

# How Slow Can You Go?

## PCB Lessons from San Leandro Bay

Don Yee

Jay Davis, Alicia Gilbreath, Lester McKee



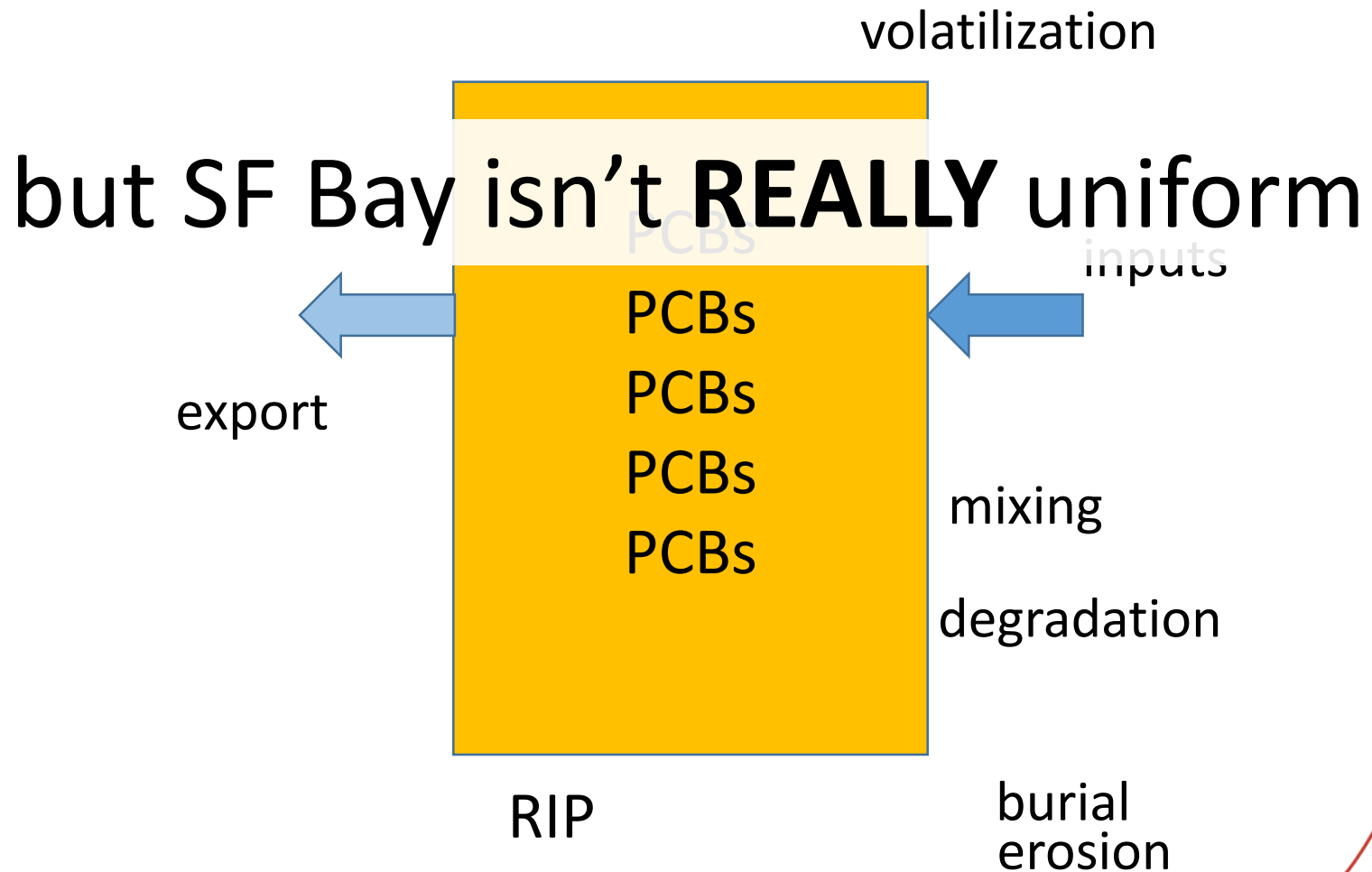
2017



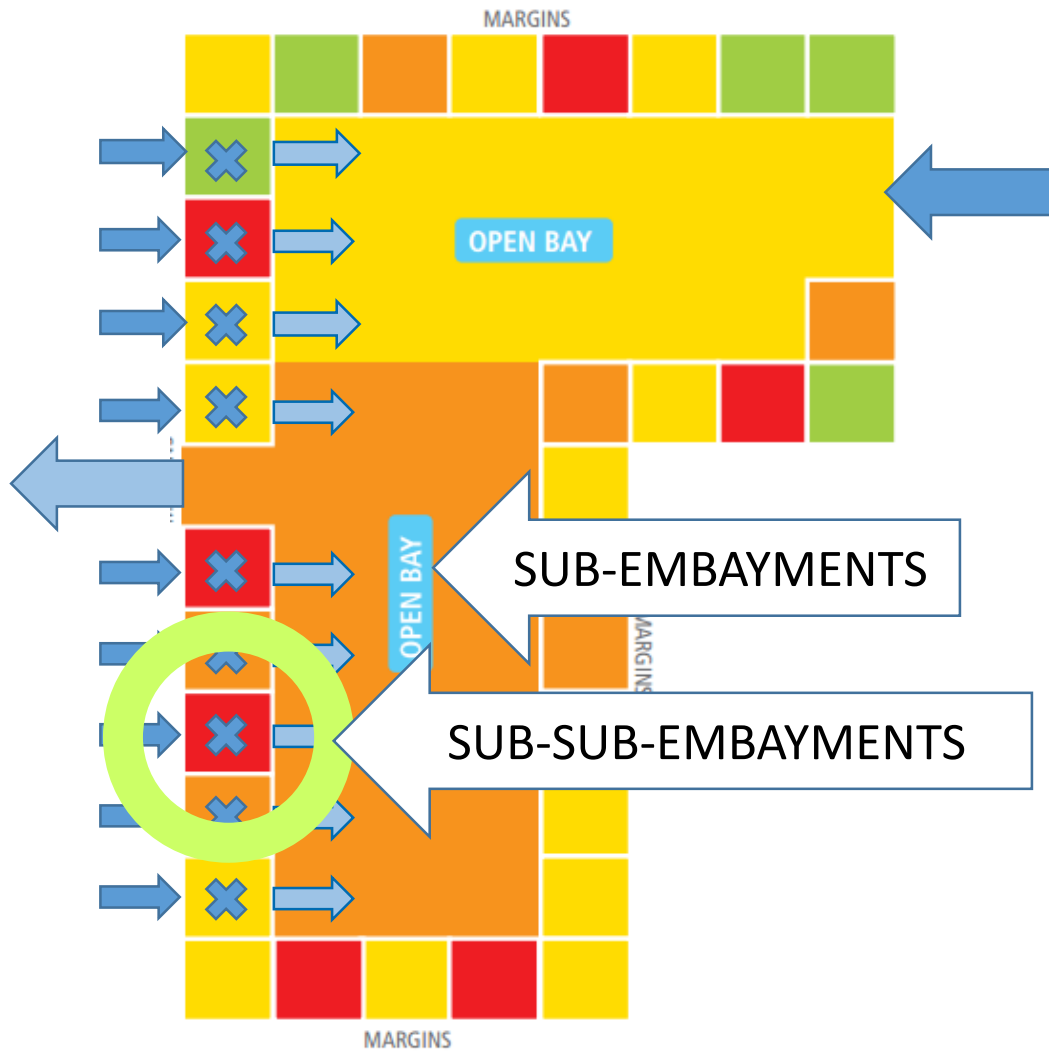
nce upon a time, in a Bay near San Francisco, a TMDL plan was devised to manage the threat posed by PCBs. A model to predict the outcome of the plan was needed, and thus was born...



# Whole SF Bay PCB CM 1.0



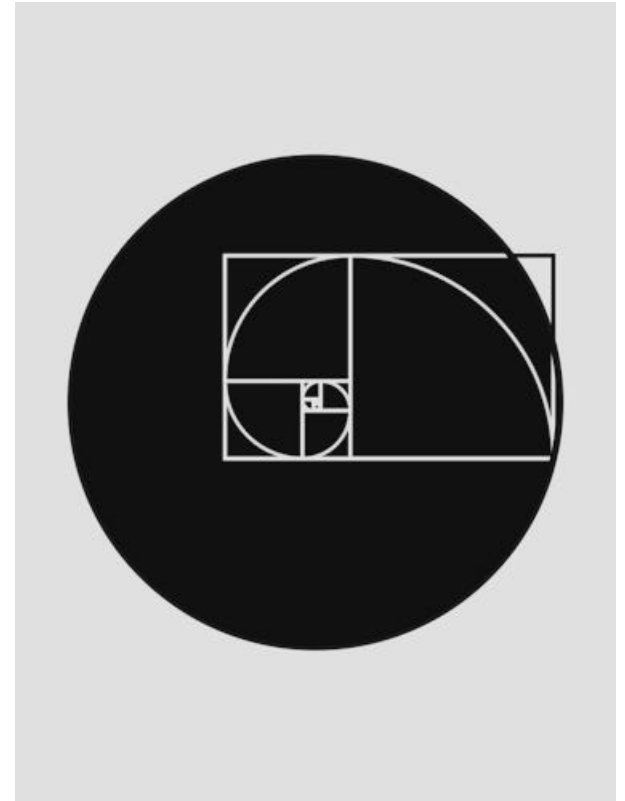
# SF Bay PCB CM 2.0



# (Sub-)<sup>m</sup>bayments

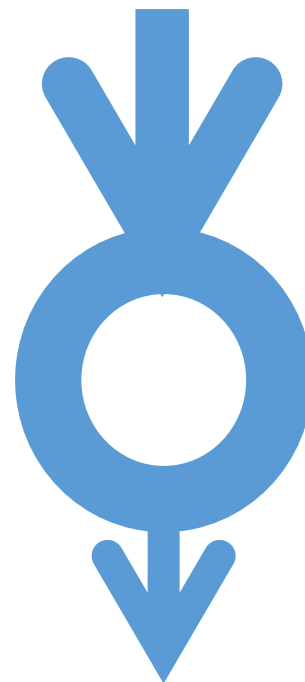
Big bays have little bays,  
Into which you can divide 'em,  
And those units have sub-units,  
And so, ad infinitum.

then you run out of data,  
computational power,  
budget,  
time



# “Priority” Margin Units (PMUs)

- previously “High Leverage Areas”
- a.k.a.
- High
  - Loading
  - Concentrations
  - Biological impact
  - Management action
  - Recovery potential (TBD)?



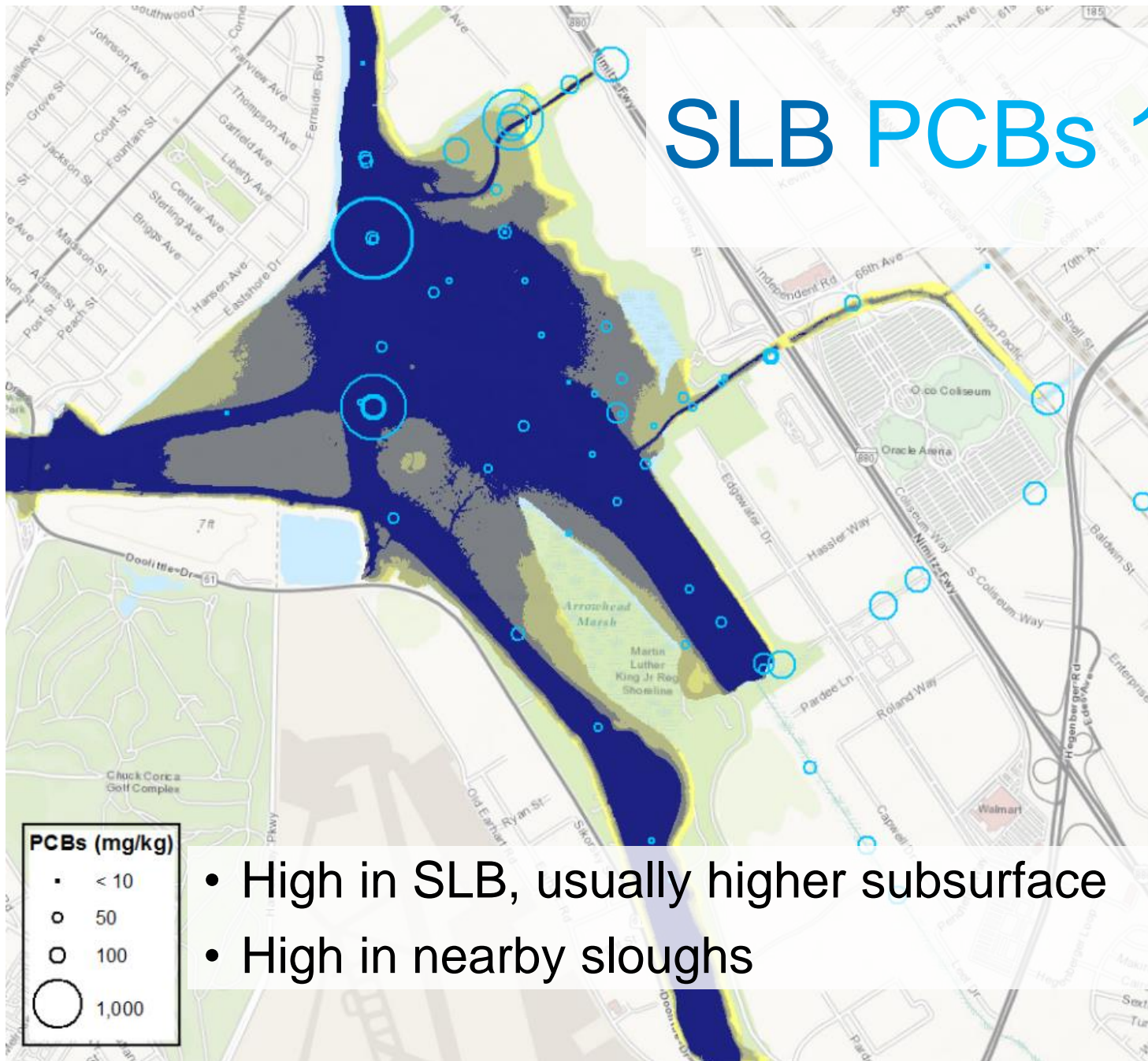
# San Leandro Bay (SLB) PMU



- Highly enclosed
- Near older urban
- Previously studied 1998  
(Daum et al. 2000)



# SLB PCBs 1998





# SLB PMU PCB Mass Budget

What would SLB PMU PCB Mass Budget Do?

- Sim

- 
- 
- 

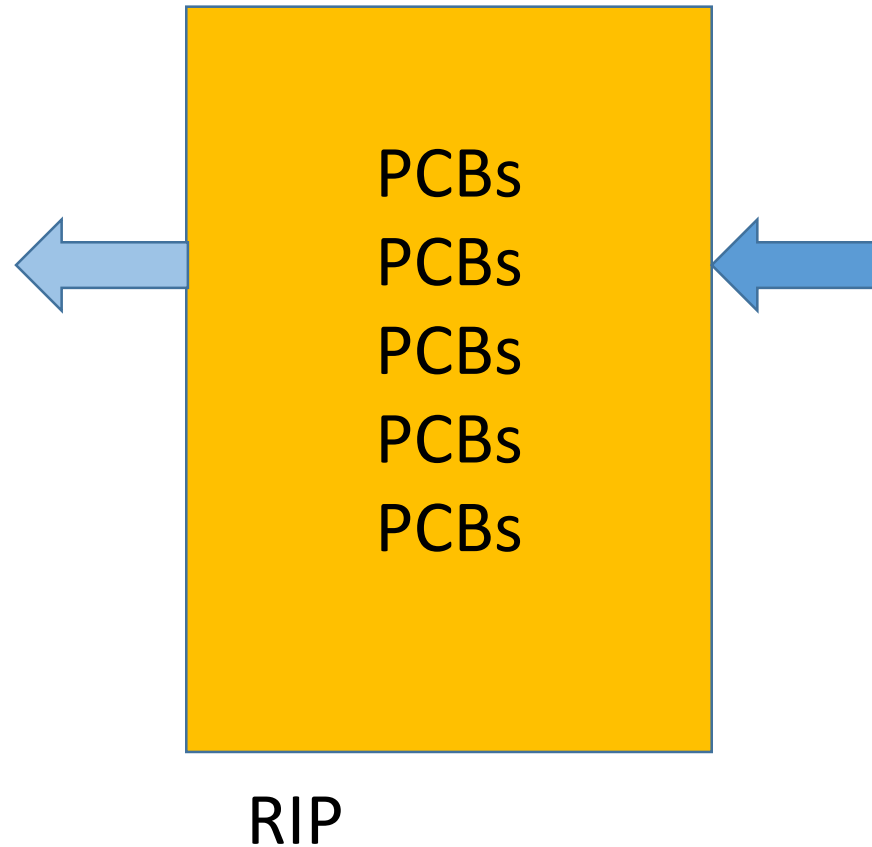
- Par

- 
- 
- 
- 
- 

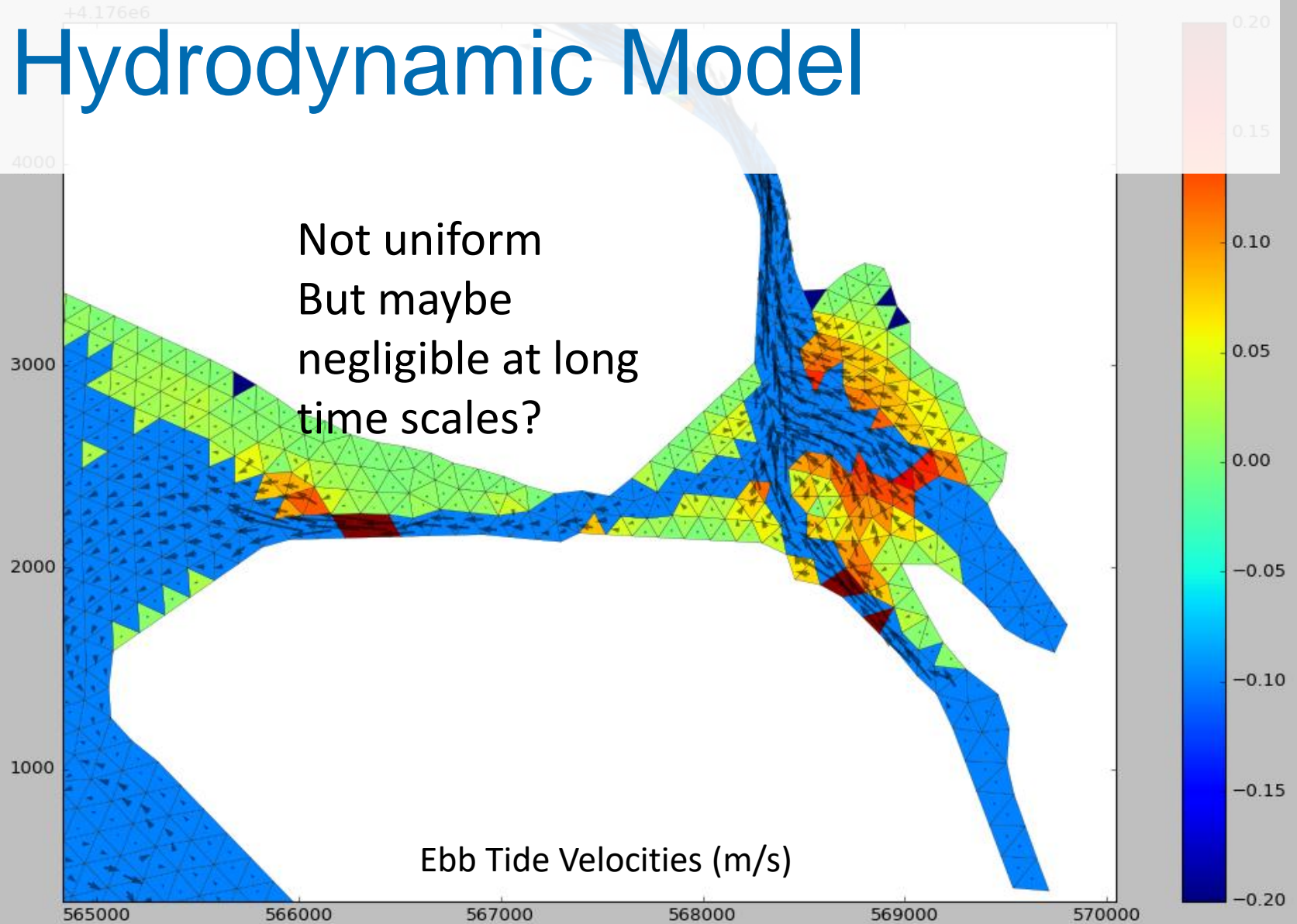


e

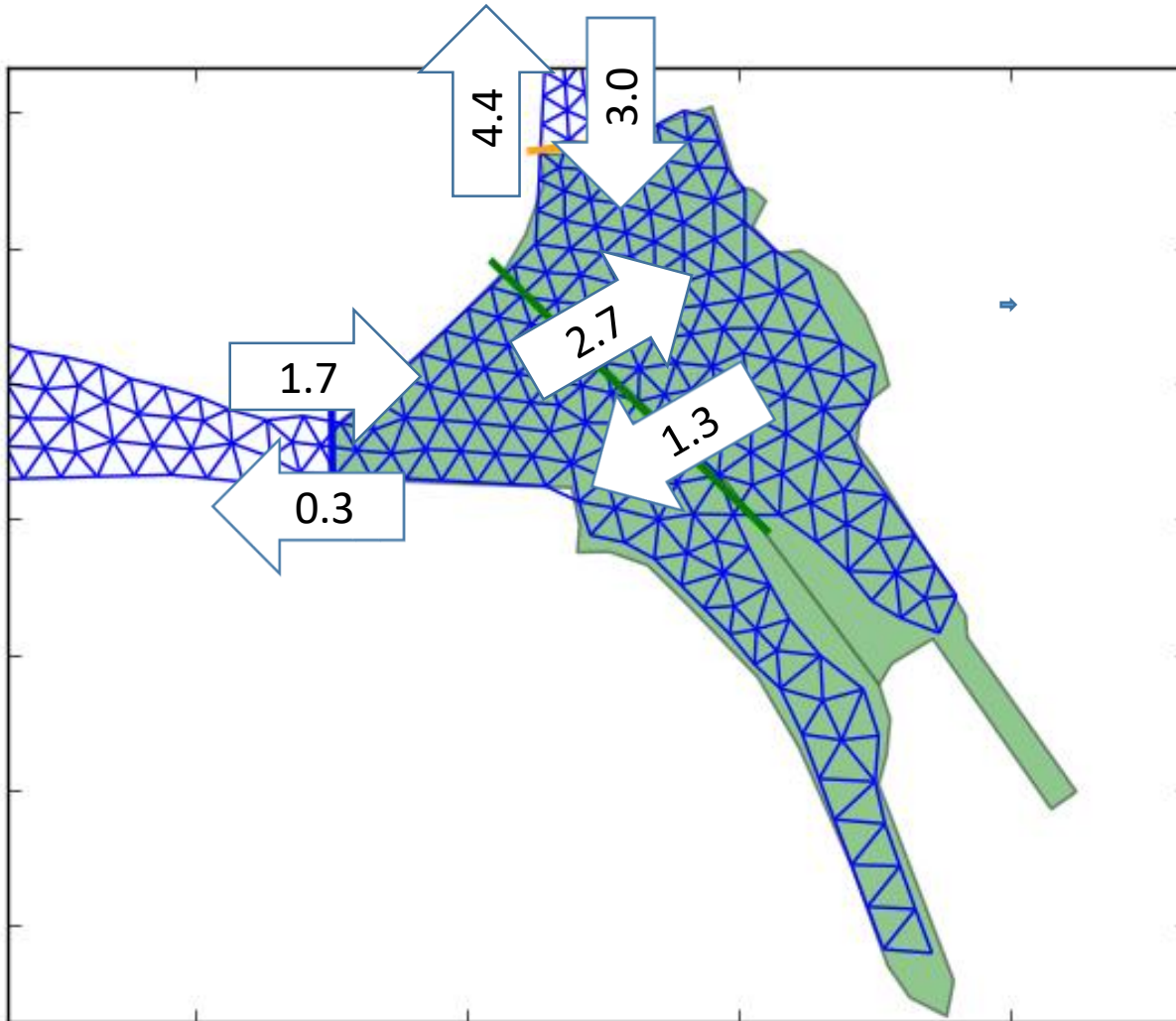
# SLB Margin Unit CM 1.0



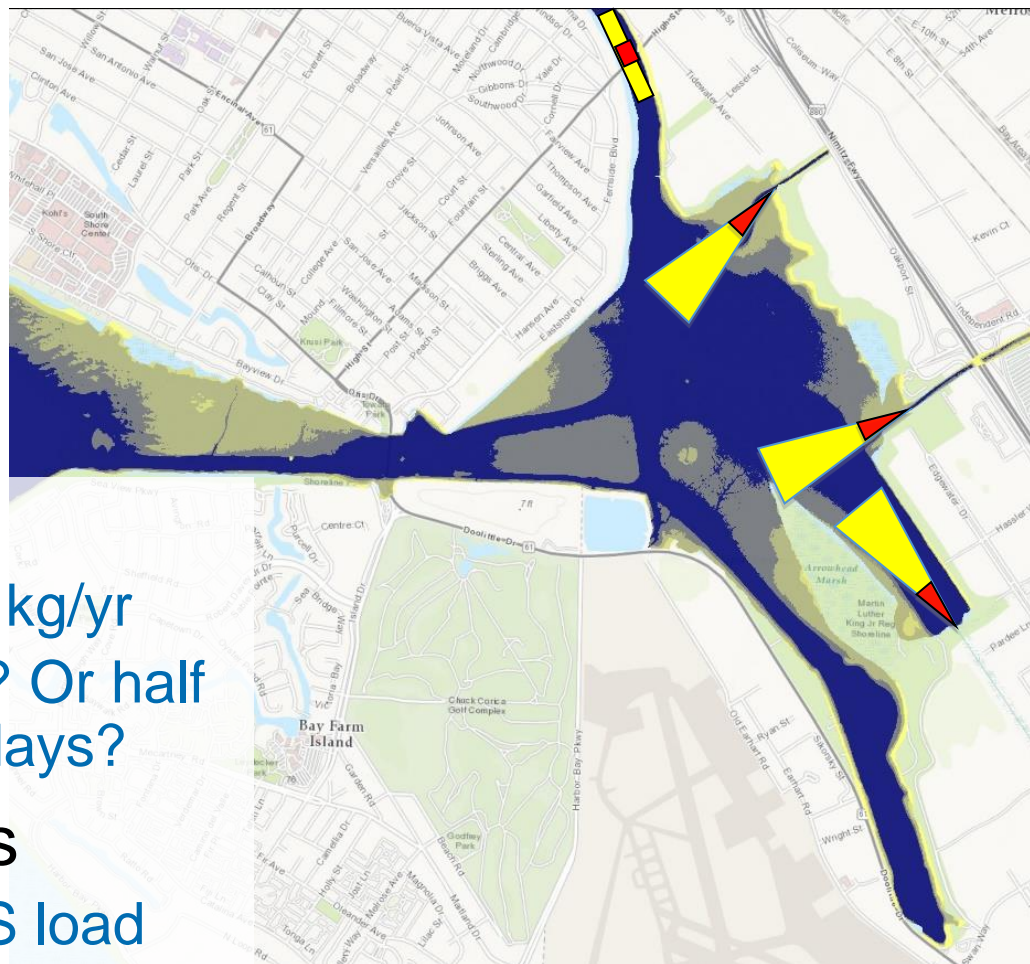
# Hydrodynamic Model



# SLB Tidal Flows (Mm<sup>3</sup>)

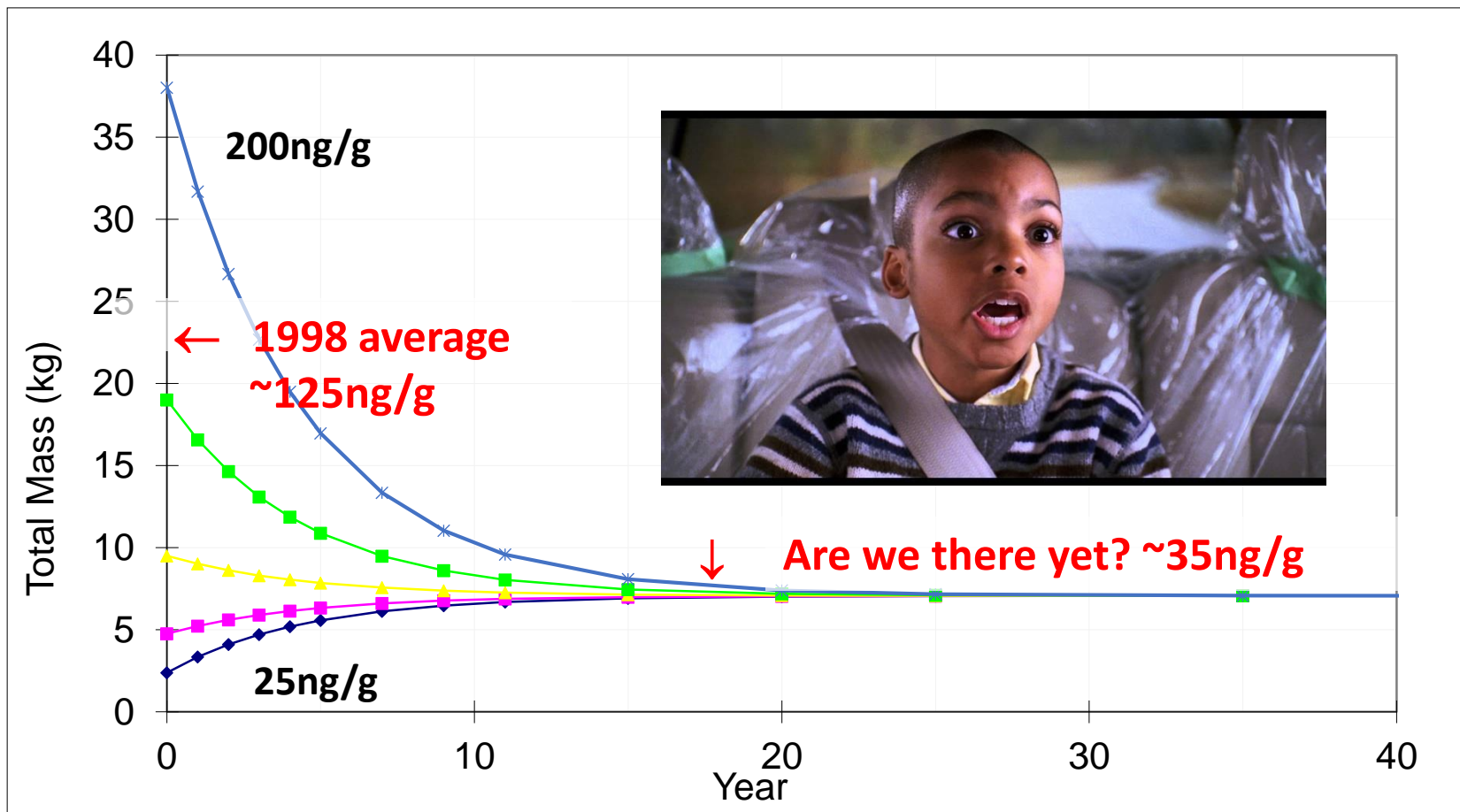


# SLB PCB Storm Loads



- RWSM
  - Loads ~1kg/yr
  - All stays? Or half gone in days?
- Tidal inputs
  - ~1/4x WS load

# SLB PCB Mass Budget

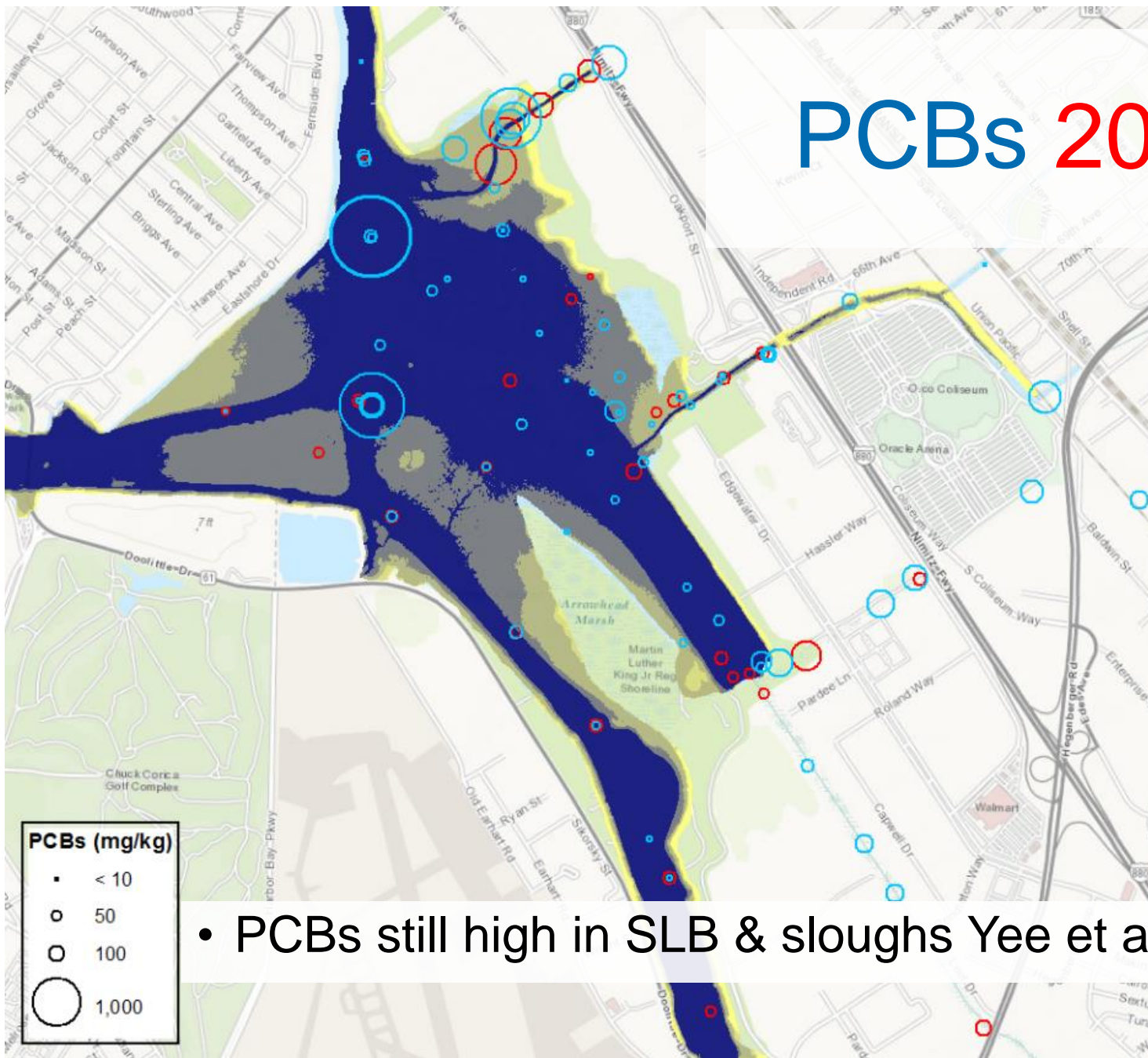


# 25,000,000 Pennies

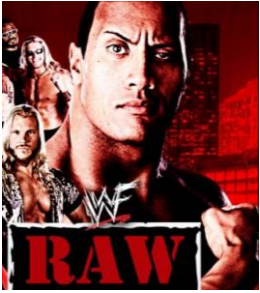
- SEP funding allowed re-examination of SLB
  - Sampled sediment, fish, water (summer 2016)
  - Many sites in 1998 study revisited
  - PCBs, fish guts, benthos prep



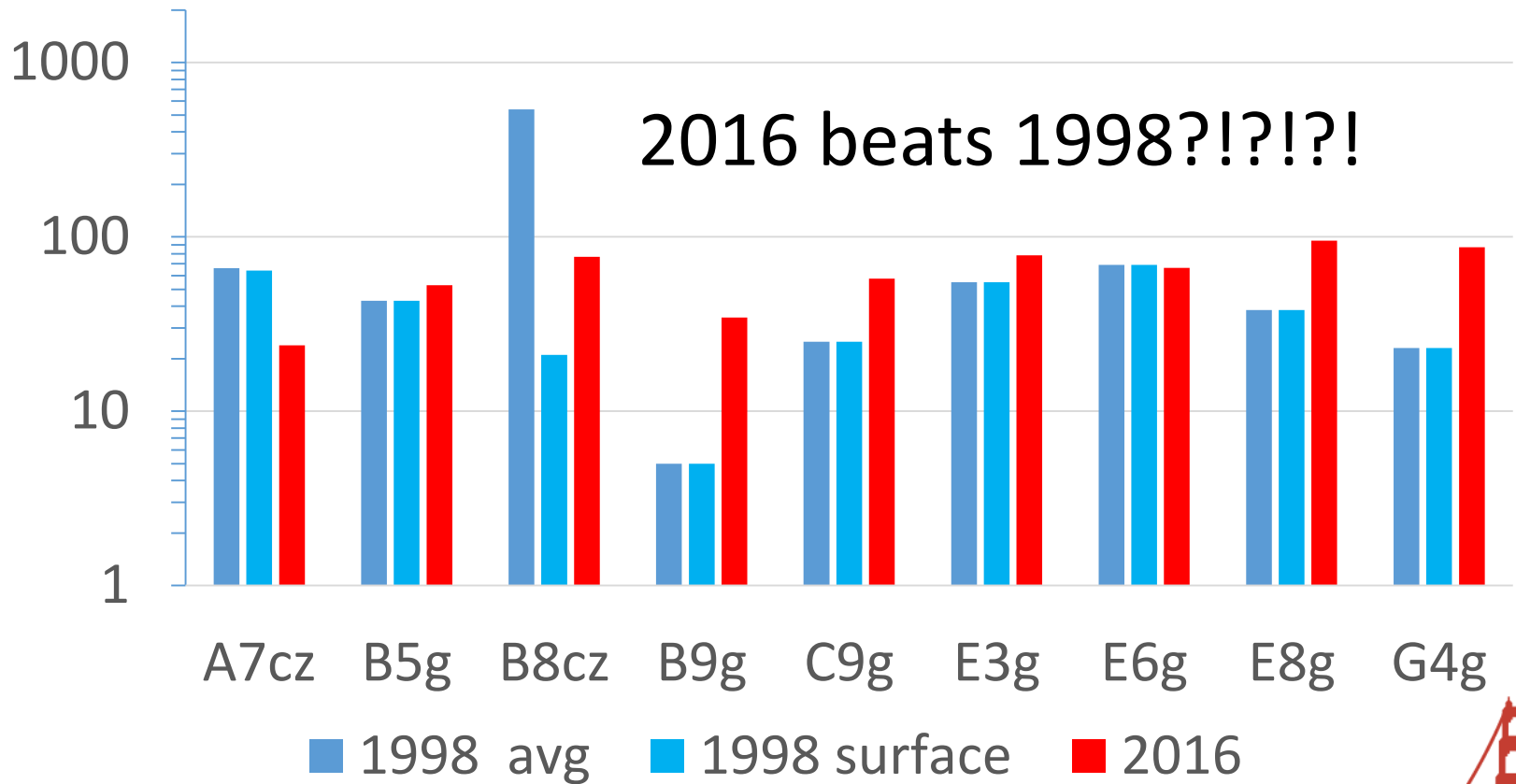
# PCBs 2016



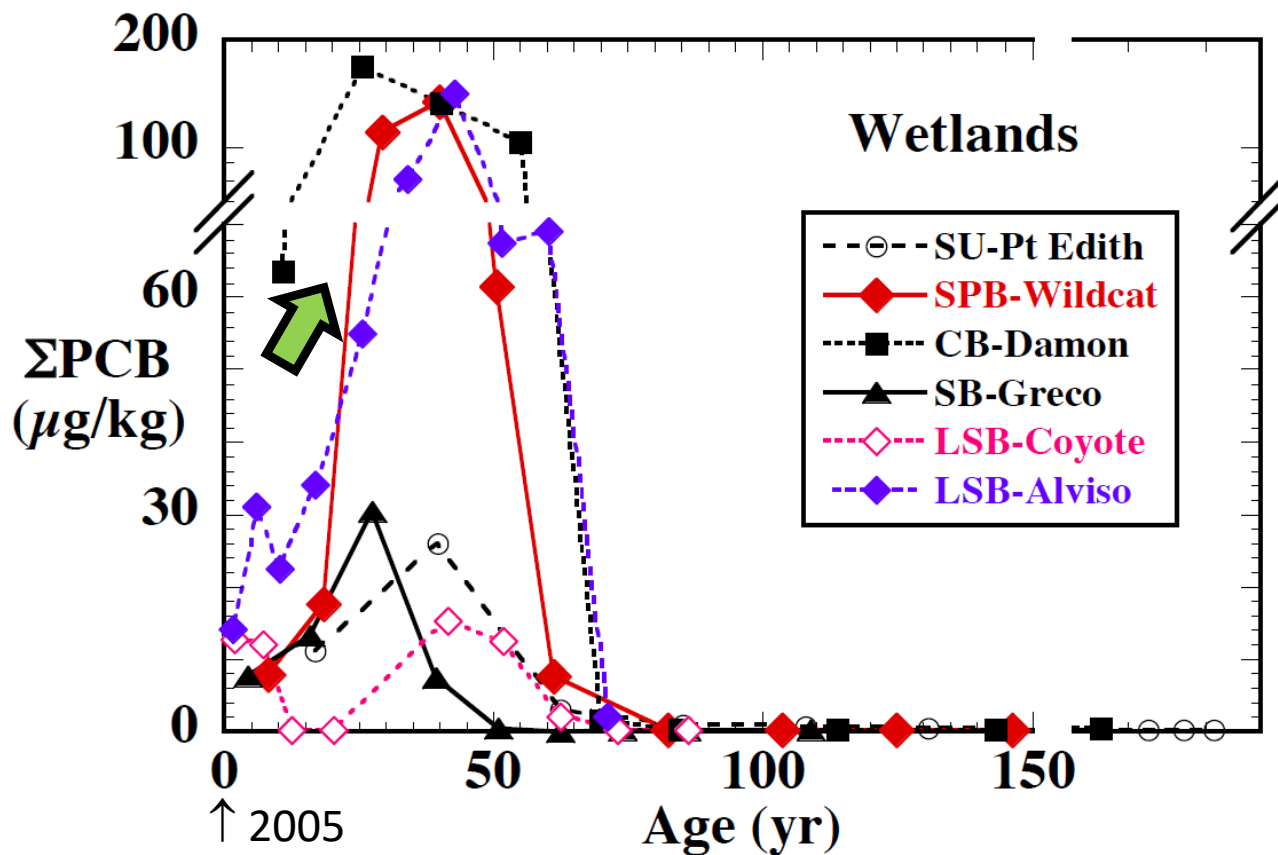




# Raw 1998 vs 2016



# Going Back In Time?

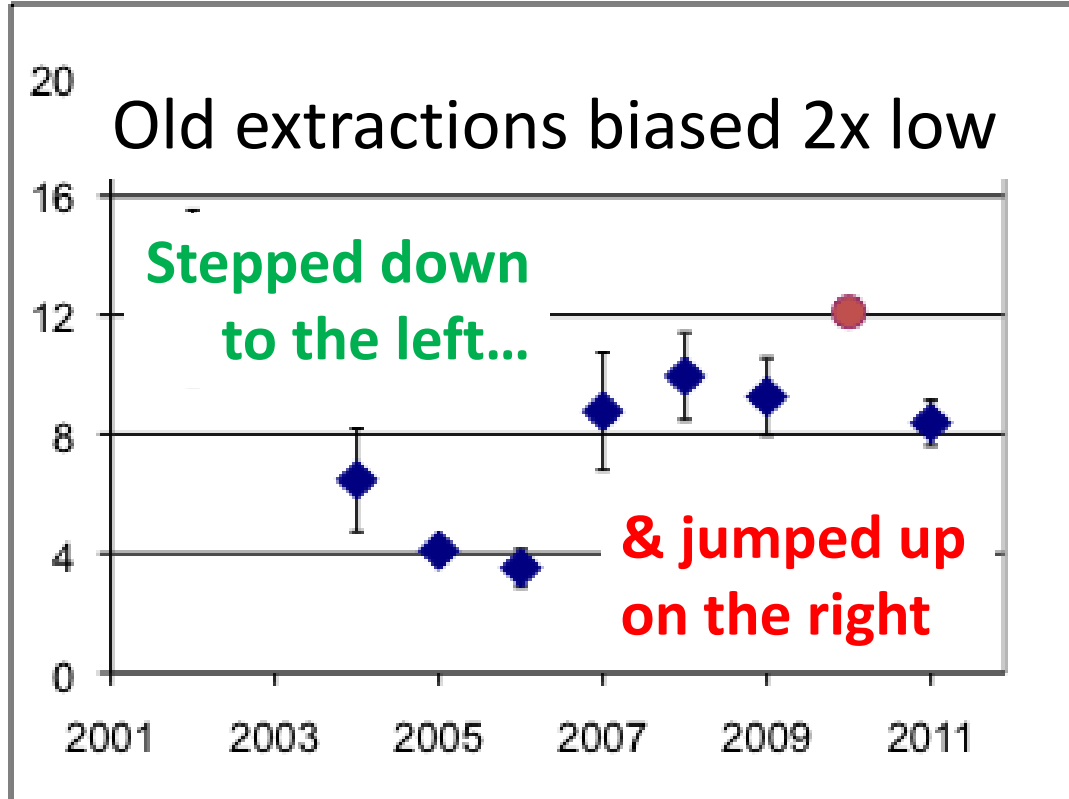
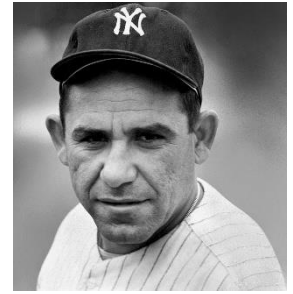


Yee et al. *in review*





# Déjà Vu All Over Again



Let's do the Time Warp again!

▶ ⏪ 🔊 3:46 / 3:50

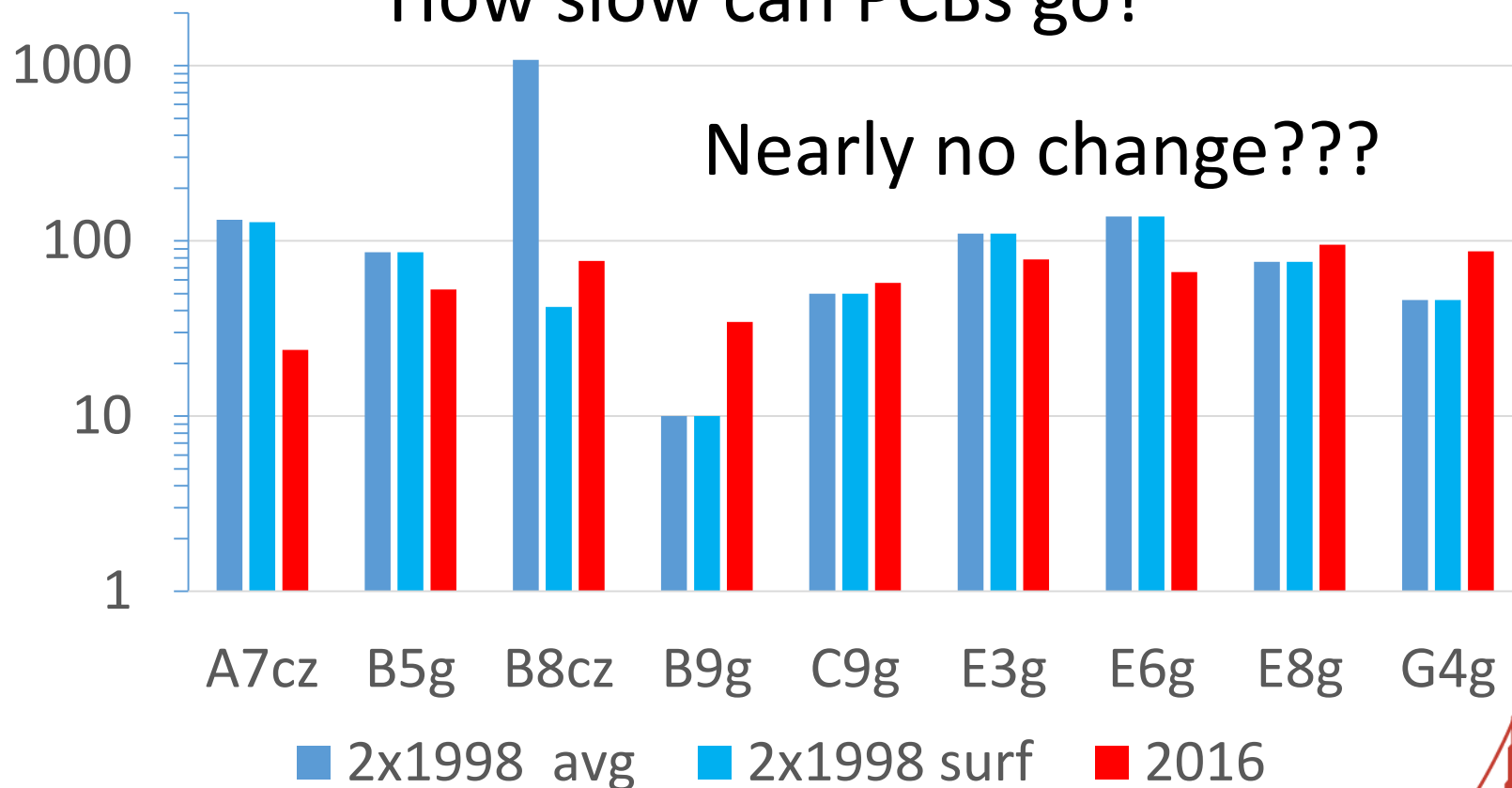
⚙️ HD 📺 🗉



# Adjusted 1998 vs 2016

How slow can PCBs go?

Nearly no change???



**WHAT  
HAPPENED**

**DON  
YEE**



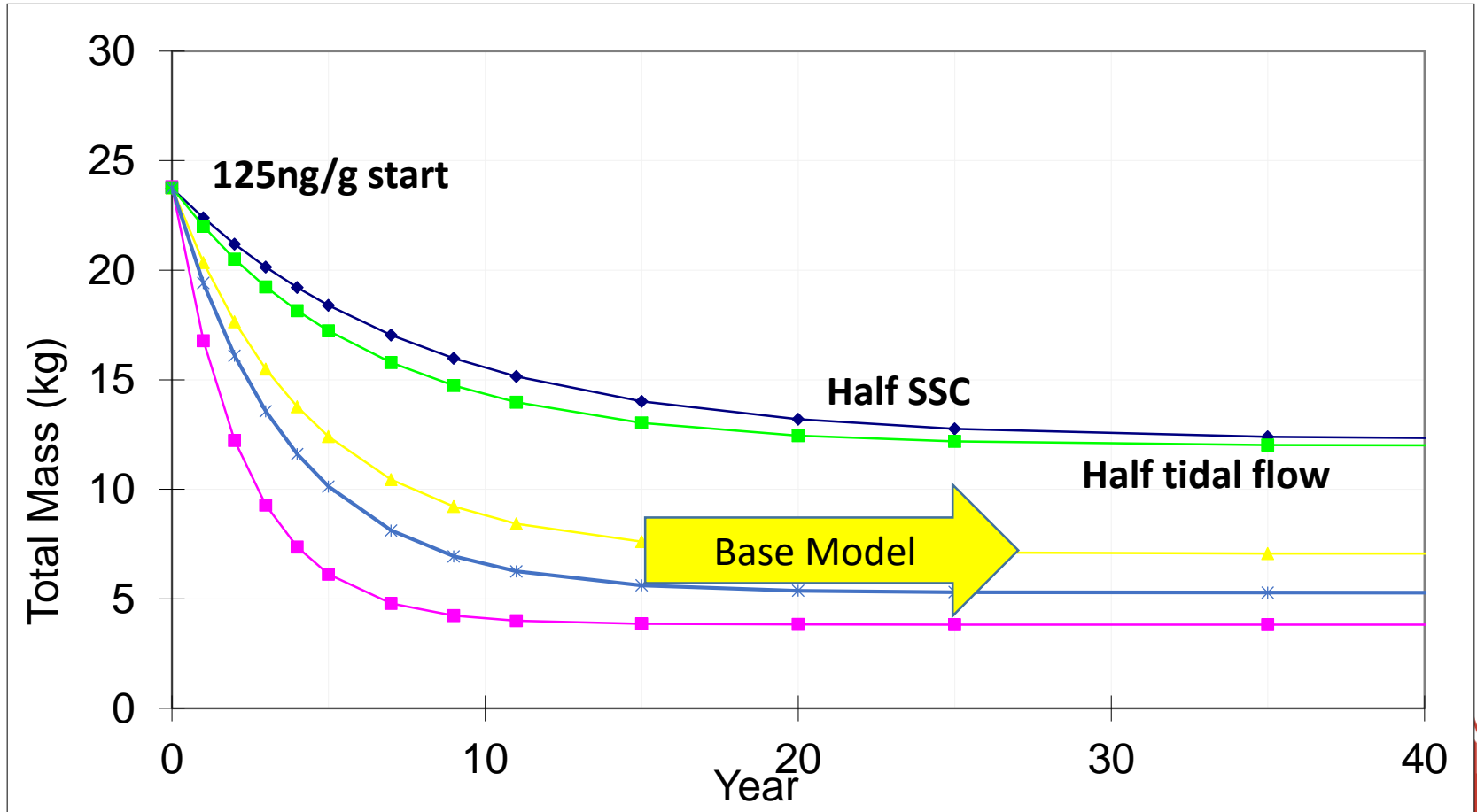
# What Happened?

All Models Are Wrong But Some Are Useful *G. Box*

- Faux/faulty/non-local data
  - Use of open Bay parameter values (mixing depth, water SSC, = overestimated mixing & transport?)
  - Regional load estimates, over-extended locally (= underestimated watershed loads?)
- Oversimplistic “1-box” model
  - SLB greatly differs E vs W (2-box?)
  - May need to consider smaller (sub-)<sup>m</sup>bayments



# 0.5x SSC = End 2x Higher



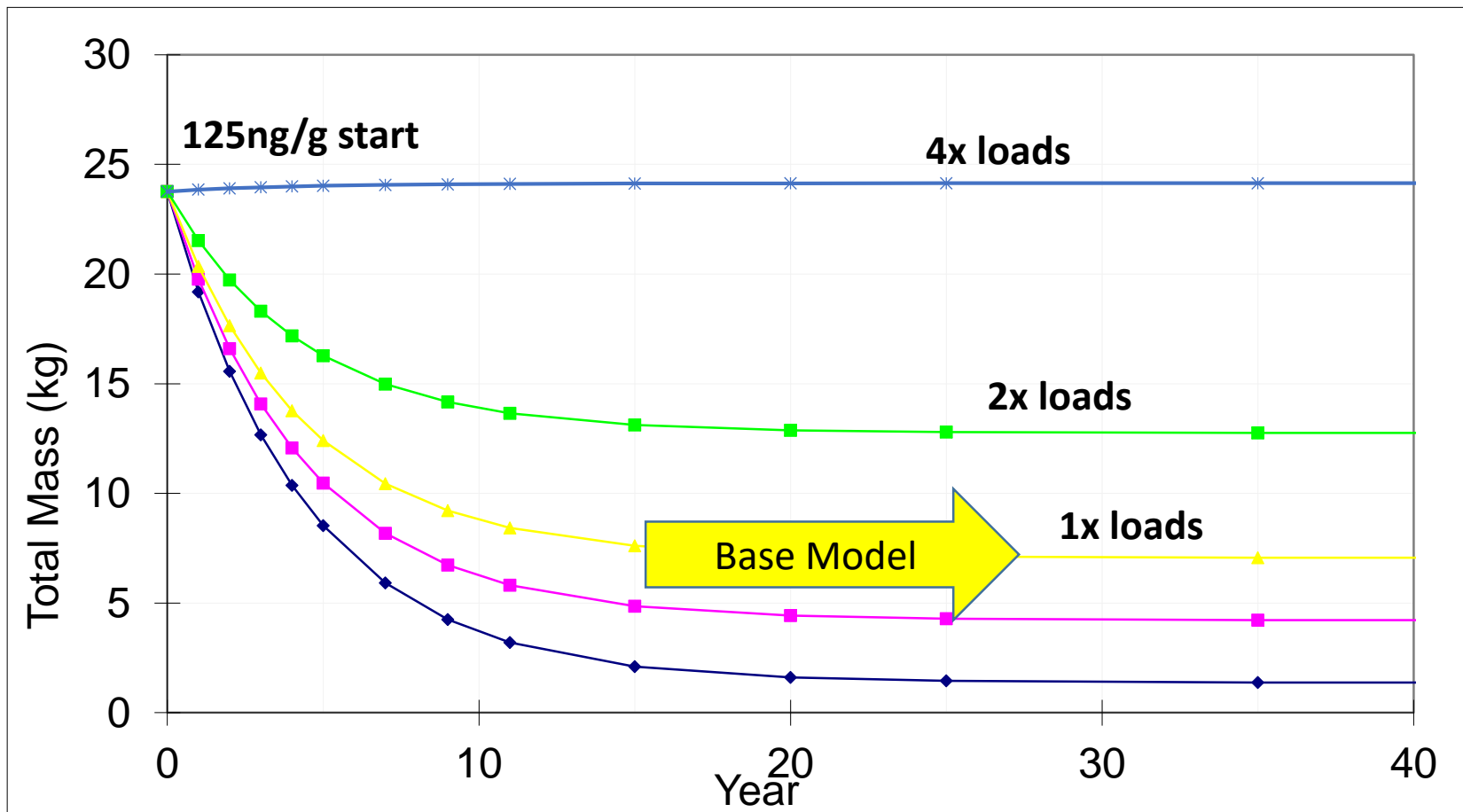


# Lower Model SSC?

- 8.5 mg/L open Bay SSC used
- SLB has less fetch, waves, resuspension?
- Want many areas, long term turbidity/SSC (full range of tidal and climate conditions)
- Limited water grabs in 2016 sampling already suggest slightly lower SSC
  - 900 pg/L avg PCBs in SLB water
  - 125 ng/g avg PCBs in SLB sediment= 7.5 mg/L SSC

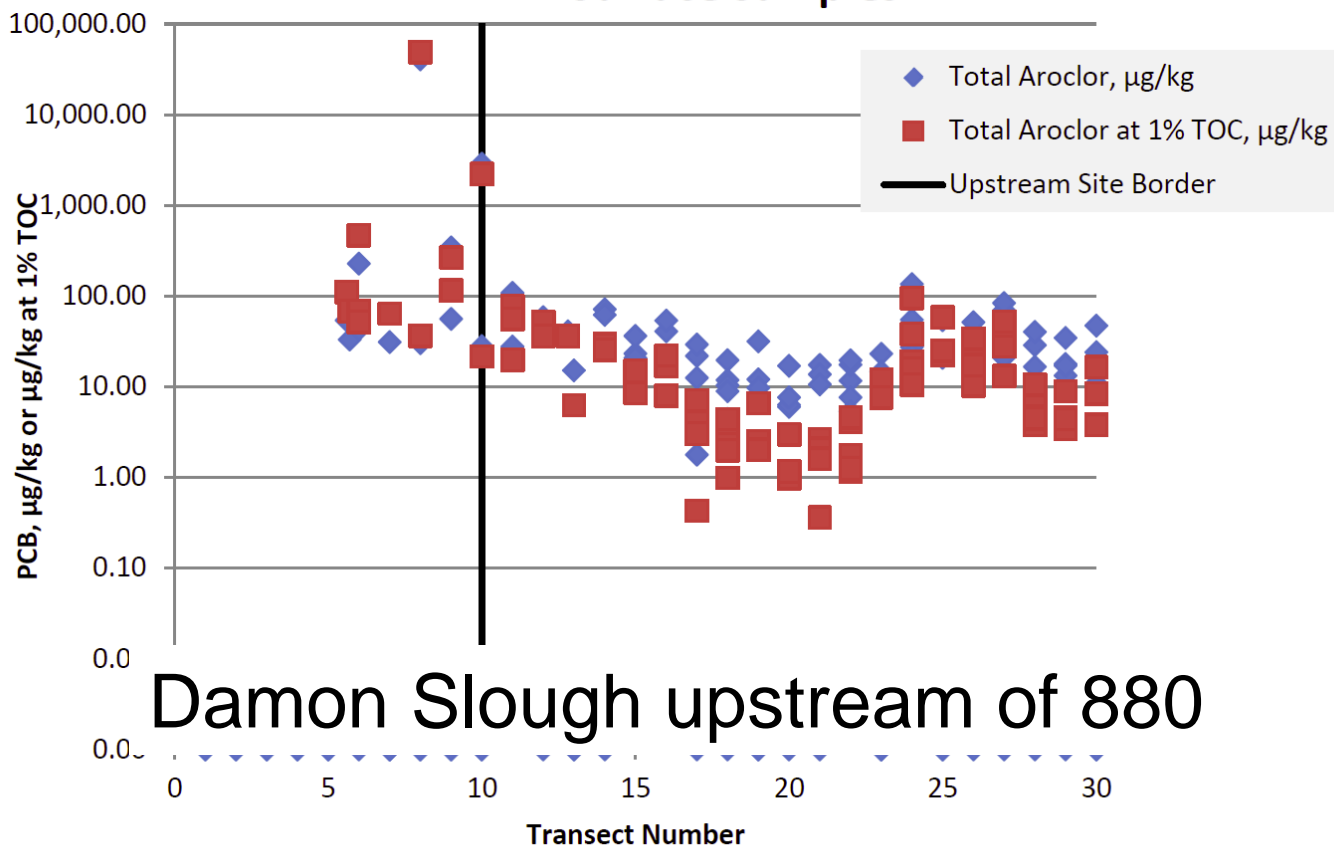


# Status Quo @ 4x Loads



# Tidal Slough Sources?

## Total Aroclor and Normalized to 1% Functional TOC in Surface Samples

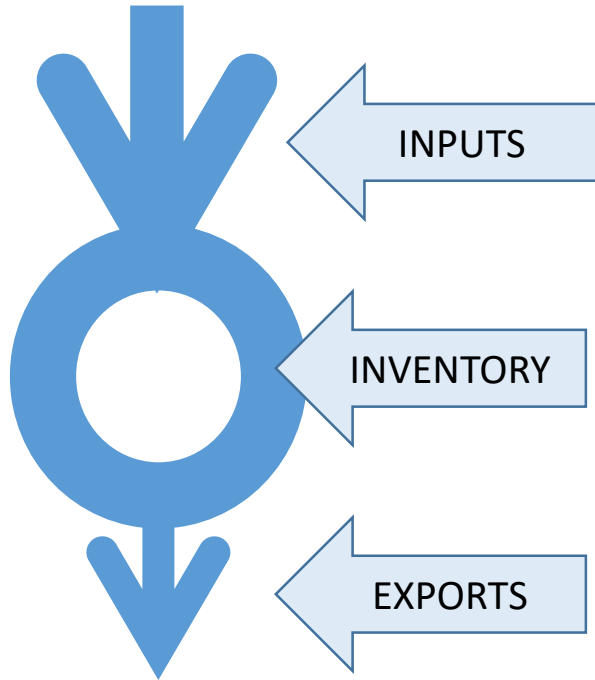


Damon Slough upstream of 880

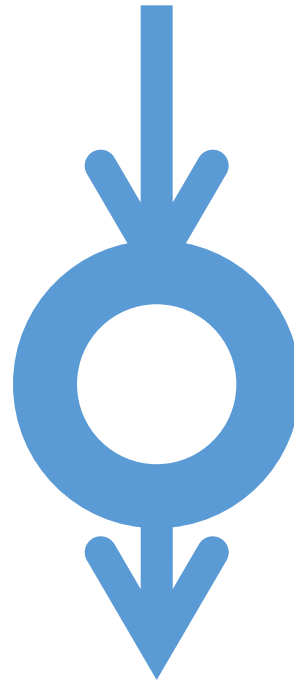
GHD, 2017



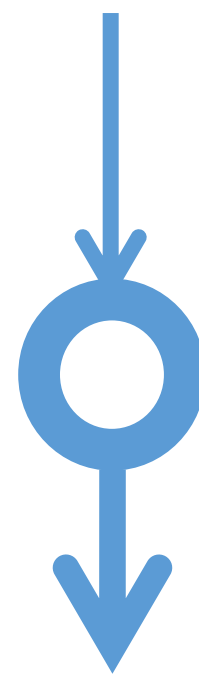
# Past



# Present



# Future?



# SLB Lessons 20/20 Hindsight

- An ounce of prevention is worth 222 tons of cure
- Don't wait until the ~~horse~~ has bolted to close the barn door.      tortoise
- Turn off the ~~faucet~~ before mopping ~~the floor~~ SL Bay  
dirty sites &  
watersheds &  
sloughs



# Questions?

[donald@sfei.org](mailto:donald@sfei.org)



