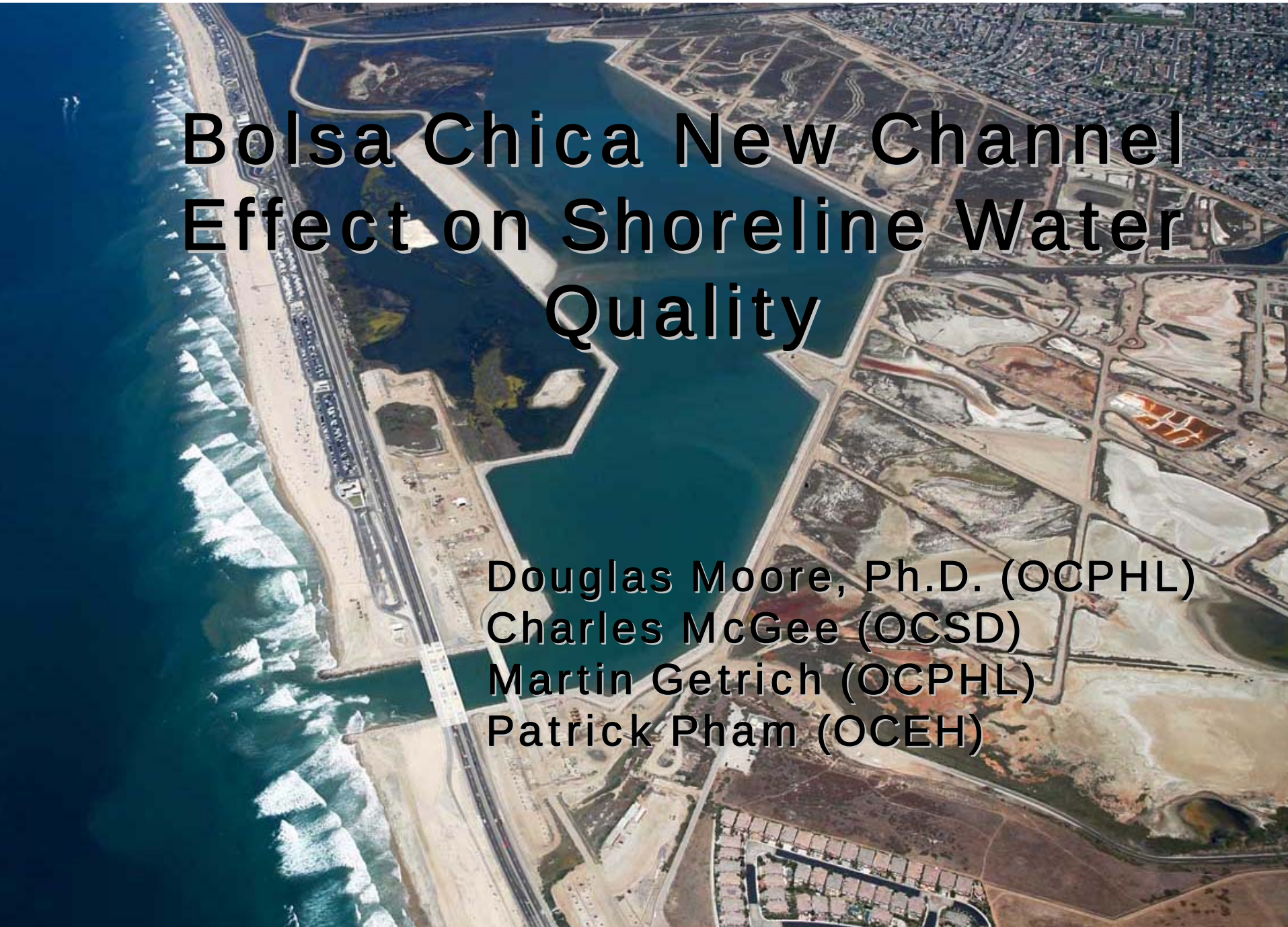


Bolsa Chica New Channel Effect on Shoreline Water Quality

Douglas Moore, Ph.D. (OCPHL)
Charles McGee (OCSD)
Martin Getrich (OCPHL)
Patrick Pham (OCEH)

Sampling Sites at Bolsa Chica State Beach and Huntington City Beach

Location of Future Channel and Two Added Study Sampling Sites: BCN and BCS

Bolsa Chica Wetlands after Channel Opening

Study Outline

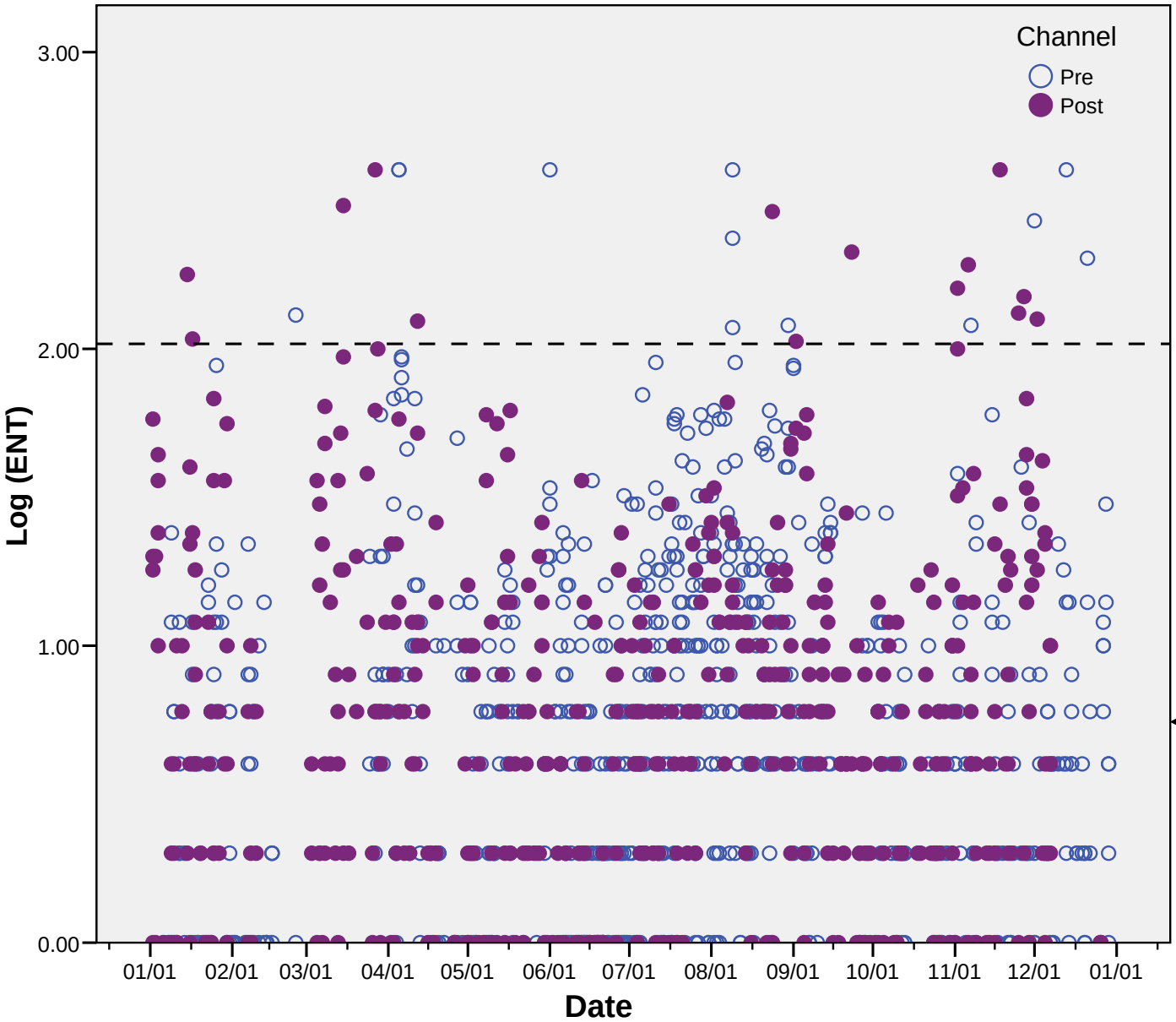
- Study utilized shoreline water quality data.
  - Pre-Channel June 7, 2005 – Aug 23, 2006
  - Post-Channel Aug 24, 2006 – Aug 27, 2007

  – 5 sample sites for Bolsa Chica Site
    - Channel Opened Aug 24, 2006
    - 4 Beach Sites (n = 190 to 450 per site)
    - 1 Mid-Channel Feb. 2007 – Aug. 27, 2007 (n = 25)
  – 8 sample sites for Santa Ana River Site
    - Date range from June 7, 2005 – Aug. 27, 2007
    - 5 Beach Sites (n = 440 to 450 per site)
    - 3 Channel Sites (n = 450 to 480 per site)

Study Details

- Collection & Testing conducted by Orange County Sanitation District. Total Coliforms, Fecal Coliforms, & Enterococcus Tested.
- Data analysis by OC PHL & OC EH
- Dry weather data only, rain periods excluded
- Statistical Analysis
  - Geomean
  - Failure rates – single samples exceedances
  - Differences in values before and after channel opening
    - The Mann-Whitney U – nonparametric rank test

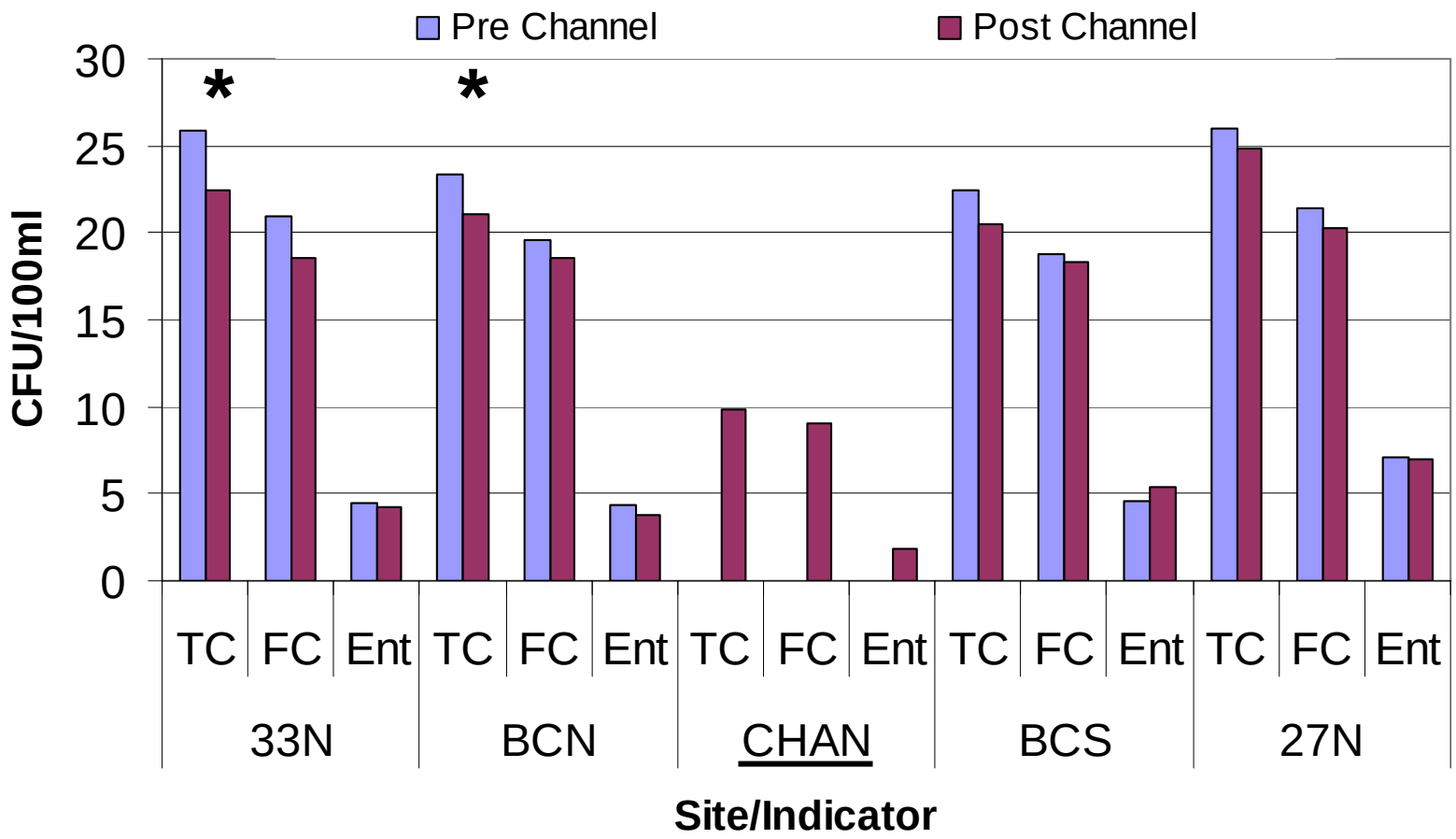
Bolsa Chica Enterococcus Data, All Sites
N = 1289



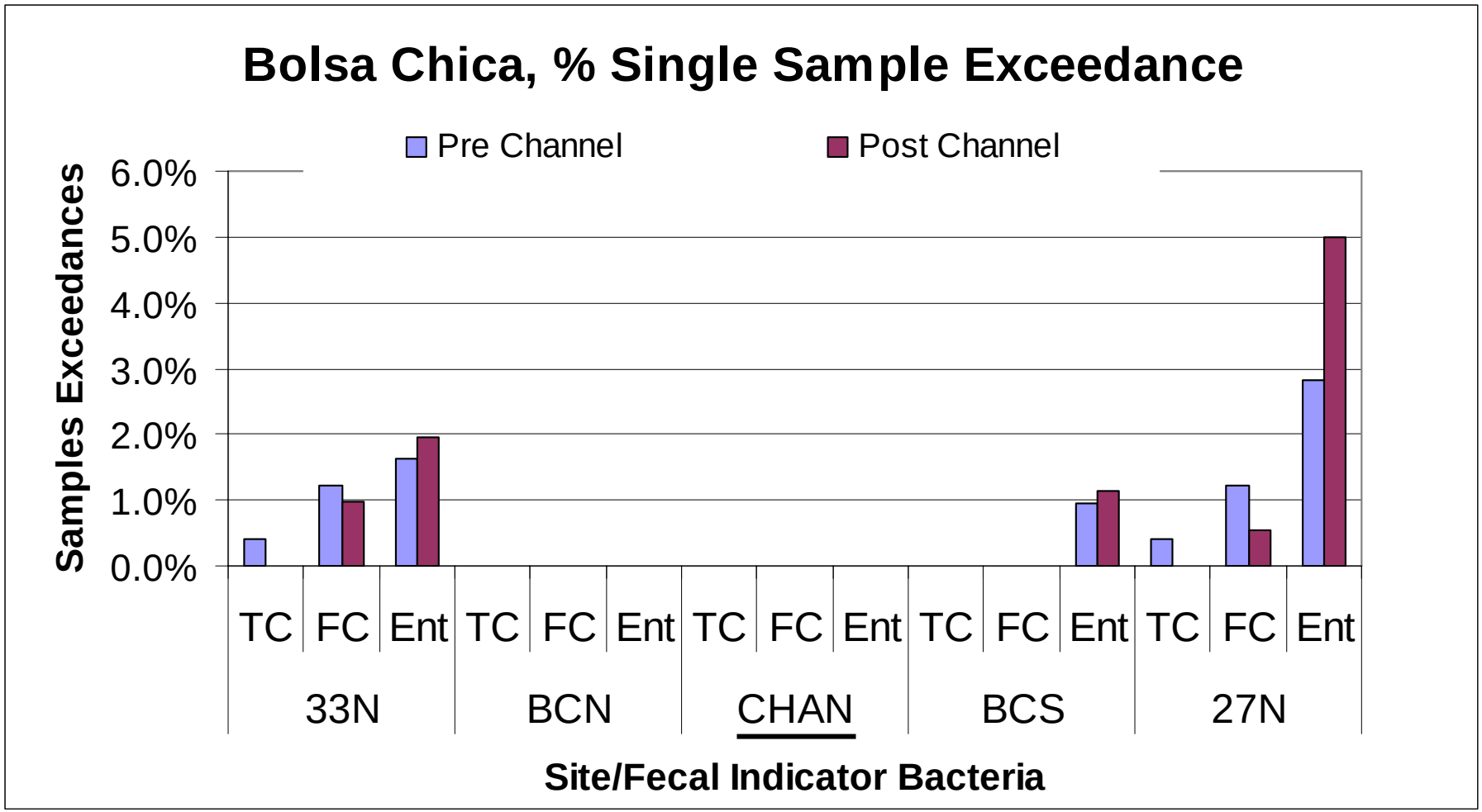
104 CFU/ 100 ml

Geomean 5.2 CFU/100 ml

Bolsa Chica, Geomean of Single Sample Levels



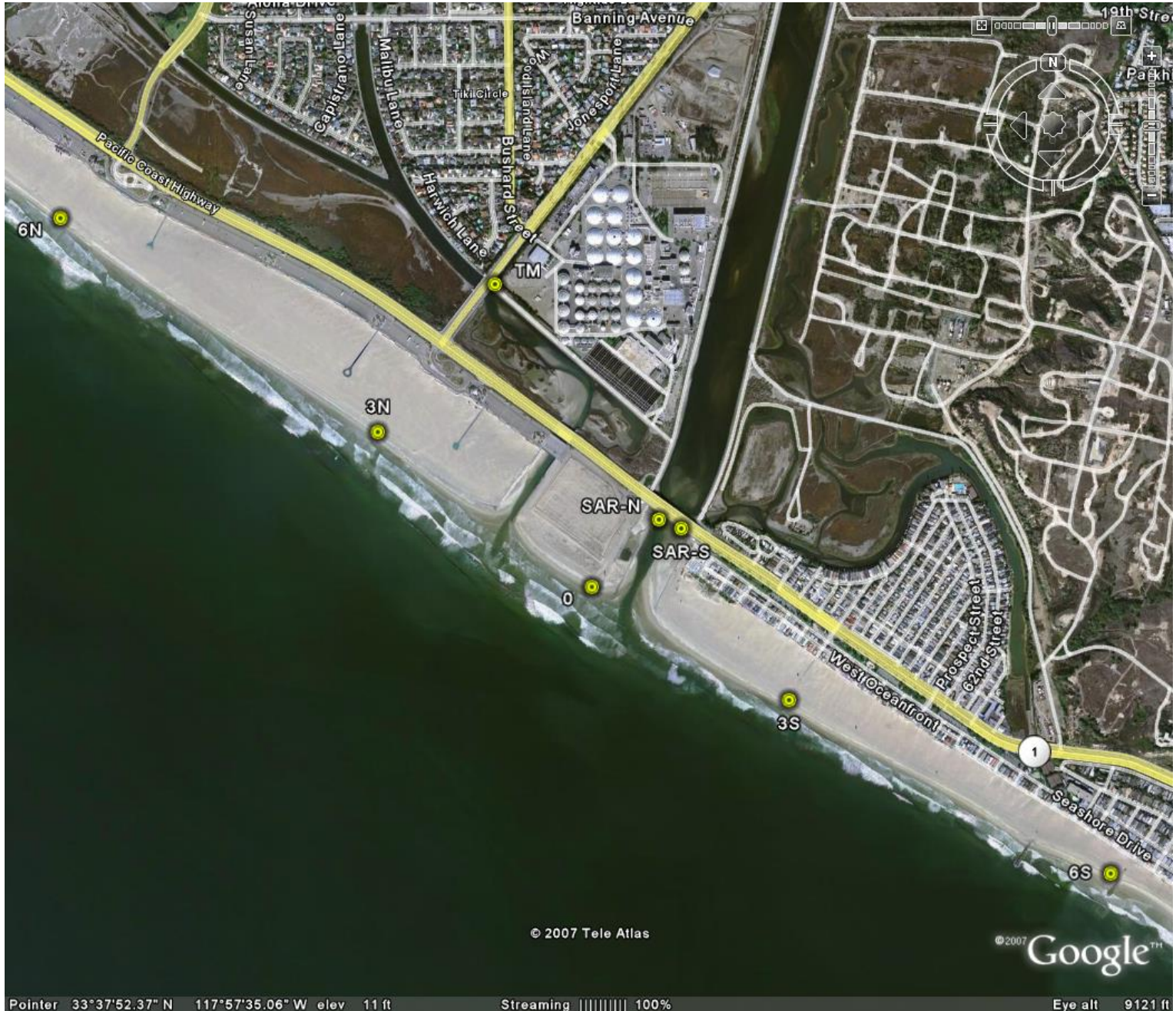
* Statistically significant for $p < 0.05$, by Mann-Whitney U Test


Bolsa Chica, % Single Sample Exceedance
Pre Channel
Post Channel
Samples Exceedances
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
TC
FC
Ent
33N
BCN
CHAN
BCS
27N
Site/Fecal Indicator Bacteria

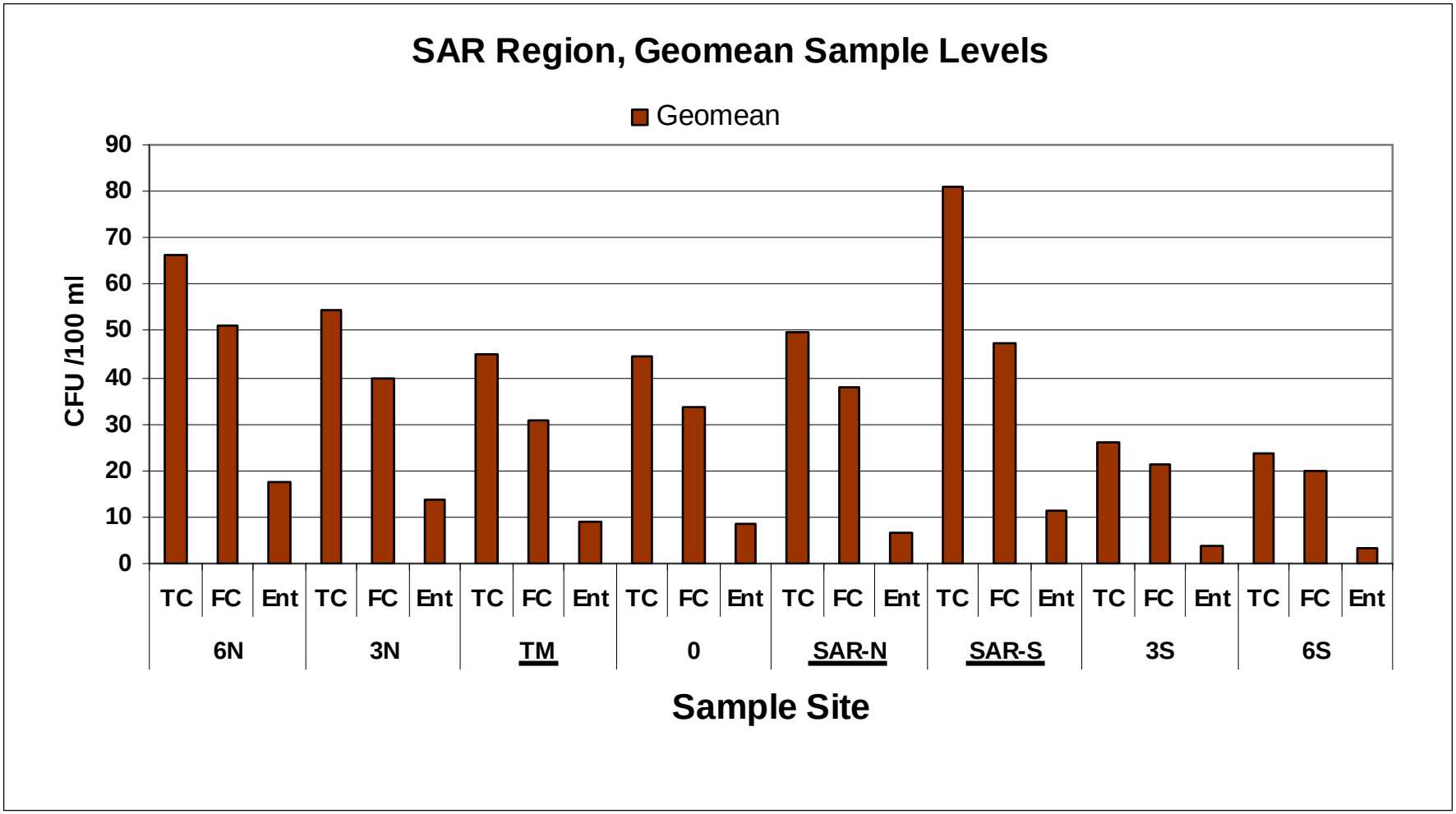
Conclusions, Bolsa Chica

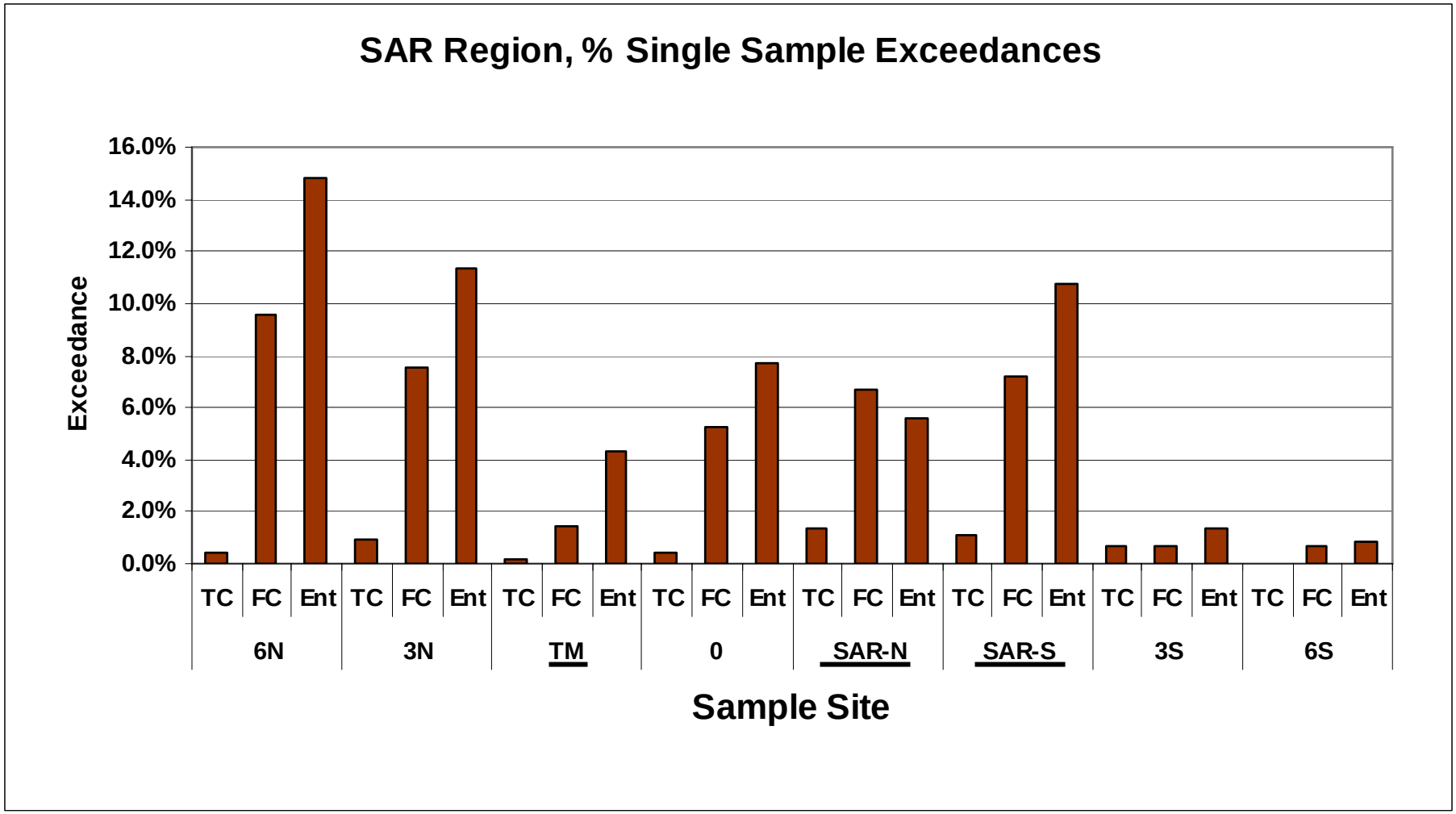
- Opening channel did not degrade water quality at adjacent beaches in a one year dry weather study.
- Water taken directly from channel has very low concentrations of indicator organisms.
- Study will be continued one additional year.
- Effect during rain events is unknown at this time.

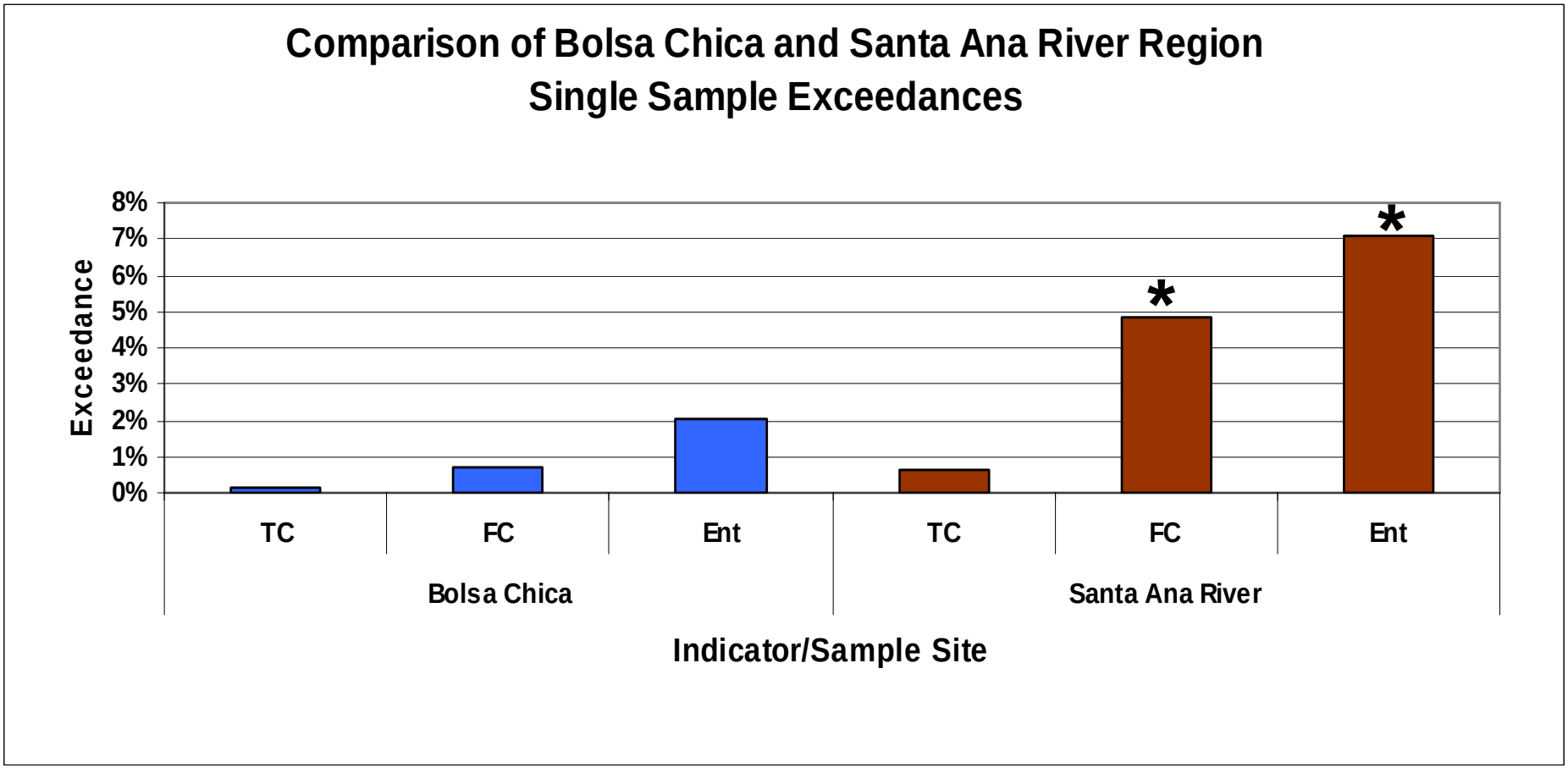
Sampling Sites at Huntington State Beach/Newport Beach



Santa Ana River Region Enterococcus Data, All Sites
N = 3624


SAR Region, Geomean Sample Levels
Geomean
CFU /100 ml
90
80
70
60
50
40
30
20
10
0
TC FC Ent TC FC Ent TC FC Ent TC FC Ent TC FC Ent TC FC Ent TC FC Ent TC FC Ent
6N
3N
TM
0
SAR-N
SAR-S
3S
6S
Sample Site


SAR Region, % Single Sample Exceedances
Exceedance
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
TC FC Ent TC FC Ent TC FC Ent TC FC Ent TC FC Ent TC FC Ent TC FC Ent TC FC Ent TC FC Ent
6N
3N
TM
0
SAR-N
SAR-S
3S
6S
Sample Site



* Statistically significant for $p < 0.05$, by Mann-Whitney U Test

Conclusions, Santa Ana River

- Channels degrade water quality at down current adjacent beaches.
- Water taken directly from channel often has high concentration of indicator organisms.
- Other studies have shown high levels of enterococcus in channel sediment.
- Dry weather beach failures are correlated with spring tides.

Bolsa Chica Wetlands Pollution Factors

Storm Drains: None

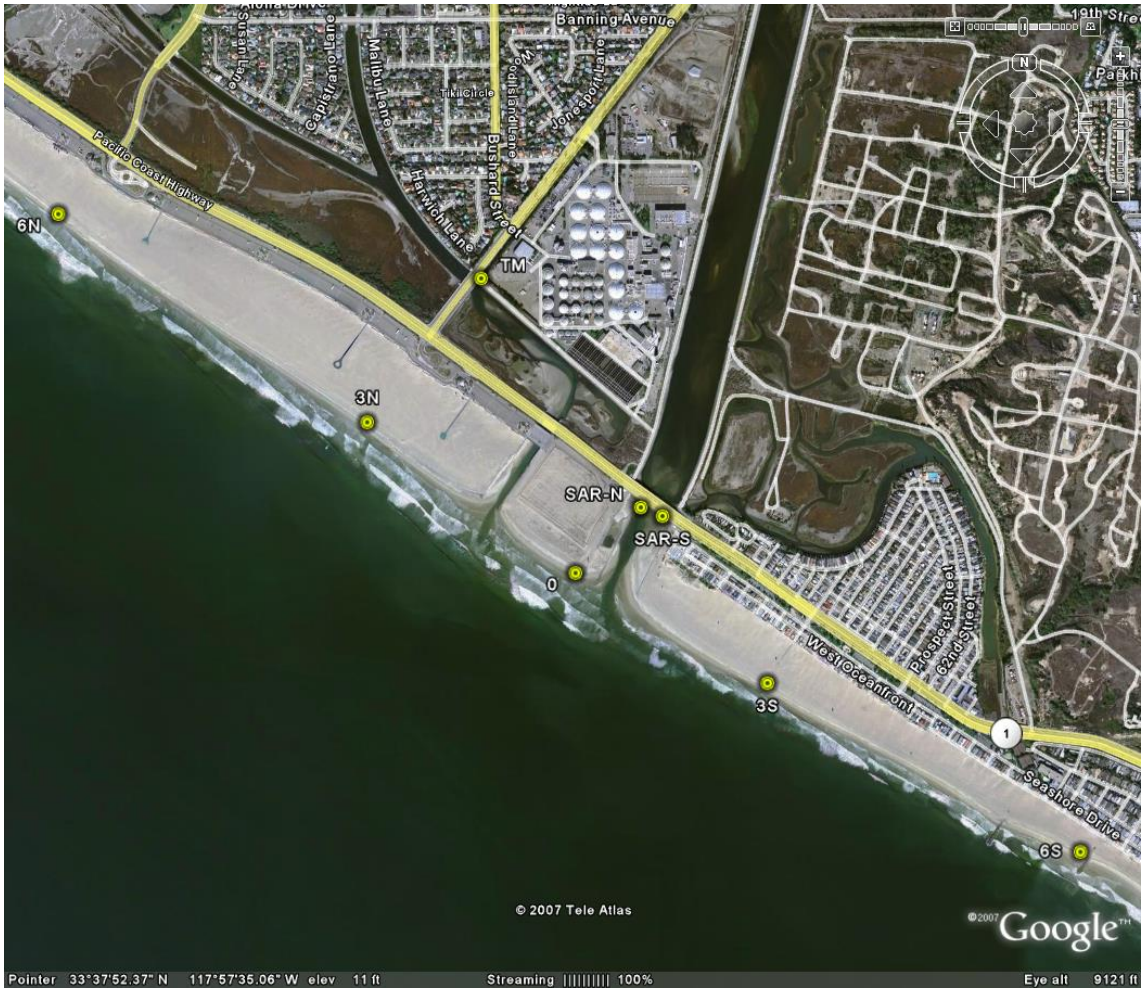
Drainage Area: Wetlands only

Intertidal Area: Small but increasing when partial tidal area is opened.

Bird Population: Yes ?

Tidal Effect: ?

SAR/Talbert Channels Pollution Factors



Storm Drains: Numerous in both SAR and Talbert Channel (diverted in dry weather)

Drainage Area: Extensive below Prado Dam. Huge total area above dam.

Intertidal Area: Large percentage of wet zone

Bird Population: Yes ?

Tidal effect: Beach pollution occurs during spring tides.

Conclusions

- Bolsa Chica is an estuary that doesn’t degrade water quality in contrast to many others.
- Certain factors may determine if an estuary will degrade surrounding water quality.
- Routing storm drains through wetlands will possibly pollute the wetlands.
- Water quality studies should be part of Bolsa Chica operation.
- Santa Ana River/Talbert Channels pollute adjacent beaches even with diverted storm drains. Cause should be determined.