



# **Understanding Measures of Water Quality: Choosing the Appropriate Method for Permit Compliance**

Shelly Anghera, Ph.D., Steve Cappellino and Andrew Martin

September 7, 2012  
WEDA Pacific

# Why does WEDA membership care?



- Environmental risk
- Water quality (WQ) criteria exceedances can impact:
  1. Production (schedule)
  2. Equipment
  3. Increased monitoring
  4. Budget

# Lower Newport Bay Dredging

- Original permit:
  - Daily water quality monitoring
  - Weekly chemistry, toxicity
  - Turbidity criteria < 20% difference
  - > \$800,000



# Solution

- Regular communication with Regional Water Quality Control Board (RWQCB)
- Use of site specific criteria related to dredging activities → related to TSS
- Phased monitoring program
  - Intense when needed, relaxed when not
- Site specific considerations
  - Long-term benefits for short-term impacts
  - Meet fill site schedule
  - Protection of eelgrass

# Result

- Effective monitoring to inform dredger
- Rigorous science to support RWQCB
- Completion of dredging program without delays due to over-protective water quality issues



# Outline

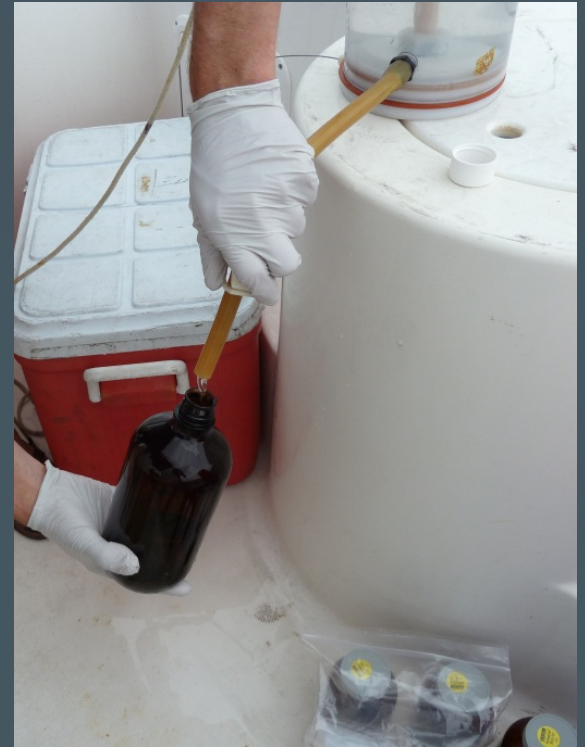
- Short primer on WQ monitoring in Southern California
- Common scientific challenges
- Lower Newport Bay: Special Study
  - Demonstrate how these WQ measures can be used

# Permits

- Dredging activities in California require waste discharge requirements (WDR) from the RWQCB
- The WDR will contain:
  - Water quality criteria
  - Required monitoring
- Results in two common problems:
  1. Use of overly conservative criteria
  2. Required monitoring may not measure the “actual” impacts of dredging equipment

# Overly Conservative Criteria

- Chronic criteria used for temporary impact
- Basin Plan Criterion used in permits:
  - pH, DO, temperature, turbidity
  - Toxicity
  - Chemistry





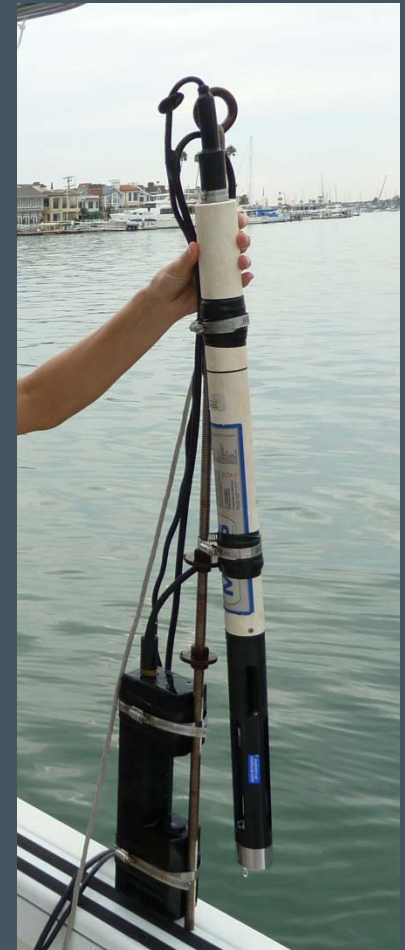
# Determining WQ Impacts of Dredging

- Dredging causes resuspension of sediments, TSS most direct measure
- Turbidity and transmissivity are used as surrogates for estimating amount of resuspended sediment



# Disconnect with Dredging Impacts

- **Turbidity:** measure of light scattered due to inorganic and organic particulates
  - Basin Plan Criteria = < 20% difference
- **Transmissivity:** measure of light penetration through set distance in water
  - Ocean Plan Criteria = any significant difference
  - Enclosed bays = USACE = < 40% difference
  - LA RWQCB = < 30% difference



# Example of Use of Criteria in Monitoring

Measure	Background	Criteria	WQ limit	Impact to dredging
Turbidity	5 to 10 NTU	30% difference	7 to 10 NTU	100% of days
Transmissivity	50 to 80%	30% difference	20 to 50%	40% of days

NTU = nephelometric turbidity unit

# Total Suspended Solids (TSS)

- CSTF study evaluates effects
- Includes marine fish, birds, invertebrates
- 10 percent of organisms experience acute sub-lethal impacts from TSS when concentrations exceeded 100 mg/L

# Special Study: Lower Newport Bay

- Currently dredging:
  - May to August 2012
  - 300,000 cy contaminated and clean material
  - Many areas adjacent to eelgrass beds
- Original permit:
  - Daily water quality monitoring; > \$800,000
  - Turbidity < 20% difference from background
- Modified permit:
  - ~\$300,000 monitoring program
  - Turbidity < 50 NTUs

# Special Study Objectives

- Describe relationship between TSS, turbidity, and light transmittance for Lower Newport Bay
- Recommend transmissivity and turbidity monitoring threshold
  - For evaluation of dredging related impacts
  - Predictive of elevated TSS
  - Protective of marine organisms
    - Acute sub-lethal effects to marine fish, birds, invertebrates

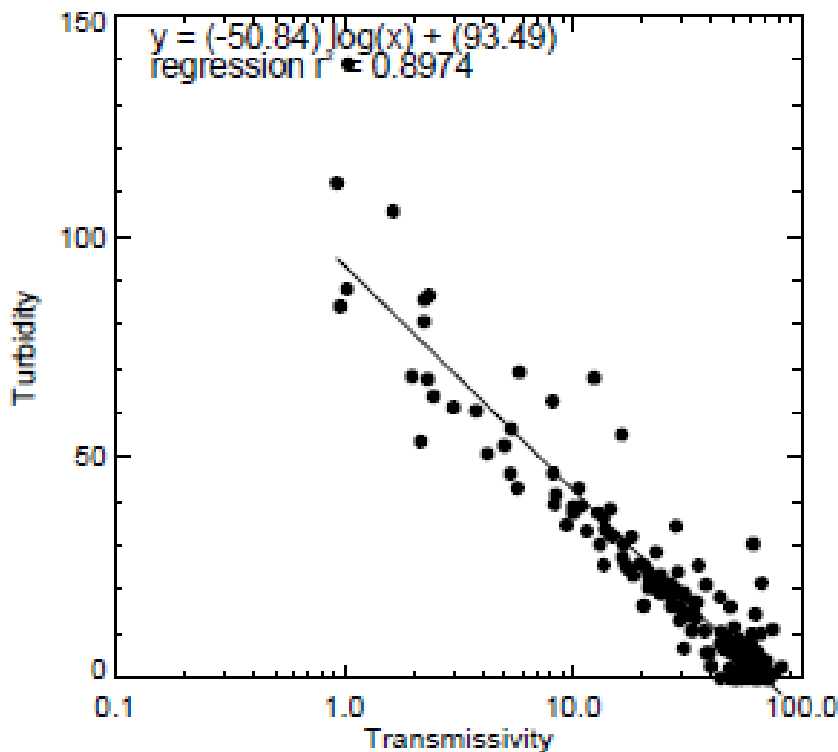
# Data Collection

- Synoptically collected transmissivity, turbidity, and TSS
  - Pre-dredge evaluation at reference locations
  - First five days of dredging
    - Reference, 100 ft upstream, 100 ft downstream, and 300 ft downstream of dredging



# Relationship Between WQ Measures

## Transmissivity and Turbidity

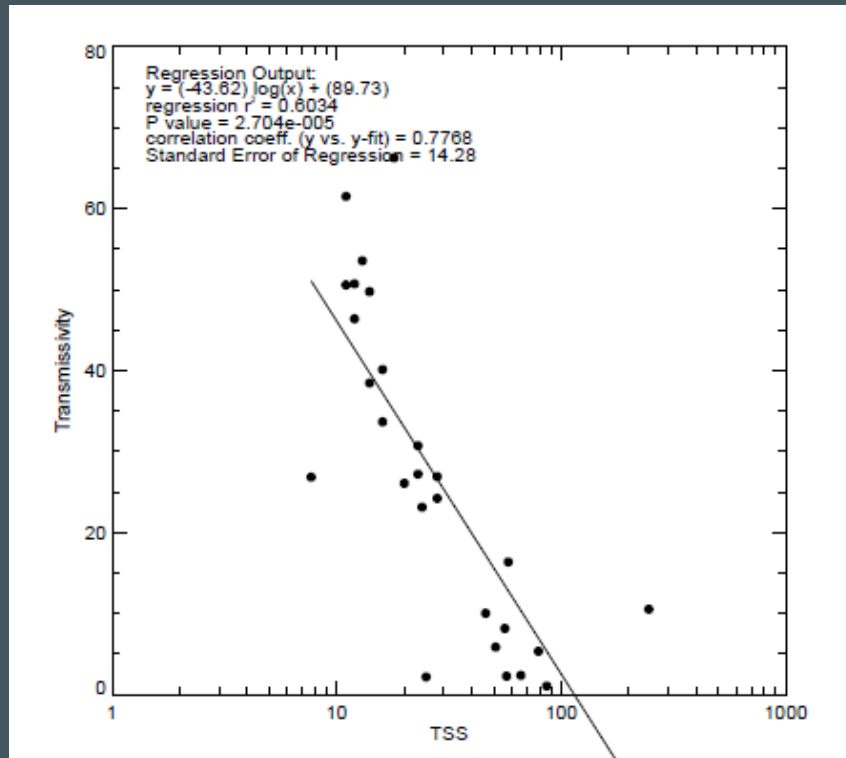


- Water quality results for stations located in the vicinity of the active dredging operations

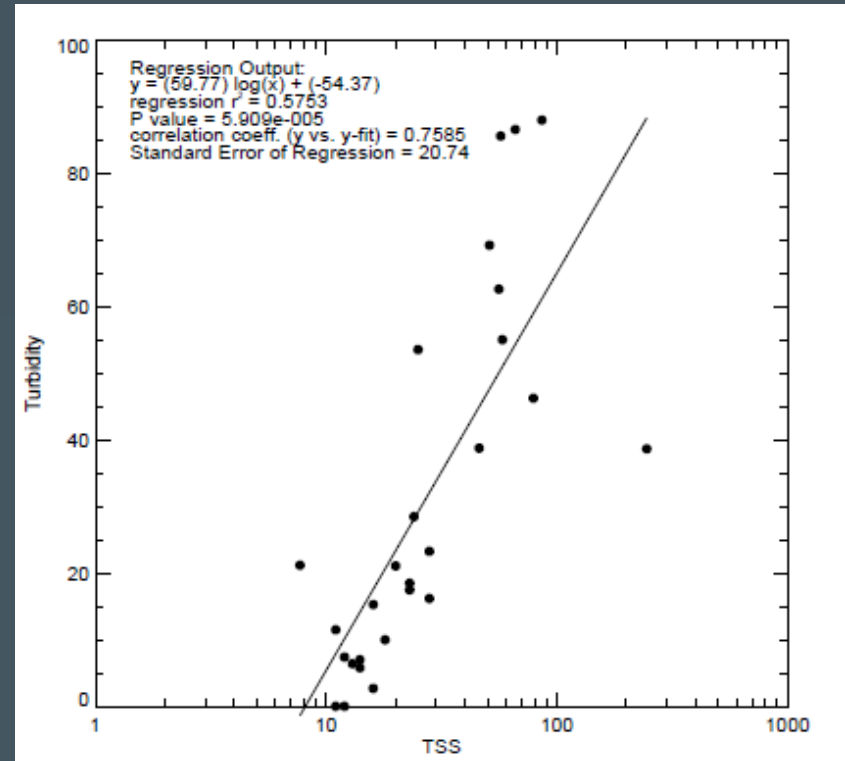


# Relationship Between WQ Measures

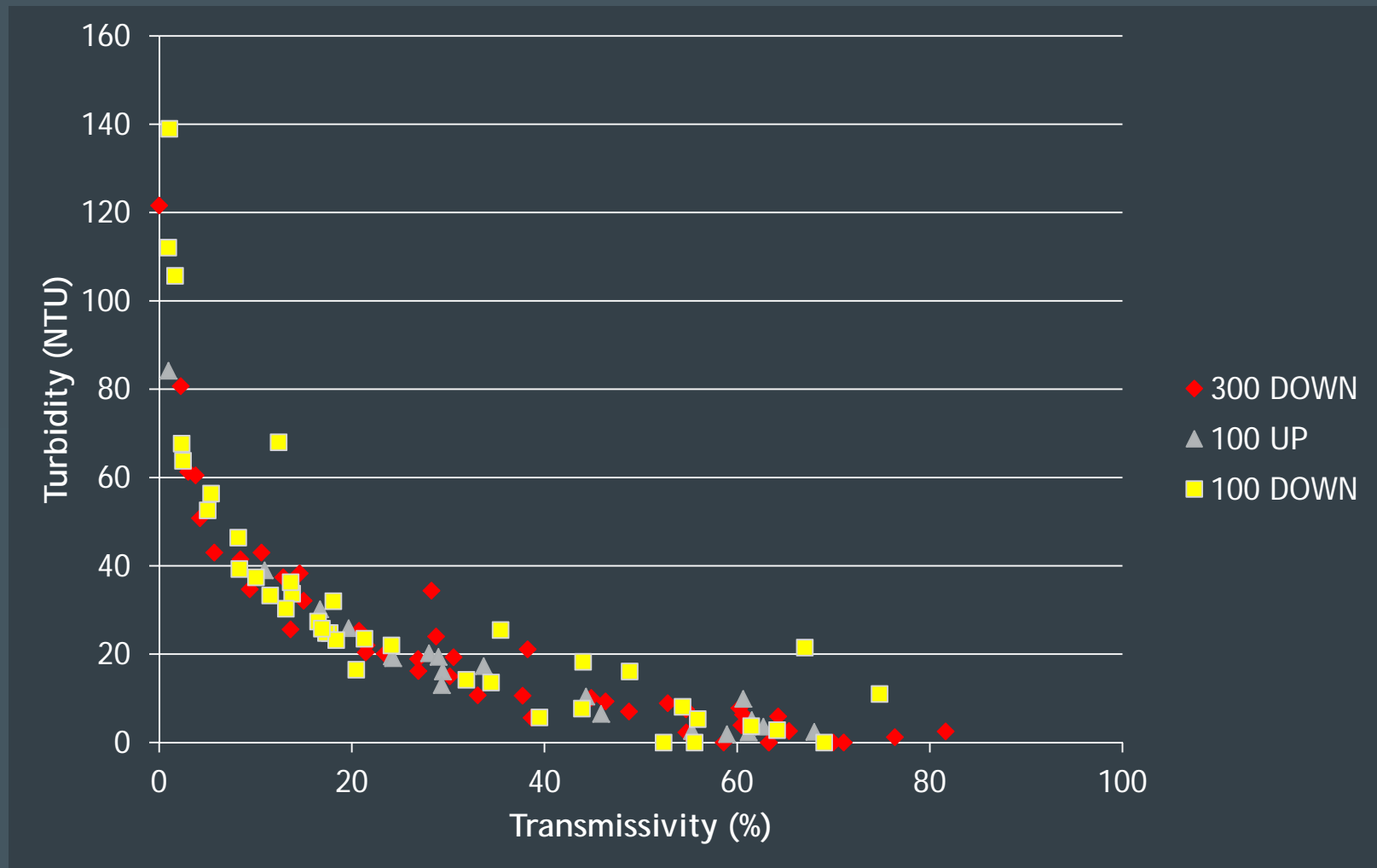
## TSS and Transmissivity



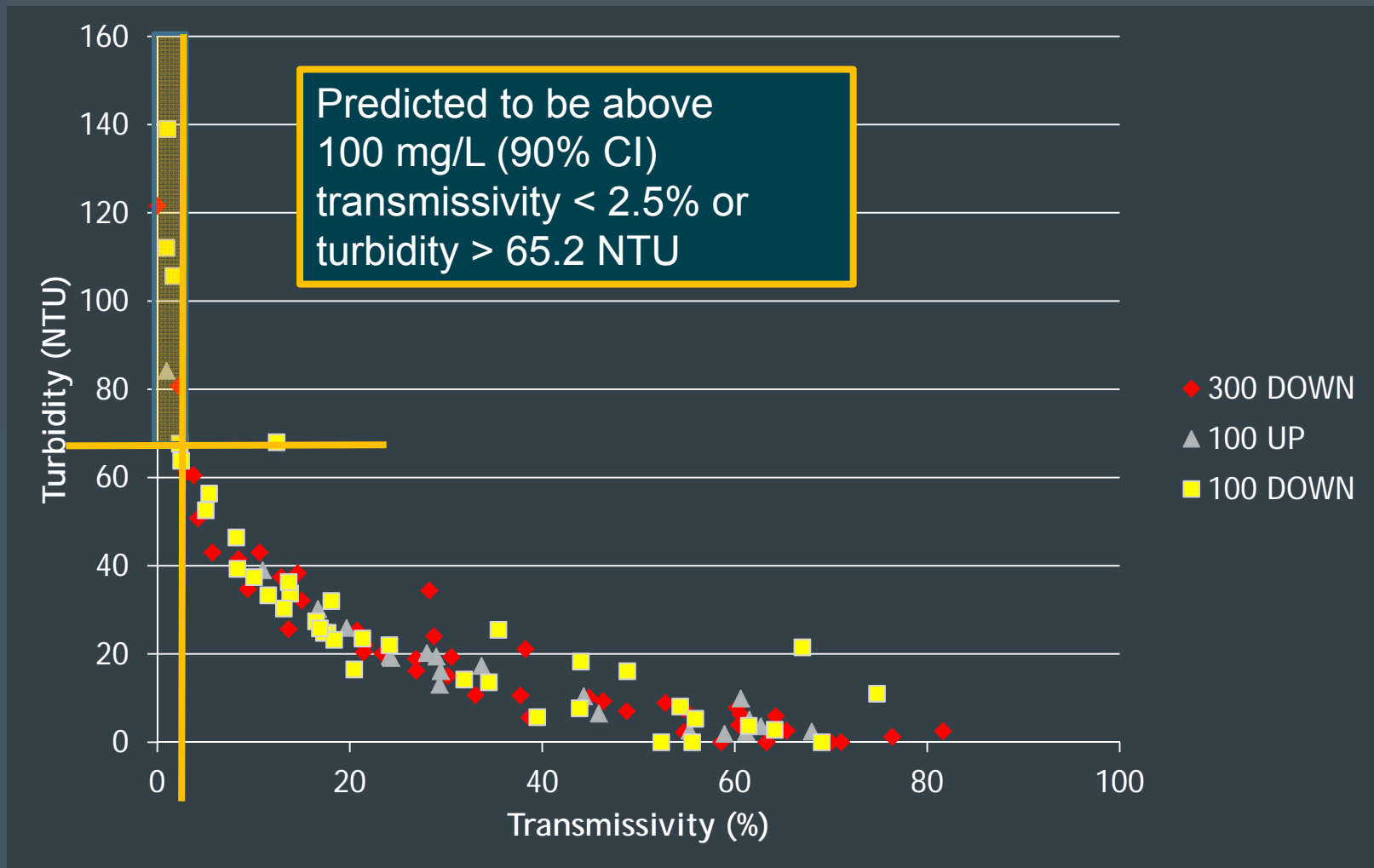
## TSS and Turbidity



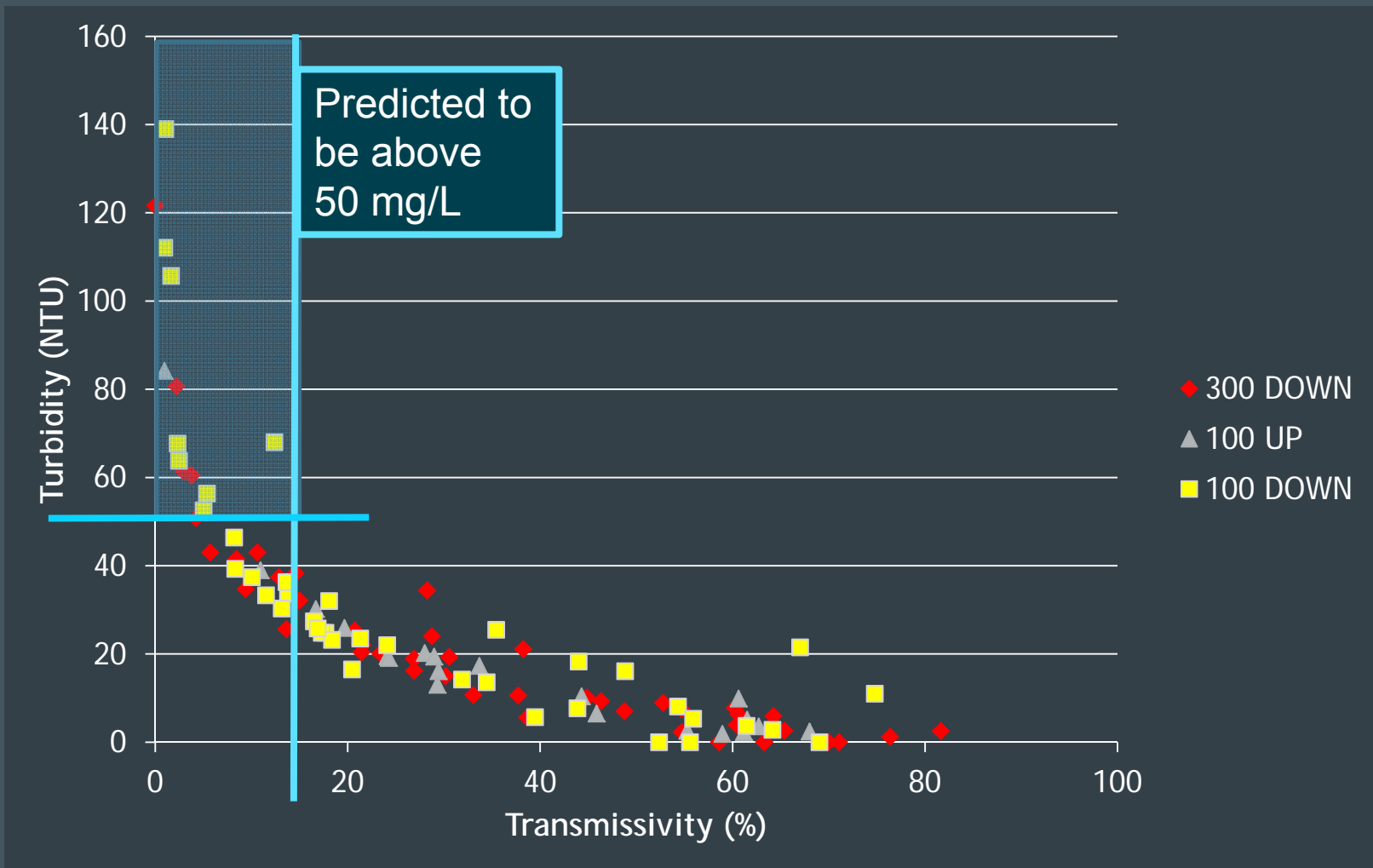
# Measured WQ During Dredging



# Protective of Acute Effects



# Protective of Acute Effects



# Protective of Acute Effects

- Proposed monitoring
  - If transmissivity and turbidity predict TSS to be greater than 50 mg/L,
    - 300 ft down current, midwater
    - Conduct additional monitoring 24 hours later
    - If conditions indicate TSS is greater than 50 mg/L for more than 24 hours, implement dredge operator BMPs
      - Slowing down
      - Increasing precision

# Summary of Water Quality During Dredging

- ~100 days of dredging
- 41 monitoring days
  - Water quality comparing 300 ft station to reference
  - At surface, mid, or bottom depths

Permit	Exceedance Days
USACE	24 (59%)
LARWQCB	31 (76%)
Negotiated SARWQCB	1 (2%)

# Setting the New Standard

- Early and frequent communication with RWQCB
- Use of site specific criteria related to dredging activities → related to TSS
- Phased monitoring program
  - Intense when needed, relaxed when not
- Site specific considerations

# Acknowledgements

- City of Newport Beach
- Santa Ana RWQCB

