Equipment Design and Implementation
For Continuous Monitoring in an Estuary

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Biography:
Tom Cluney (corresponding author) is a Water Quality Inspector II with the Irvine Ranch Water District. As a lead person for the Monitoring Section Tom is responsible for both conducting and reporting functions for it's more sophisticated environmental programs. He has been with the District since 1990 when he began as an Engineering Tech I. Previously Tom worked for the Orange County Marine Institute as an instructor within their Living History and Marine Biology Programs. He is a graduate of the California State University at Long Beach in 1976 with a BS in Marine Biology.

Chris Kinner is the Water Quality Monitoring Supervisor for the Irvine Ranch Water District. He has been a laboratory supervisor for eight of his ten years with the Distinct. Prior to his employment with IRWD Chris was a Laboratory Technician with the South East Regional Reclamation Authority. Chris graduated from the University of California at Santa Barbara in 1983 with a BA in Biological Sciences.

Abstract:
The California Regional Water Quality Board (RWQCB) issued a permit in February on 1996 requiring IRWD to sample and monitor both the wetlands and Newport Back Bay areas before discharging could begin. One component of establishing a water quality baseline for the Back Bay required continuous monitoring for salinity, temperature and dissolved oxygen at a specific depth of one (1) foot below the surface at three (3) different locations within the confluence of the creek and bay.

IRWD selected Hydrolab's DataSonde 4 instrument for it's data collection needs. Starting with the physical dimensions of the sondes, IRWD designed and fabricated three (3) identical buoy systems. Besides meeting the basic requirements for the monitoring permit they also addressed additional concerns. Some of these concerns for the buoys were:

- Cost effectiveness (in-house construction of $920.00 / buoy)
- Security (lockable and temper resistant)
- Low maintenance and fouling potential
- Durability (two year minimum deployment within a marine environment)
- Provide continuous water flow through without inhibition
- Easy and cost effective access for deployment/re-deployment
- Ease of data retrieval
- Affective anchoring system (upgraded after the December 6, 1997 El Nino Storm)
- Not create navigational hazards

The buoys not only met the RWQCB requirements but also exceeded all expectations. The systems were deployed over a two year period collecting valuable data concerning water quality with the influence of daily tidal changes, urban runoff and storm events. The valuable data collected was used by the Army Corp of Engineers to create a sediment transport model and calibrate a brand new salinity model. This information was then in turn used to evaluate nutrient transport, release and uptake for the watershed (and bay) and will be used to complete a pathogen transport model as part of a TMDL. Additionally, the County of Orange in conjunction with the RWQCB requested us to utilize the buoys to monitor a dredging operation in the Newport Back Bay. The sondes were subsequently equipped with turbidity probes and relocated for this purpose. Once again they were very effective at fulfilling this monitoring requirement.

BACKGROUND:

The Irvine Ranch Water District (IRWD) is a large size water utility located in Orange County, California. The District serves a population of over 150,000 with domestic water, reclaimed water and wastewater services. IRWD's Michelson Wastewater Reclamation Plant (MWRP) has the capacity to treat up to 15 mgd of domestic wastewater utilizing a full tertiary activated wastewater treatment process. IRWD provides recycled water for a wide variety of applications with peak seasonal demands during the spring, summer, and fall. Reclaimed water production exceeds customer demands and storage capacity during the winter months by approximately 5 mgd. The cost for diverting flows to the Orange County Sanitation Districts facility was well in excess of a million dollars per year.

A concept was developed at the District to reduce excess reclaimed water by first using it in a series of man made ponds (wetlands) after which it would be discharged into the San Diego Creek. This creek feeds directly into the Newport Back Bay and then the Pacific Ocean.

BUOY CONSTRUCTION (See Fig 1):

Buoy construction was in two phases:

- Phase I was performed by JIM-BUOY a Division of Cal-June Incorporated, P.O. Box 9551, North Hollywood, CA 91609-1551. Contact person was Jim Robertson at (818) 761-3516.

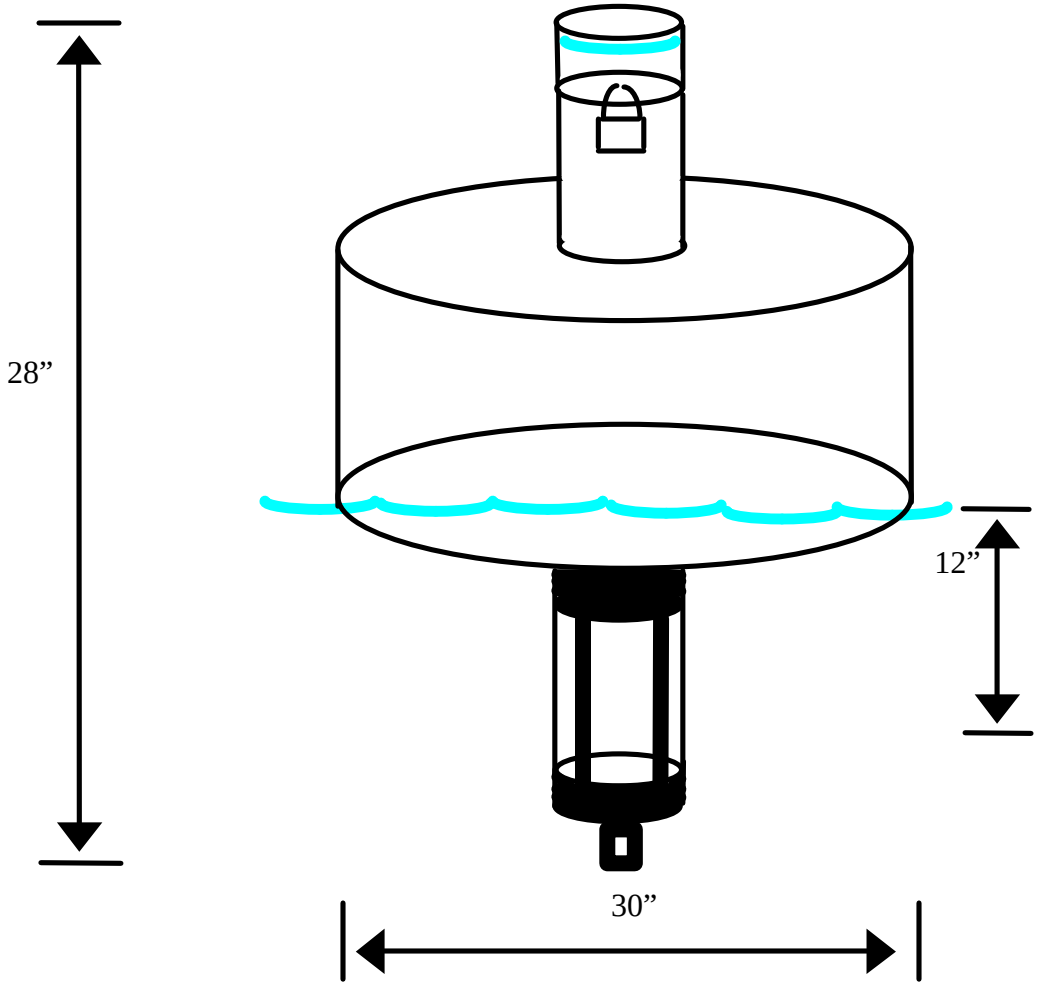
    - We selected a "sombrero" style buoy 30" in diameter and 12" high due to their strength and huge floatation base which assures upright floatation under severe conditions.
    - The floatation portion of the buoy is constructed of a CJ-37 Rock Hard Outer Shell with a high density polyethane foam inside.
    - The district supplied a 15" long x 4"I.D. schedule 40 PVC pipe to JIM-BUOY to be attached inside of the buoy during buoy fabrication. This sleeve was used to help support the stainless steel shaft that would be added during Phase II. The ends of the center sleeve was allowed to protrude 1.5 inches out from the bottom and top of the buoy and was attached to support splines similar to a hub and spoke configuration for added support.

- Phase II was performed Irvine Ranch Water District personnel.

    - A 36 " long x 4" O.D. x 1/8 " thick marine grade stainless steel pipe was inserted into the PVC sleeve. Welded side tabs prevent the tube from sliding up or down within the sleeve. One inch from the bottom, 4 slots seven inches long were cut into the tube to allow for water flow through. This is where the probes of the sonde would be located. On top a hinged cover with hasp was created to accept the lock. On the bottom a tab to accommodate a anchor chain was welded in place.
    - The stainless was painted with a white marine grade polyurethane for environmental compatibility and long term durability. The top portion of the steel tube had a 1" blue stripe added indicating that the buoy was non-navigational.
    - Three quarter inch anchor chain was attached to a two hundred (200) pound scrap domestic drinking water valve for an anchoring system.

IRWD Buoy System Design

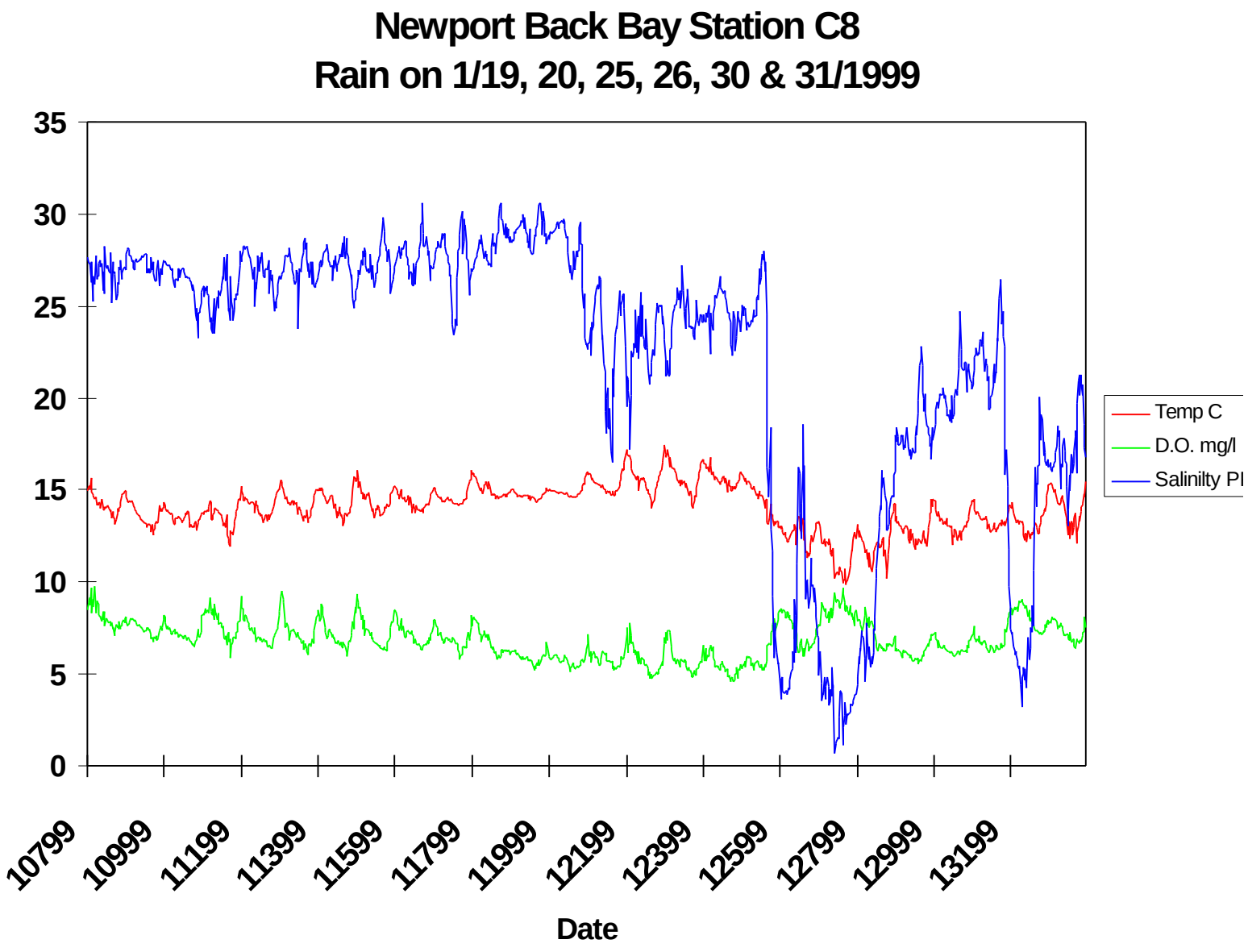
November 1996



- The floatation portion of the buoy is constructed of a CJ-37 Hard Rock outer shell with high density polyethane foam inside.
- A lockable stainless steel center enclosure houses the Hydrolab data sonde.
- The sonde's probes are located one foot below the water’s surface.
- The buoy is white with a blue stripe on the lid indicating that it is not for navigational purposes.
- There are three buoys in total. They are deployed at stations C2, C5, and C8 of the Upper Newport Back Bay for the Wetlands Water Supply Project monitoring.

Inspector John B. Hayes ready to insert a DataSonde 4 into a buoy in the northern section of Newport Back Bay, CA.

Buoy with Hydrolab's DataSonde 4 collecting data in Newport Back Bay, Ca.


Newport Back Bay Station C8
Rain on 1/19, 20, 25, 26, 30 & 31/1999
35
30
25
20
15
10
5
0
10799
10999
11199
11399
11599
11799
11999
12199
12399
12599
12799
12999
13199
Date
Temp C
D.O. mg/l
Salinilty PI