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# **Suisun Marsh Monitoring Program Channel Water Salinity Report**

Reporting Period: November 2003

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## 1. SUISUN MARSH MONITORING STATIONS AND REPORTING REQUIREMENT

As per SWRCB Water Rights Decision 1641, dated December 29, 1999, and previous SWRCB decisions, the California Department of Water Resources (DWR) is required to provide monthly channel water salinity compliance reports for the Suisun Marsh to the SWRCB. Conditions of channel water salinity in the Suisun Marsh are determined by monitoring specific electrical conductivity. Specific electrical conductivity is referred to in the reports as "specific conductance". The locations of all listed stations are shown in Figure 5.

The monthly reports are submitted for October through May of the following year in accordance with SWRCB requirements. This report is required to include salinity data from the stations listed below:

Station Identification	Station Name	General Location	Classification
C-2*	Collinsville	Western Delta	Compliance Station
S-64	National Steel	Eastern Suisun Marsh	Compliance Station
S-49	Beldon's Landing	North-Central Suisun Marsh	Compliance Station
S-42	Volanti	North-Western Suisun Marsh	Compliance Station
S-21	Sunrise	North-Western Suisun Marsh	Compliance Station

In addition, data from the stations listed below are included in the monthly reports to provide information on salinity conditions in the western Suisun Marsh.

Station Identification	Station Name	General Location	Classification
S-97	Ibis	Western Suisun Marsh	Monitoring Station
S-35	Morrow Island	South-Western Suisun Marsh	Monitoring Station

Information on Delta outflow, area rainfall, and operation of the Suisun Marsh Salinity Control Gates are also included in the monthly reports to provide information on conditions that may affect channel water salinity in the Marsh.

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\* Throughout the report, the representative data from nearby USBR station is used in lieu of data from station C-2.

## 2. Monitoring Results

### 2.1 Channel Water Salinity Compliance

During the month of November, 2003, salinity conditions at all five compliance stations are in compliance with channel water salinity standards of SWRCB (Table 1). Compliance with standards for the month of November was determined for each compliance station by comparing the progressive daily mean of high-tide specific conductance (SC) with respective standards. The standard for the eastern compliance stations ( i.e. C-2, S-64, S-49) was 15.5 mS/cm, and western stations (i.e. S-42 and S-21) was 16.5 mS/cm during November 2003. Table 1 lists monthly mean high-tide SC at these compliance stations. The progressive daily mean (PDM) is the monthly average of both daily high-tide SC values. The mathematical equation is shown below.

$$\text{PDM} = \frac{\sum \text{daily average of high tide SC}}{\# \text{ days of the month}}$$

### 2.2 Delta Outflow

The November Delta outflow varied from 4,000 cfs to 15,000 cfs as shown in Figure 3. Increased Delta outflow occurred during November 8 through 14, 2003. This increase was due to significant precipitation resulting in high runoff from the major rivers. The largest Delta outflow peaked to about 15,000 cfs on November 12. Thereafter, Delta outflow dropped and remained stable between 4,000 to 6,000 cfs for the remainder of the month. The monthly Delta outflow is represented by the mean Net Delta Outflow Index (NDOI). The NDOI is the estimated daily average of Delta outflow. Mean NDOI for November is listed below:

Month	Mean NDOI (cubic feet per second)
November	6,893

## 2.3 Rainfall

Total monthly rainfall at the Waterman Gauging Station in Fairfield during November 2003 is listed below:

Month	Total Rainfall (inches)
November	1.08

## 2.4 Suisun Marsh Salinity Control Gate (SMSCG) Operations

Operations and flashboard/boat lock installations at the SMSCG during November 2003 is summarized below.

Date	Gate status	Flashboards status	Boat Lock status
November 1 - 11	3 gates open	Removed	Closed
November 12 - 30	3 gates operating	Installed	Closed

From November 1 through 11, 2003, the final phase (Phase III) of the fish passage study was conducted. Salinity levels in the marsh were on the rise as a result of gate setting for the phase: gates were being held open and flashboards removed. Upon completion of the fish study, the flashboards were installed and gates operating normally to control salinity.

## 3. Discussion

### 3.1 Factors Affecting Channel Water Salinity in the Suisun Marsh

Factors that affect channel water salinity levels in the Suisun Marsh include:

- delta outflow;
- tidal exchange;
- rainfall and local creek inflow;
- managed wetland operations; and,
- operation of the SMSCG and flashboard configurations.

## 3.2 Observations and Trends

### 3.2.1 Conditions during the Reporting Period

During November 2003, salinity levels at Collinsville(C-2), National Steel(S-64), and Beldons(S-49) varied between 8.0 mS/cm and 15.0 mS/cm, whereas at Sunrise Club(S-21) and Volanti(S-42), it varied between 14.0 mS/cm and 16.0 mS/cm as shown in Figure 1. At the two monitoring stations(S-97 and S-35) salinity levels ranged from 16.0 mS/cm and 19.0 mS/cm as shown in Figure 2. Salinity levels at all, except Collinsville, started off at 14.0 mS/cm or higher due to the final phase of the fish passage study. In this final phase, the gates were held open and flashboards removed, thus salinity levels coming into November at most stations were on the high end. At the end of the fish study, the flashboards were re-installed and gates operating on November 12, 2003 to control salinity. As a result of gate operation, salinity reduction at Beldons was observed immediately, whereas the reduction was more gradual at Sunrise Club and Volanti due to the proximities of these stations relative to the gates. Nevertheless, all stations except Collinsville responded to gate operations noticeably. For Morrow(S-35) and Ibis(S-97), both monitoring sites started off at different salinity levels, however, by mid-November salinity levels at both locations began to converge to the same level, as shown in Figure 2. Although changes in salinity level at Morrow Club(S-35) appears to correlate with gate operation, salinity level at Ibis(S-97) were stable throughout the month and did not exhibit any correlation with gate operations. Overall, salinity levels were stable and were below the standard of 15.5 and 16.5 for the eastern and western stations, respectively.

Channel water salinity conditions in the marsh appeared to be influenced more by gate operations than outflow in November because outflow increased during November 8 through 14, and salinity levels at Volanti, Sunrise Club, and Beldons were still high during this period. However, outflow during this period appears to be more significant at National Steel and Morrow because both stations exhibited a decline in salinity level.

### 3.2.2 Comparison of Reporting Period Conditions with Previous Years

Monthly mean high-tide SC at the compliance and monitoring stations for November 2003 were compared with means for those months during the previous nine years (Figure 4).

Means salinity pattern of all compliance and monitoring stations were similar to that of 1999 and 2000, but with higher magnitude, except for C-2 when comparing the 2000 year. Comparing to the previous nine years, the following observations are made of the salinity levels:

- S64 salinity level for November 2003 was the highest
- S49 was the second highest
- S42 was at the same level as that of 2001, and is third highest

- S21 was the third highest
- S97 was at the same level as 1997, and is second highest
- S35 was the highest

Overall November 2003 salinity levels were ranked second in high Specific Conductance. This was probably due to the fish passage study phase III configuration with gates open and flashboards removed beginning in late October and ending in mid-November. Without gate operations during phase III, salinity levels in the marsh started off high for November 2003.

**Table 1****Monthly Mean High Tide Specific Conductance at Suisun Marsh  
Water Quality Compliance Stations****November 2003**

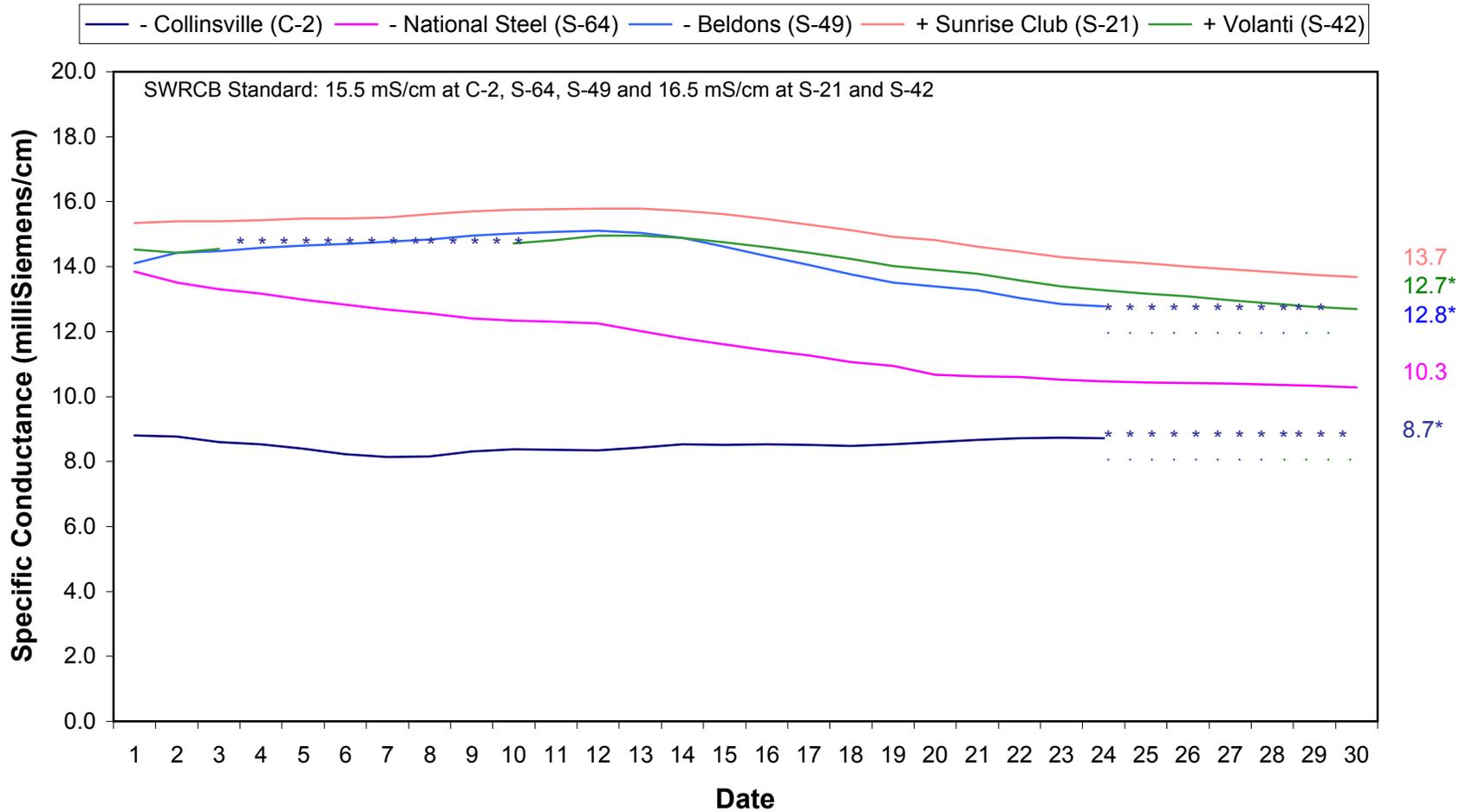
Station	Specific Conductance (mS/cm)*	Standard	Standard meet?
C-2**	8.7***	15.5	Yes
S-64	10.3	15.5	Yes
S-49	12.6***	15.5	Yes
S-42	12.6***	16.5	Yes
S-21	13.7	16.5	Yes

\*milliSiemens per centimeter

\*\*The representative data from nearby USBR station is used in lieu of data from station C-2.

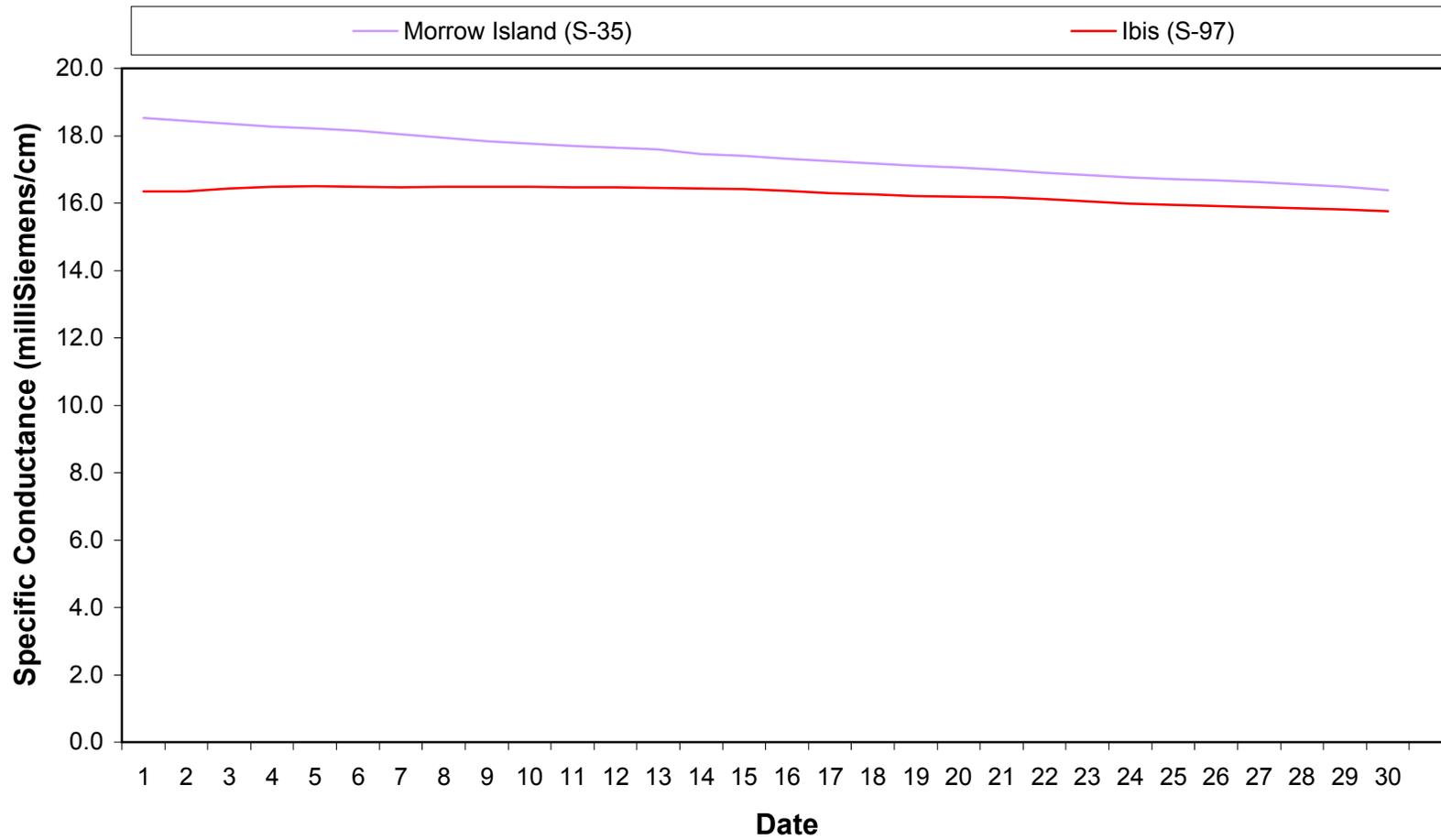
\*\*\*Value does not reflect actual end of month PDM due to equipment problems. However, the number of missing data during the month was low enough that it did not alter the end of month result.

**Figure 1 - Suisun Marsh Progressive Mean High-Tide Specific Conductance for November 2003**

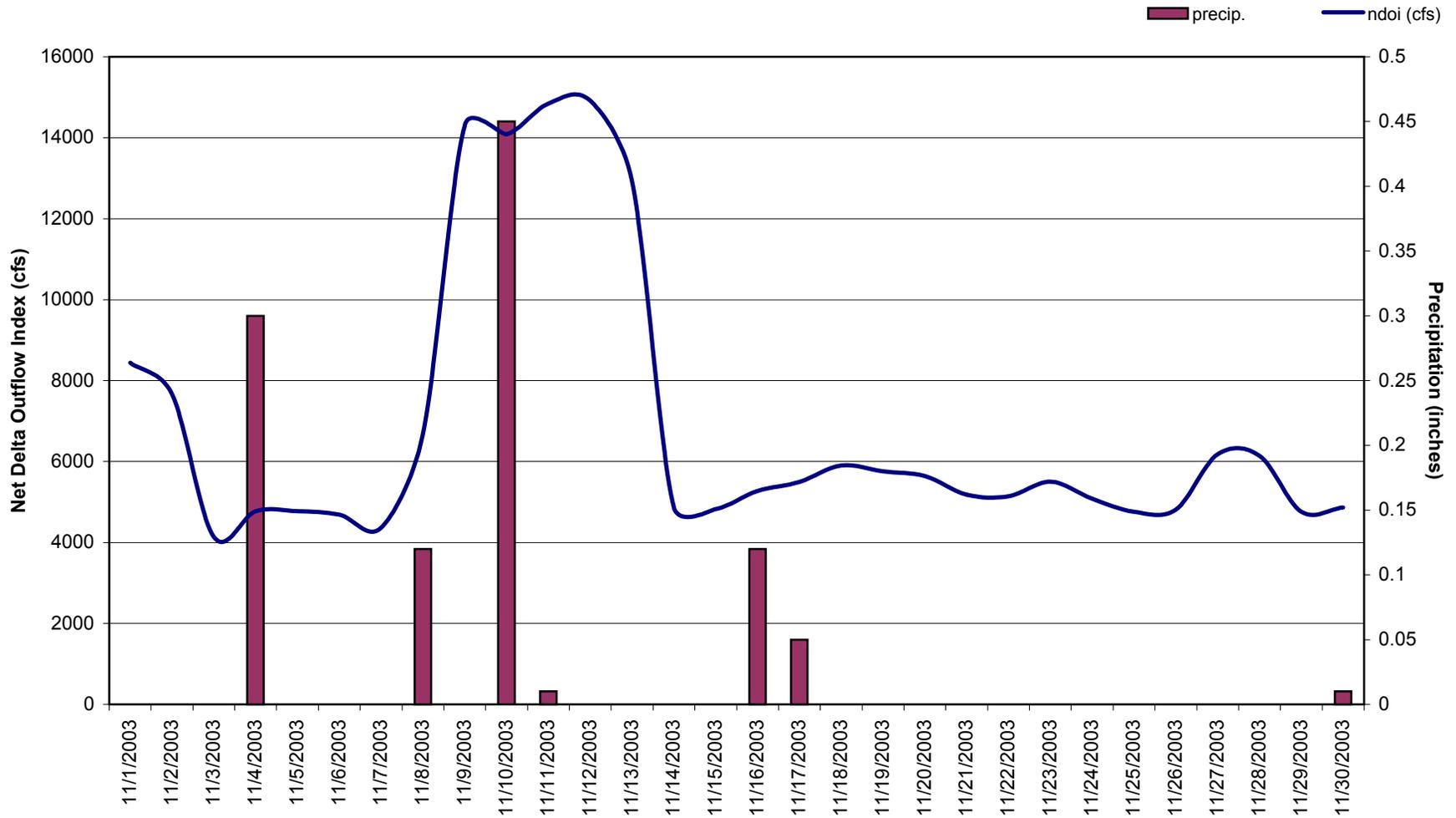


\* End of month PDM value not actual due to missing data; however, the number of missing data is low enough not to alter end of month value  
 \* \* \* \* \*Missing data due to equipment

**Figure 2. Suisun Marsh Progressive Mean High-Tide Specific Conductance at Monitoring Stations S35 and S97 November 2003**

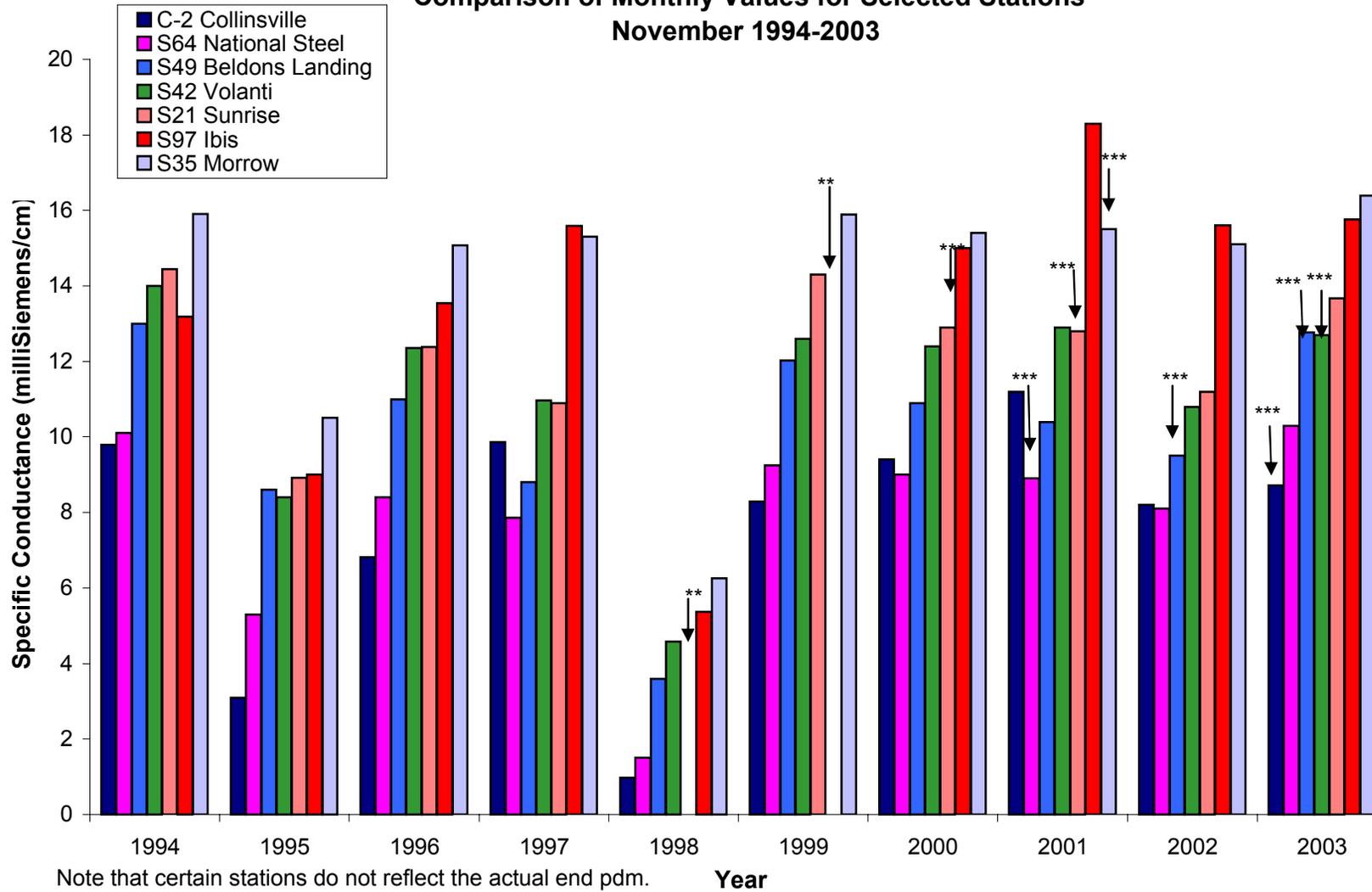


**Figure 3. Daily Net Delta Outflow Index and Precipitation\*  
November 2003**



\*Preliminary DWR, O&M Delta Outflow data and precipitation from Fairfield Water Treatment Plant.

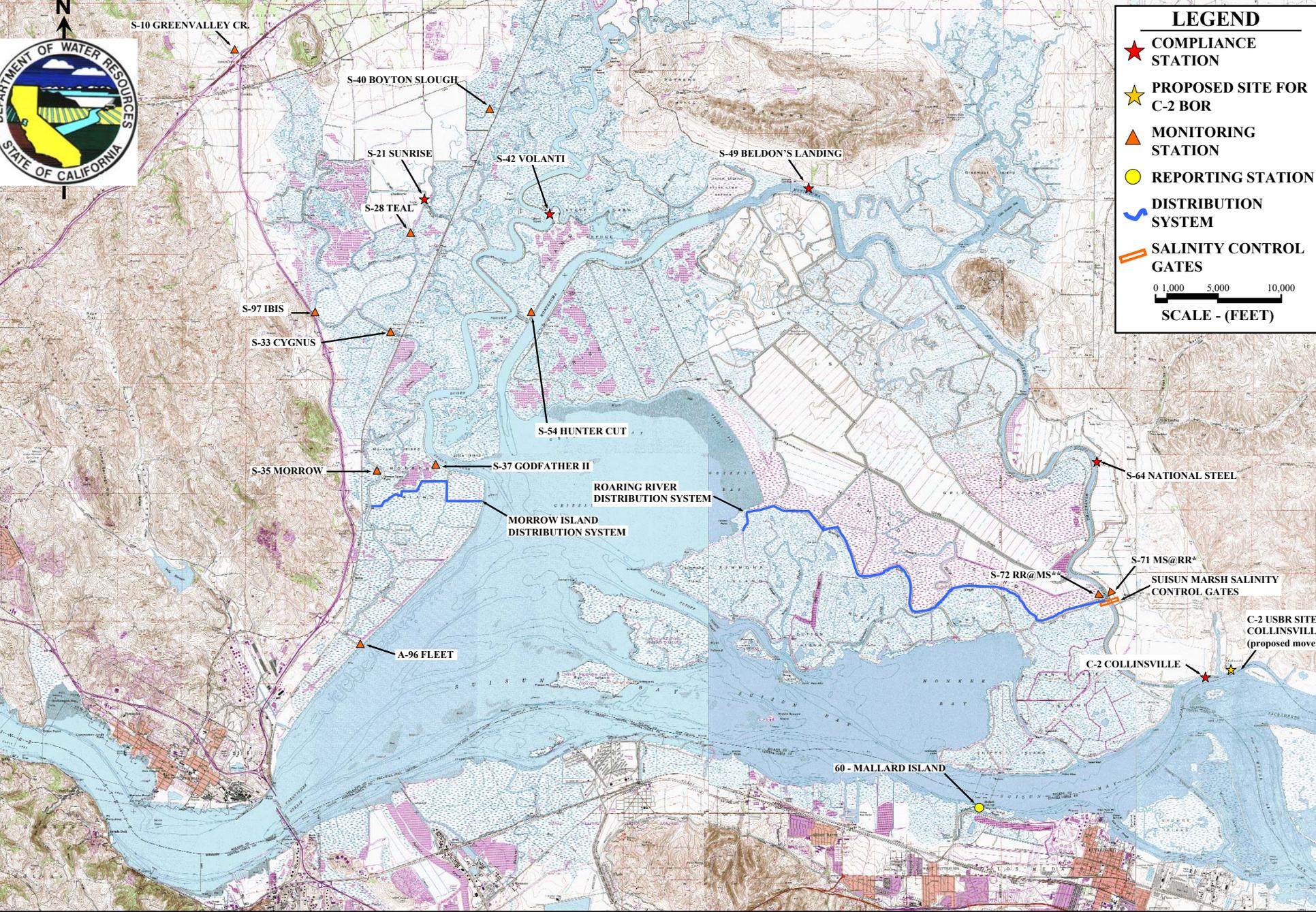
**Figure 4. Monthly Mean Specific Conductance at High Tide:  
Comparison of Monthly Values for Selected Stations  
November 1994-2003**



Note that certain stations do not reflect the actual end pdm.

\*\* Data was not obtained due to powder problems at the station.

\*\*\* Some data not obtained due to equipment malfunction.



# SUISUN MARSH PROGRAM WATER QUALITY MONITORING AND CONTROL FACILITIES