Rationale for Change and Implementation Status	Approved by SWRCB Exec. Dir.
C3A	▲	Sacramento River @ Hood	38.36772	-121.52051		No op. change, but new station number	Moved from C3 (C3 has been discontinued)	Moved from C3 (C3 has been discontinued)	Reinstate		None	Continuous & discrete monitoring station consolidation at continuous station location to improve monitoring efficiency & QA/QC - implementation complete; Reinstated zooplankton monitoring at ecologically important northern rim flux station (imports) - implementation in progress	Yes
D7	▲	Grizzly Bay @ Dolphin nr. Suisun	38.11708	-122.03972	Add		No change	No change	No change	No change	None	Ambient stations representing shallow water habitat in ecologically and operationally important locations along the estuarine transition zone.	Yes
D9	▲	Honker Bay near Wheeler	38.07245	-121.93923	Add		Reinstate	Reinstate			None	New continuous monitoring to better understand tidal constituent dynamics - implementation in progress	Yes
D11	▲	Sherman Lake near	38.04228	-121.79951	Add		Reinstate	Add			None		Yes
D19	▲	Franks Tract near Russo's	38.04376	-121.61477	Add		Reinstate	Reinstate	Reinstate		None		Yes
D41A	▲	San Pablo Bay near Mouth of Petaluma River	38.08472	-122.39067			Add	Add	Add	No change	None	Ecologically important ambient station representing shoal habitat with fluctuating salinity levels. Long-term benthos station. - implementation complete	Yes

■ Compliance monitoring station

▲ Baseline monitoring station

● Compliance and baseline monitoring station

No change

Add

Reinstate

Move (from & to)

Remove

Proposed Changes

3. Remove one Baseline Station (Station NZ080)

Changes at "Baseline" Monitoring Stations

Station Number	Station Type	Station Description	Lat.	Long.	Cont. Recorder	Cont. Multiparameter	Discrete Physical/Chemical	Discr. Phytoplankton	Discr. Zooplankton	Discrete Benthos	Water Quality Objectives in 1995 B-D Plan	Rationale for Change and Implementation Status	Approved by SWRCB Exec. Dir.
NZ080	▲	San Joaquin River, 549 meters upstream of light 26							Remove		None	Station discontinued since 1996, not mandated in D-1641	No

■ Compliance monitoring station

▲ Baseline monitoring station

● Compliance and baseline monitoring station

No change

Add

Reinstate

Move (from & to)

Remove

Changes at “Baseline” Monitoring Stations

Station Number	Station Type	Station Description	Lat.	Long.	Cont. Recorder	Cont. Multiparameter	Discrete Physical/Chemical	Discr. Phytoplankton	Discr. Zooplankton	Discrete Benthos	Water Quality Objectives in 1995 B-D Plan	Rationale for Change and Implementation Status	Approved by SWRCB Exec. Dir.
C3A	▲	Sacramento River @ Hood	38.36772	-121.52051		No op. change, but new station number	Moved from C3 (C3 has been discontinued)	Moved from C3 (C3 has been discontinued)	Reinstate		None	Continuous & discrete monitoring station consolidation at continuous station location to improve monitoring efficiency & QA/QC - implementation complete; Reinstated zooplankton monitoring at ecologically important northern rim flux station (imports) - implementation in progress	Yes
D7	▲	Grizzly Bay @ Dolphin nr. Suisun	38.11708	-122.03972	Add		No change	No change	No change	No change	None	Ambient stations representing shallow water habitat in ecologically and operationally important locations along the estuarine transition zone.	Yes
D9	▲	Honker Bay near Wheeler	38.07245	-121.93923	Add		Reinstate	Reinstate			None	New continuous monitoring to better understand tidal constituent dynamics - implementation in progress	Yes
D11	▲	Sherman Lake near	38.04228	-121.79951	Add		Reinstate	Add			None		Yes
D19	▲	Franks Tract near Russo's	38.04376	-121.61477	Add		Reinstate	Reinstate	Reinstate		None		Yes
D41A	▲	San Pablo Bay near Mouth of Petaluma River	38.08472	-122.39067			Add	Add	Add	No change	None	Ecologically important ambient station representing shoal habitat with fluctuating salinity levels. Long-term benthos station. - implementation complete	Yes
NZ080	▲	San Joaquin River, 549 meters upstream of light 26							Remove		None	Station discontinued since 1996, not mandated in D-1641	No

■ Compliance monitoring station

▲ Baseline monitoring station

● Compliance and baseline monitoring station

No change

Add

Reinstate

Move (from & to)

Remove

Proposed Changes

4. Modify station numbers and descriptions for four continuous “Baseline Monitoring Stations”
(Stations C3, D6, D28A, P8)

Modified station numbers and descriptions at "Baseline" Monitoring Stations

Station Number	Station Type	Station Description	Lat.	Long.	Cont. Recorder	Cont. Multiparameter	Discrete Physical/Chemical	Discr. Phytoplankton	Discr. Zooplankton	Discrete Benthos	Water Quality Objectives in 1995 B-D Plan	Rationale for Change
C3	▲	Sacramento River @ Greens Landing	38.36772	-121.52051			Move from	Moved from C3 (C3 has been discontinued)			None	Station consolidation at C3A reviewed & approved by the SWRCB Exec. Director in 2003. Implemented.
C3A		Sacramento River @ Hood	38.36772	-121.52051		No op. change, but new station number	Move to	Moved to	Reinstate			
D6	▲	Suisun Bay @ Bull's Head Pt. near Martinez	38.04427	-122.11764			No change	No change	No change	No change	None	No operational change at continuous multiparameter station. New station number and description to indicate that the (shore-based) continuous monitoring is taking place in a different location than the (mid-channel) discrete monitoring activities. These changes were approved by the SWRCB Exec. Director in 2003.
D6A		Suisun Bay @ Martinez	38.02762	-122.14052		No op. change, but new station number						
D28A	▲	Old River near Rancho Del Rio	37.97038	-121.57271			No change	No change	No change	No change	None	
D28B		Old River @ Bacon Island	37.9698	-121.5721		No op. change, but new station number						
P8	▲	San Joaquin River @ Buckley Cove	37.97815	-121.38242			No change	No change	No change	No change	None	
P8A		San Joaquin River @ Rough and Ready Island	37.96277	-121.36587		No op. change, but new station number						

■ Compliance monitoring station

▲ Baseline monitoring station

● Compliance and baseline monitoring station

No change

Reinstate

Move

No op. change, but new station number

Proposed Changes

5. Modify sampling interval description for discrete sampling in footnotes to Table 4

From: “monthly”

To: “on near-monthly basis that alternates between spring and neap tides”

...to avoid tidal bias

Proposed Changes

6. Modify Table 4 to reflect monitoring changes, include geographic coordinates and rearrange table columns

Lat. & Long. Cont. Discrete

Station Number ¹		Station Description ²	Latitude ³	Longitude ³	Cont. Rec. ⁴	Cont. Multi-parameter ⁵	Discrete Physical/Chemical ⁶	Discr. Phytoplankton ⁷	Discr. Zooplankton ⁸	Discrete Benthos ⁹
C2	■	Sacramento River @ Collinsville	38.07395	-121.85010	*					
C3A	▲	Sacramento River @ Hood	38.36772	-121.52051		*	*	*	*	
C9	●	West Canal @ Mouth of CC	37.82818	-121.55275						*
		Forebay Intake	37.83075	-121.55703		*	*	*	*	
P8	▲	San Joaquin River @ Buckley Cove	37.97815	-121.38242			*	*	*	*
P8A	▲	San Joaquin River @ Rough and Ready Island	37.96277	-121.36587		*				

2 Locations at C&B Station

2 Locations at B Station

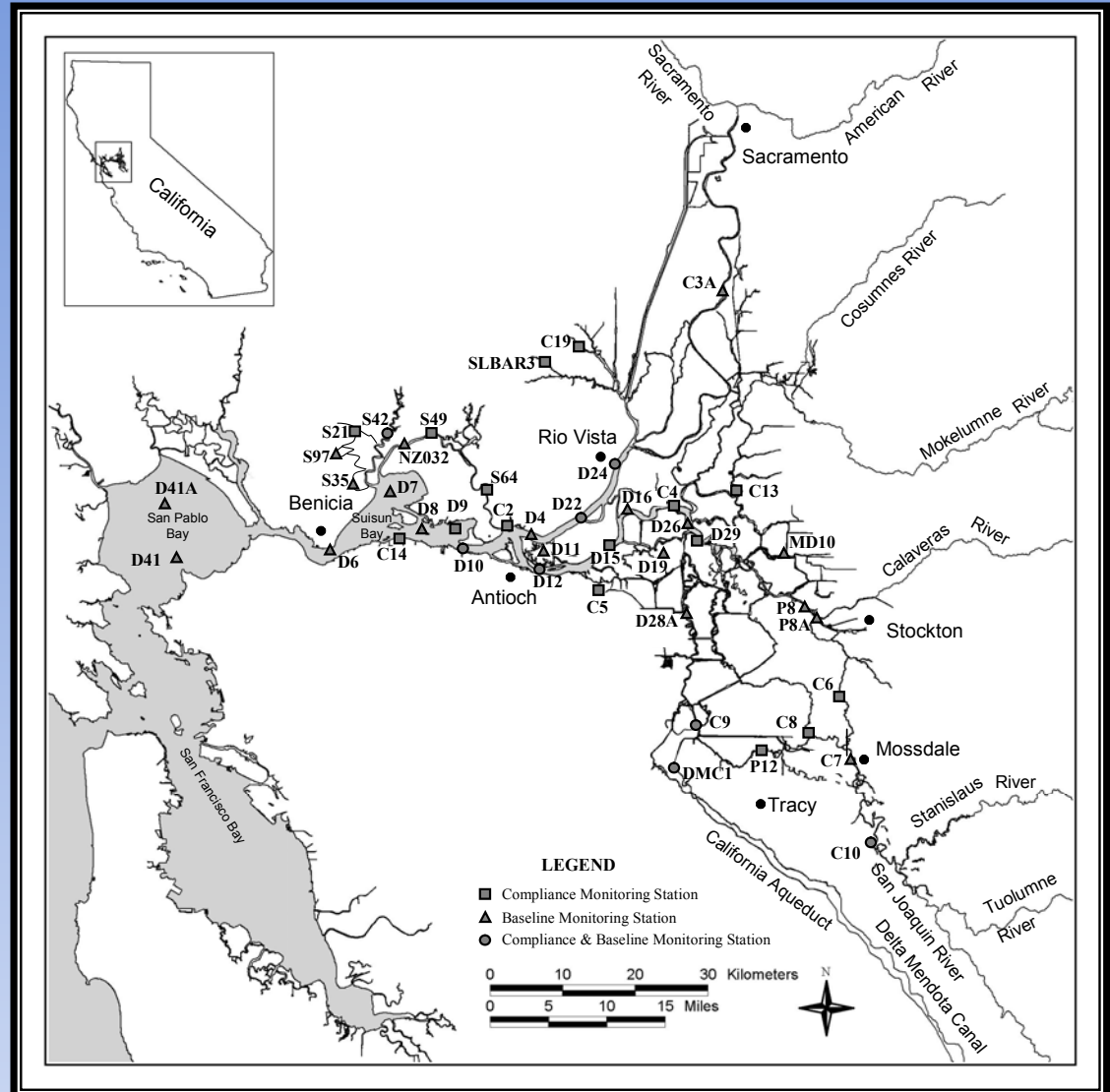
■ Compliance monitoring station

▲ Baseline monitoring station

● Compliance and baseline monitoring station

Proposed Changes

7. Update Figure 2



Conclusion

The requested changes to the Water Quality Compliance and Baseline Monitoring Program would provide a more scientifically sound and safer monitoring program, fulfill water right permit conditions and better address the needs of data users.



Prepared & presented by Steve Ford and Anke Mueller-Solger, DWR
and Erwin Van Nieuwenhuyse, USBR

Background

Purpose of the Water Quality Compliance and Baseline Monitoring Program

- Determine compliance with water quality objectives
- Provide baseline information
- Evaluate aquatic habitat and organism responses
- Increase understanding of the Estuary ecosystem

Implementation of Review Recommendations

Implementation Categories:

- 1) Immediate
- 2) After concurrence of the SWRCB
Executive Director (D-1641 Condition 11 e)
- 3) After Bay-Delta Plan Review

1) Immediate Implementation

Examples:

- Improved sample analysis
- Improved data analysis and storage
- Improved reporting of data and information
- Further review of benthic monitoring

2) Implementation after SWRCB Executive Director concurrence

(received August 11, 2003)

- Changes to individual BASELINE monitoring elements monitoring at six “Baseline Monitoring Stations”
- Sampling interval adjustments
- Amendments to D-1641 Table 5 & Figure 4 reflecting these changes

3) Implementation after Bay-Delta Plan Review

- Changes to individual BASELINE monitoring elements at one “Compliance Monitoring Station” and seven “Compliance and Baseline Monitoring Stations”
- Amendments to Bay-Delta Plan Table 4 & Figure 2 and D-1641 Table 5 & Figure 4 reflecting all changes

Monitoring Elements

- Continuous “Continuous Recorder” and “Multiparameter” monitoring of physical and chemical conditions

- Discrete (near-monthly) monitoring:

- Physical & Chemical Conditions
- Phytoplankton
- Zooplankton
- Benthos



Vessel-based
monthly monitoring

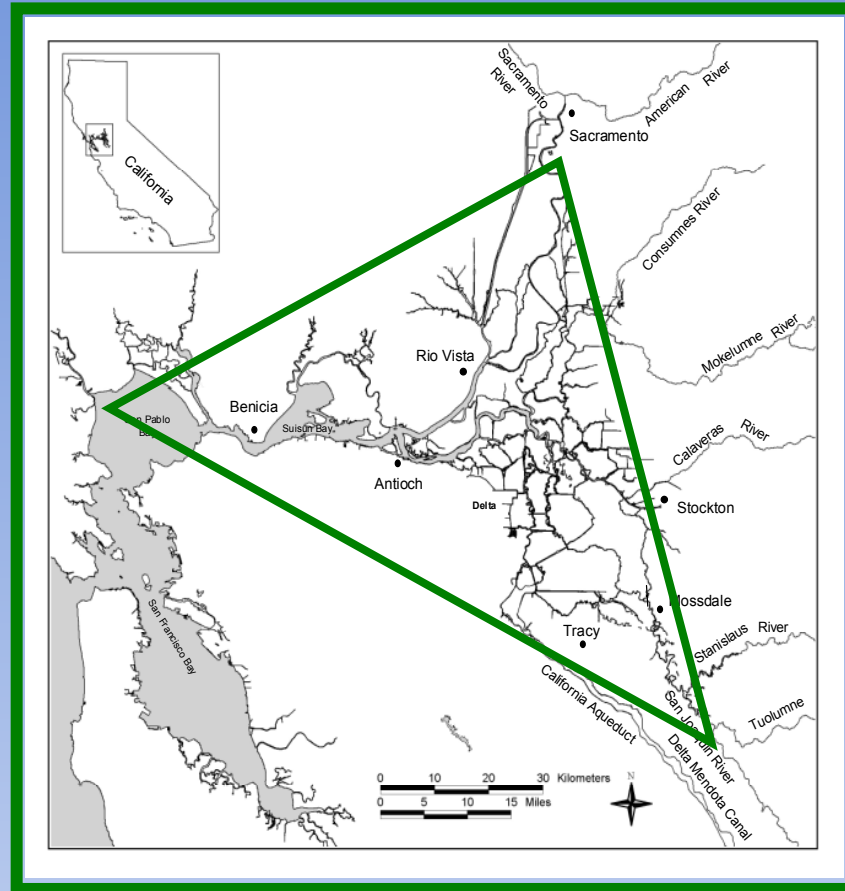


Shore-based
continuous monitoring

- Data available via CDEC (<http://cdec.water.ca.gov/>), BDAT (<http://bdat.ca.gov>), reports, etc.

Monitoring area

San Pablo Bay

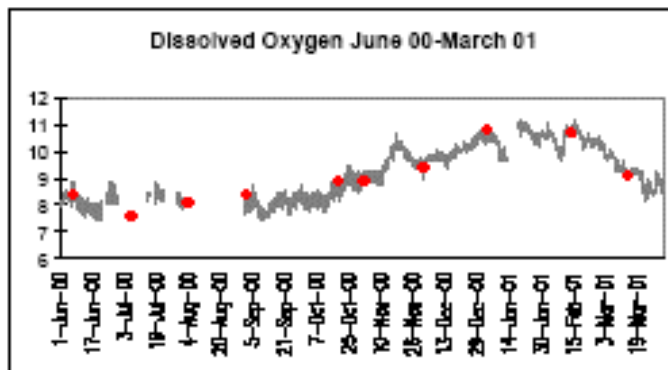
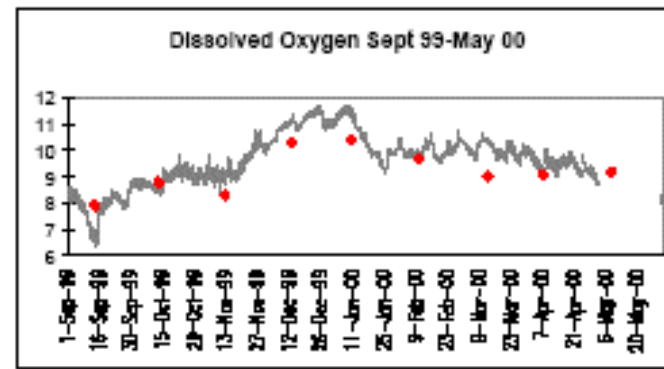
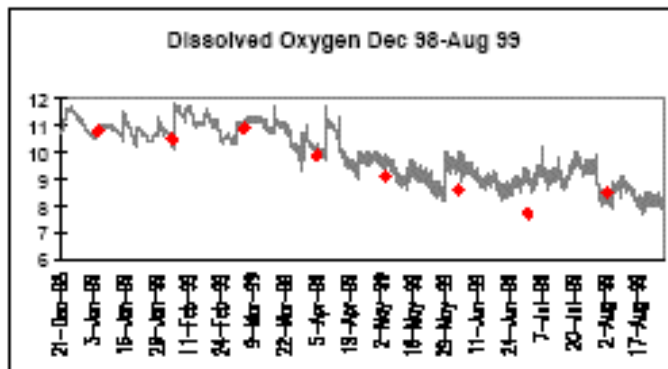


Hood

Vernalis

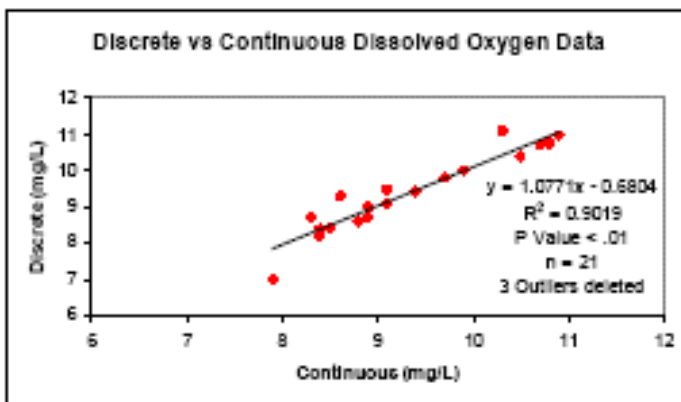
Ongoing since 1971 - One of the nation's oldest and most comprehensive long-term monitoring programs!

Dissolved Oxygen (mg/L) for Discrete Station C3 and Continuous Monitoring Station 70
December 1998 – March 2001



— Continuous

◆ Discrete

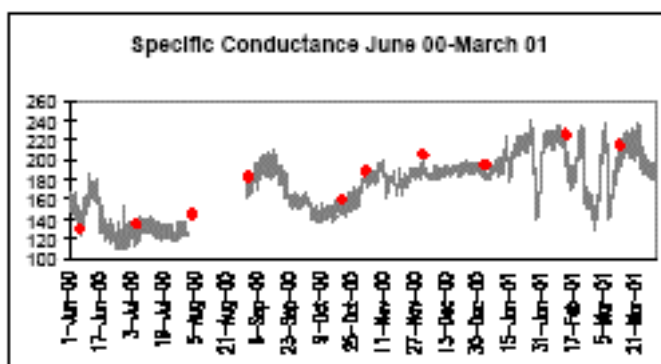
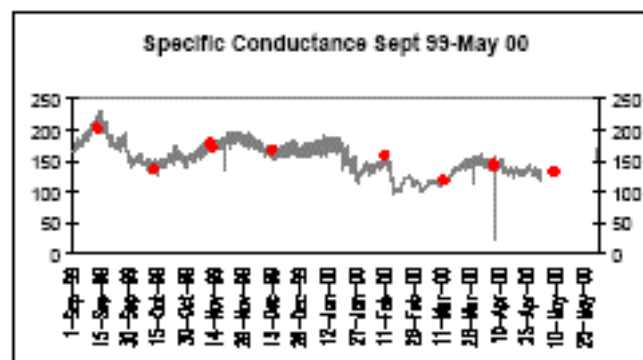
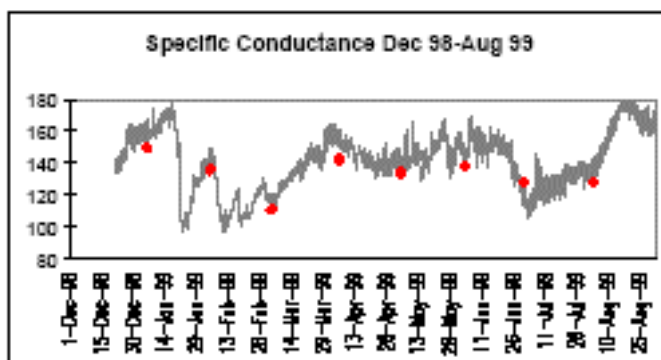


Absolute Difference Discrete - Continuous	
Mean	-0.04
Standard Deviation	0.35
Minimum	-0.8
Maximum	0.9

Residuals	
Standard Deviation	0.3
Minimum	-0.68
Maximum	0.55

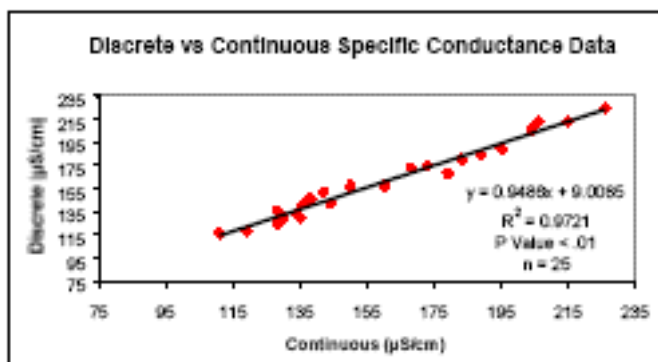
Specific Conductance ($\mu\text{S}/\text{cm}$) for Discrete Station C3 and Continuous Monitoring Station 70

December 1998 – March 2001



— Continuous

• Discrete

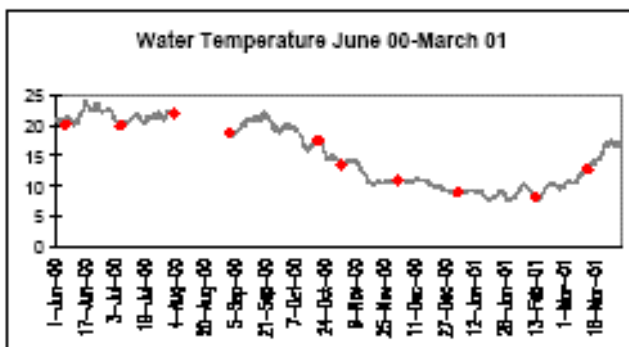
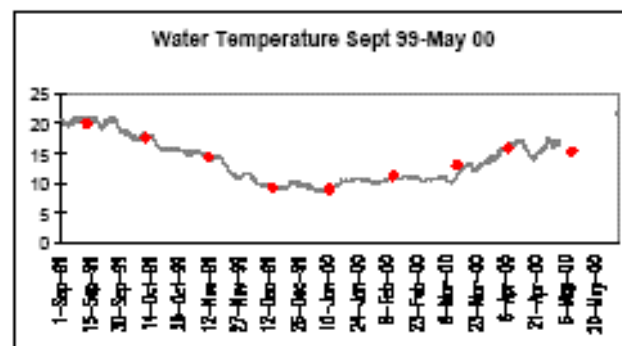
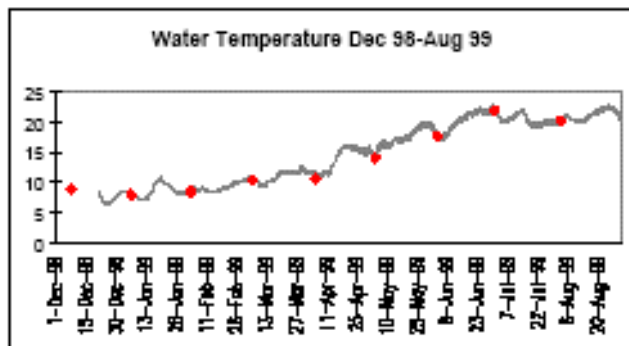


Absolute Difference Discrete - Continuous	
Mean	-0.8
Standard Deviation	5.5
Minimum	-10
Maximum	11

Residuals	
Standard Deviation	5.4
Minimum	-9
Maximum	11.6

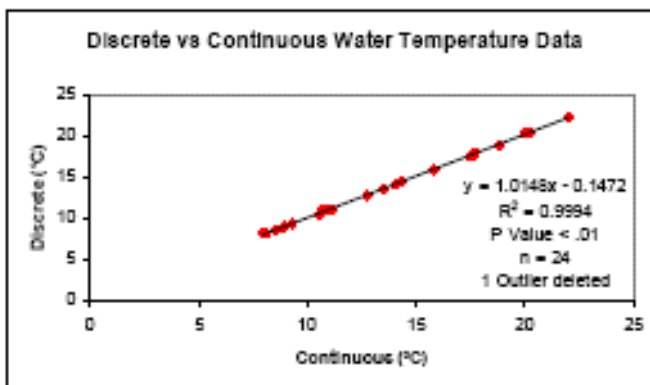
Water Temperature (°C) for Discrete Station C3 and Continuous Monitoring Station 70

December 1998 – March 2001



— Continuous

◆ Discrete



Absolute Difference Discrete - Continuous	
Mean	-0.06
Standard Deviation	0.13
Minimum	-0.4
Maximum	0.18

Residuals	
Standard Deviation	0.11
Minimum	-0.24
Maximum	0.19