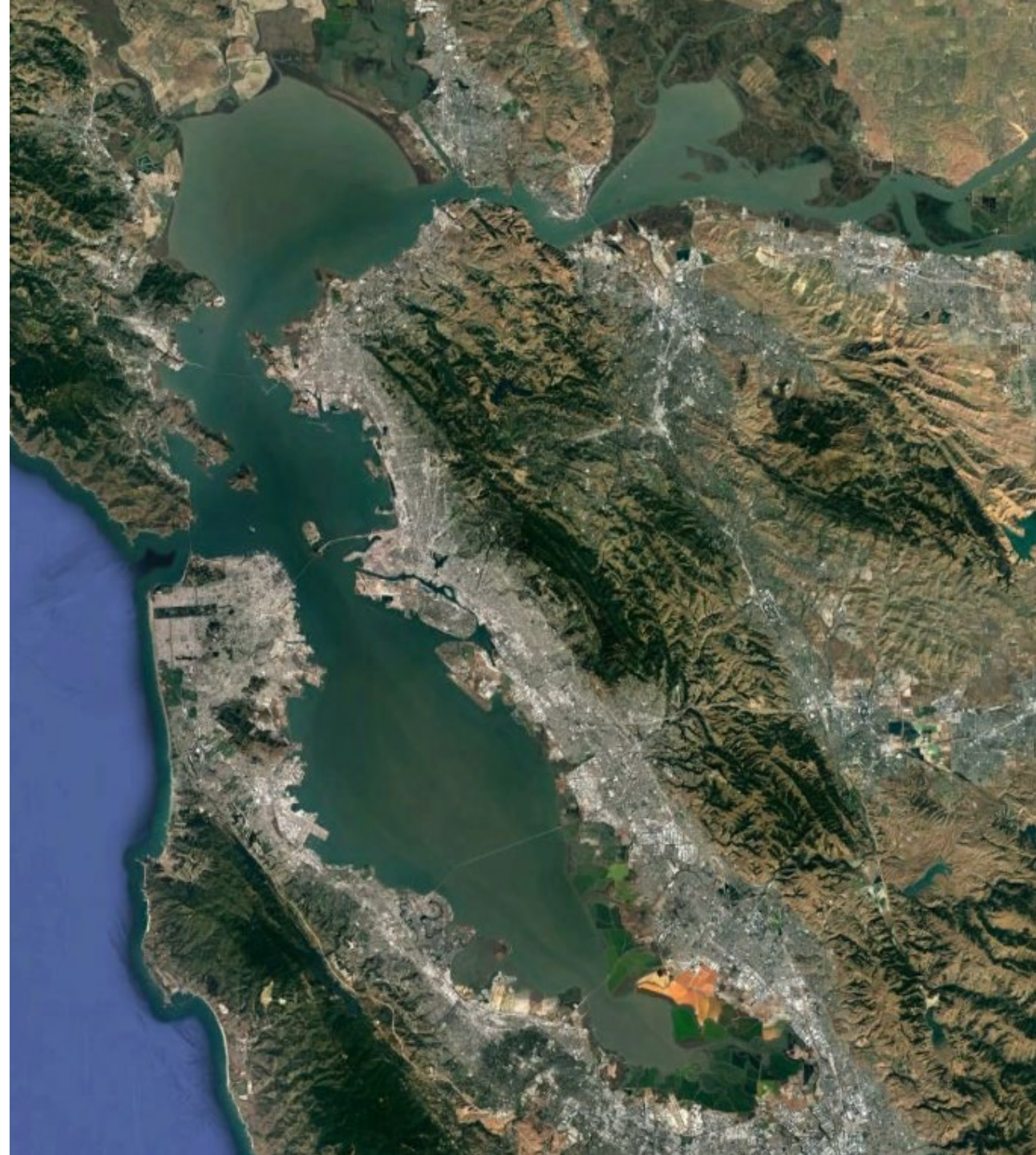


SF Bay Sand Science Studies

BCDC Working Group Meeting #4
March 18, 2025

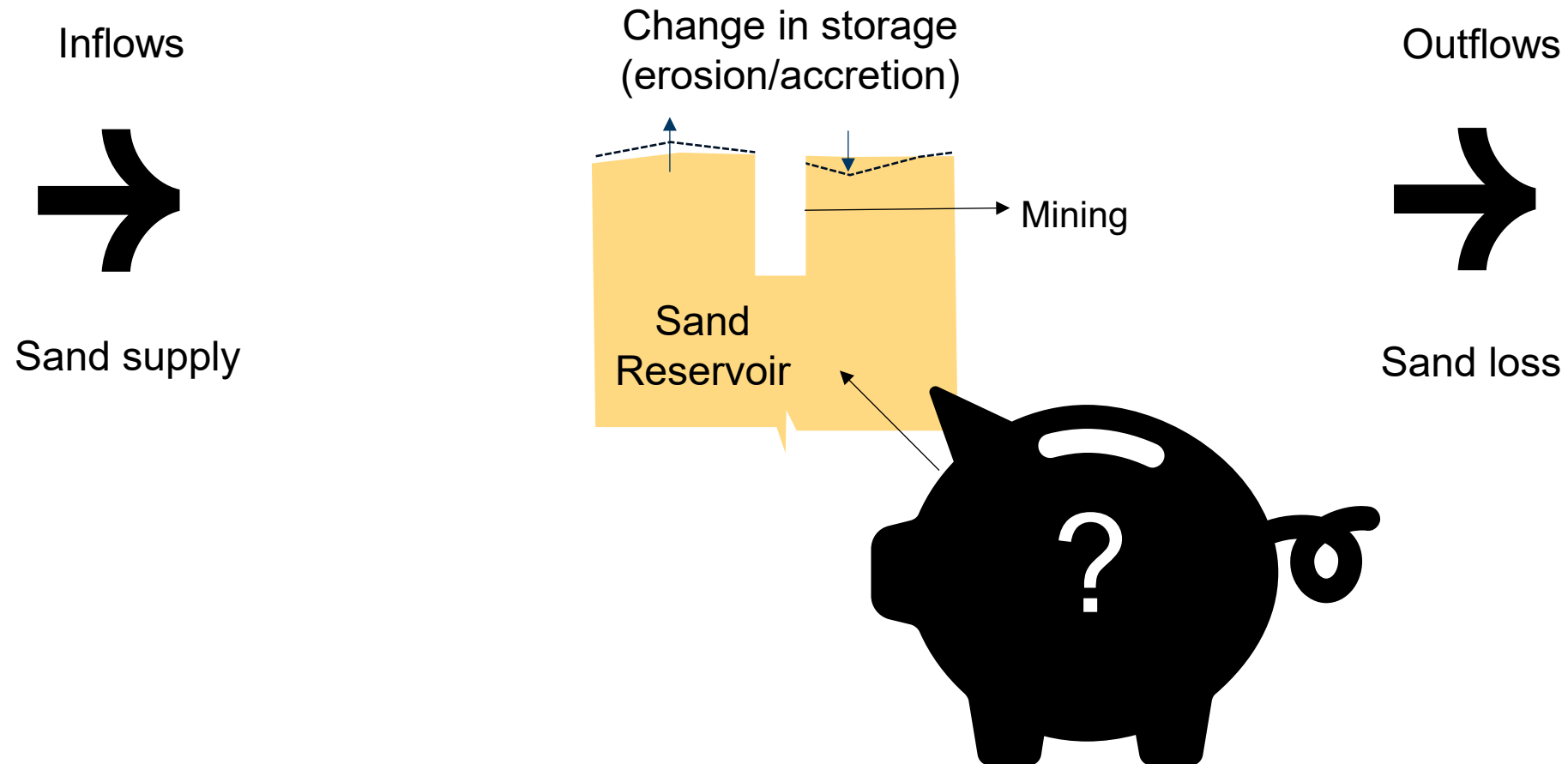
Mining Team – Supporting Slides



Agenda Item 2

Sand Budget – Majority of mining below active sand layer

- Sand budget focused on “active” bed sediment
- Active layer changes typically $\pm 0.5\text{-}1\text{m}$ outside mined areas (Deltares)
- Most mining occurs below active layer, not exposed to estuarine currents

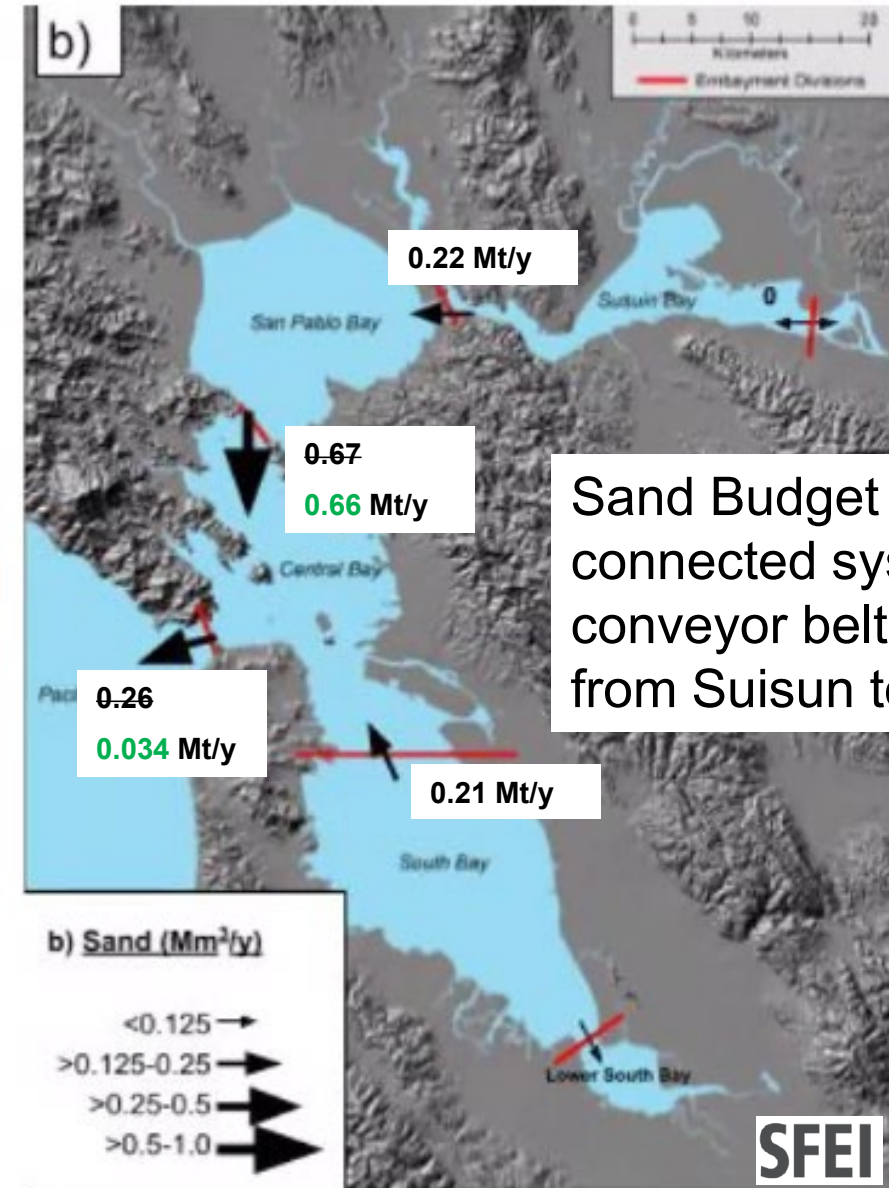
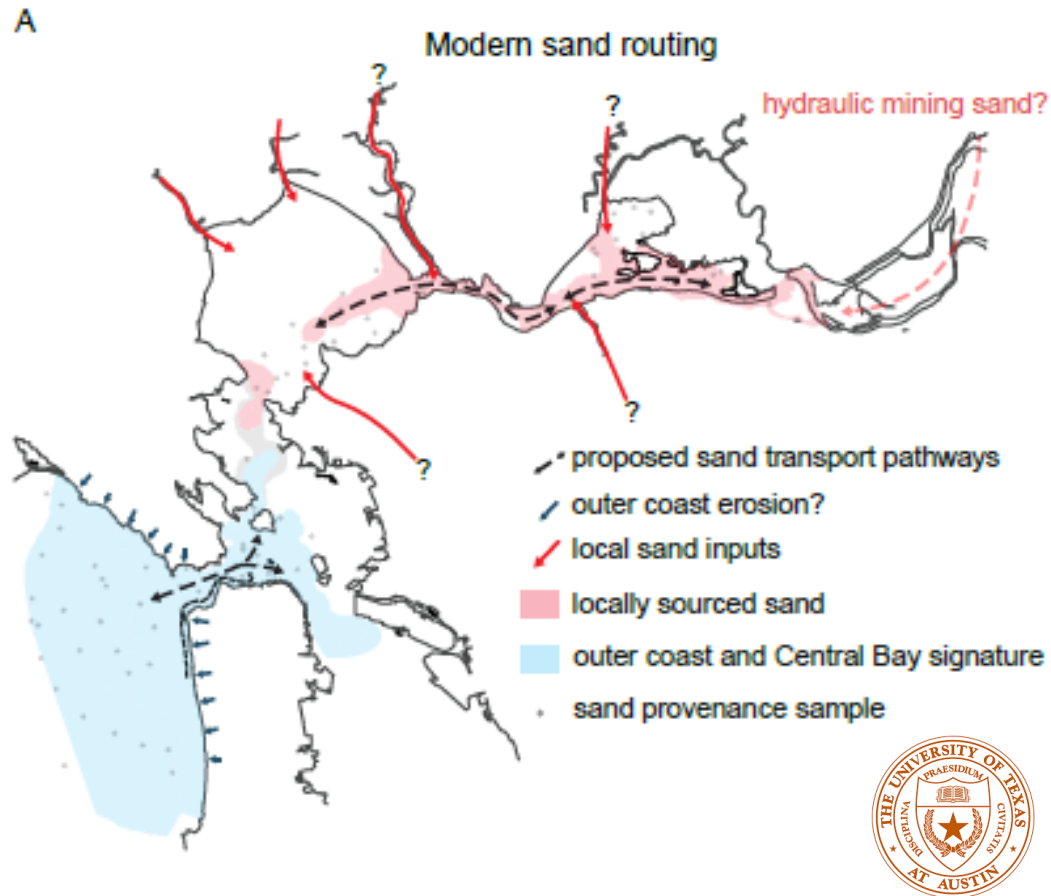


Sand budget hypotheticals

- Hypotheticals in sand budget do not represent reality of physical processes.
 - Need to consider studies that focus on physical processes not simply conservation of mass.
- **Deltares** ring study analyzes where sand moves because of mining activities.
 - Findings indicate localized effects.
- **Stratigraphy** study evaluates connectivity of Bay sand systems.
 - Findings indicated a disconnected system.

Study Comparison – Disconnected system?

Conceptual model – different sand sources in Suisun and Central Bay implies a disconnected system



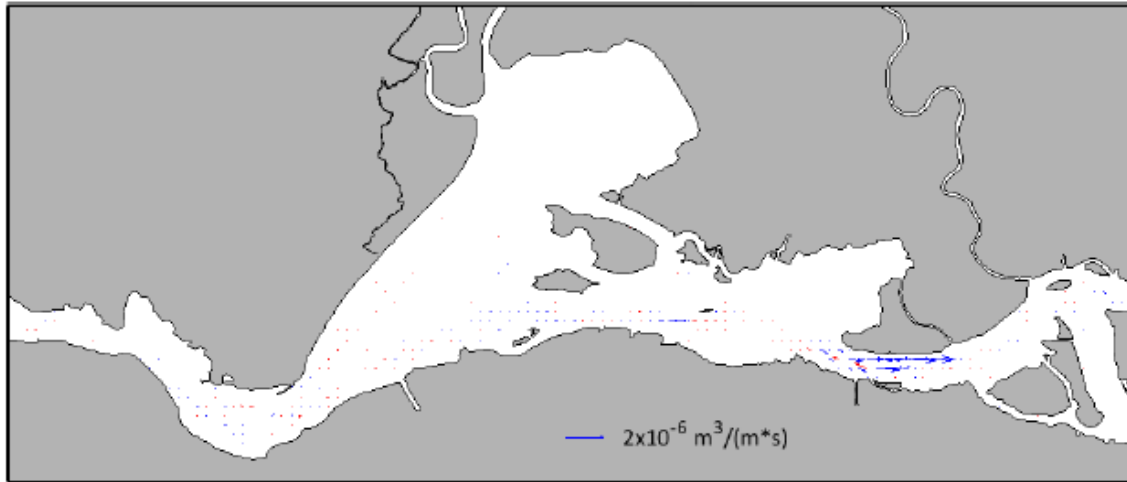
Sand Budget – implies a connected system with conveyor belt of sand from Suisun to Ocean

Agenda Item 3

Sand Transport Patterns

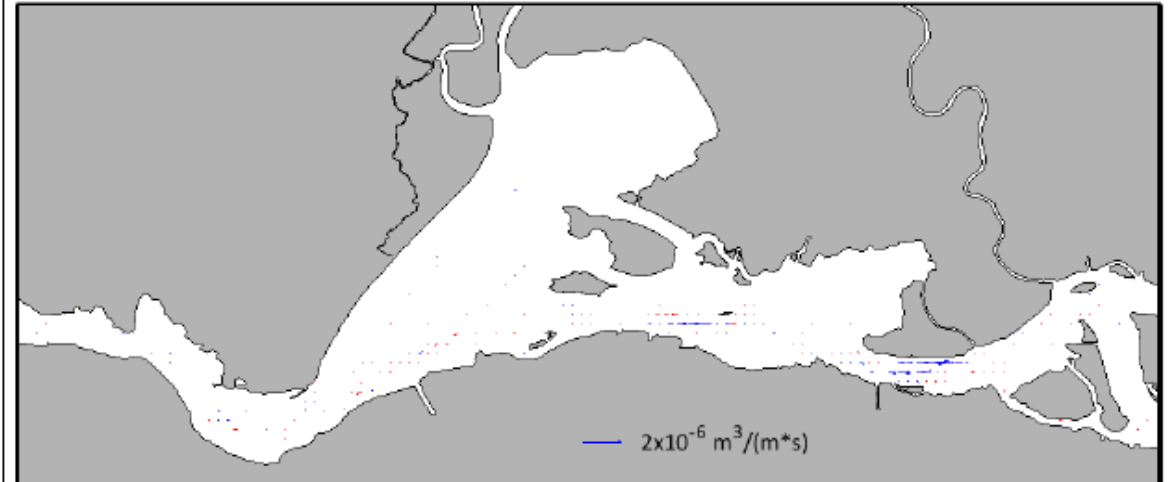
Changes in transport due to mining limited to mined areas:

Figure 6.1-3
Map of Change to Predicted Total Sand Transport as a Result of Sand Mining for the High-Outflow Year



Notes:
Arrows show how sand transport was predicted to change as a result of sand mining. Red arrows show there was an increase in ebb-directed transport relative to flood-directed transport, whereas blue arrows show there was an increase in flood-directed transport relative to ebb-directed transport.

Figure 6.1-4
Map of Change to Predicted Total Sand Transport as a Result of Sand Mining for the Low-Outflow Year

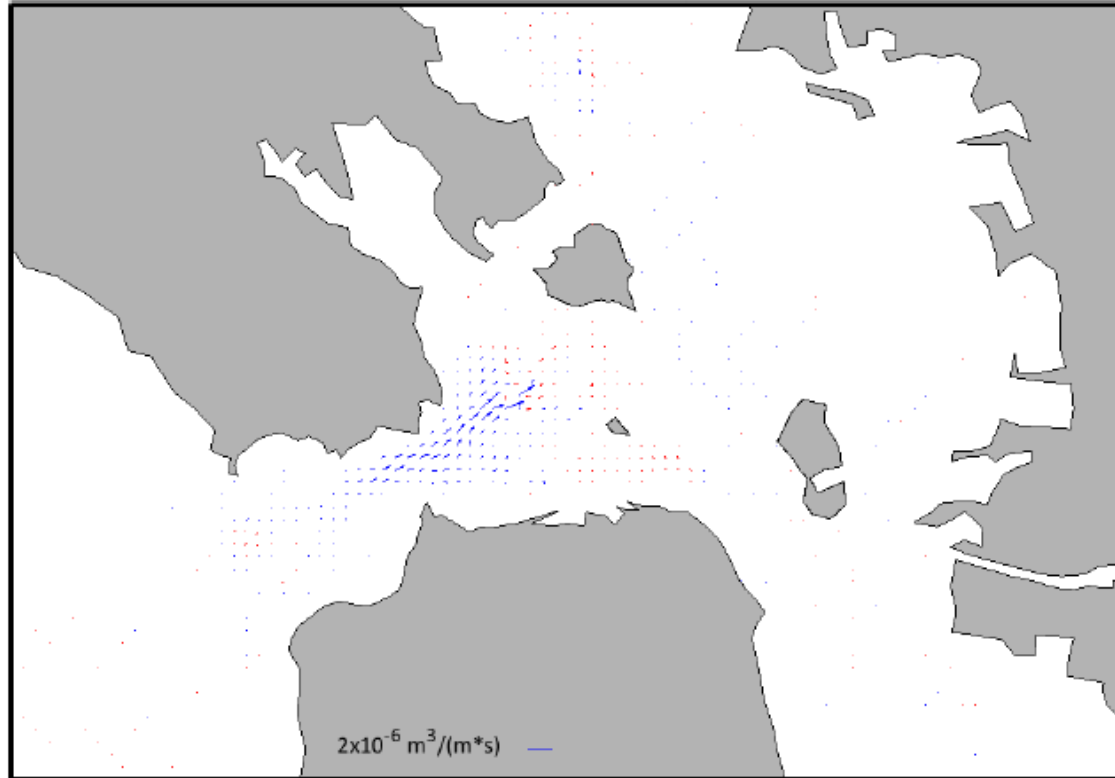


Notes:
Arrows show how sand transport was predicted to change as a result of sand mining. Red arrows show there was an increase in ebb-directed transport relative to flood-directed transport, whereas blue arrows show there was an increase in flood-directed transport relative to ebb-directed transport.

Sand Transport Patterns

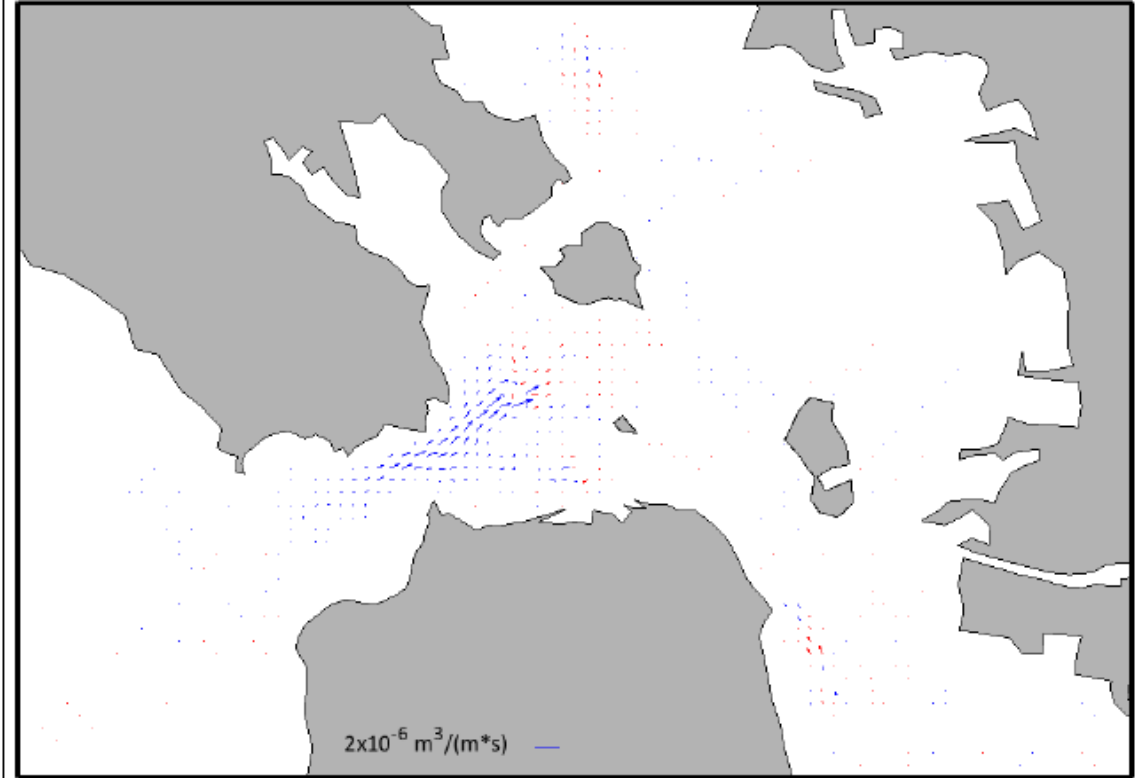
Changes in transport due to mining limited to mined areas:

Figure 6.2-3
Map of Change in Predicted Total Sand Transport as a Result of Sand Mining for the High-Outflow Year



Notes:
Arrows show how sand transport was predicted to change as a result of sand mining. Red arrows show there was an increase in ebb-directed transport relative to flood-directed transport, whereas blue arrows show there was an increase in flood-directed transport relative to ebb-directed transport.

Figure 6.2-4
Map of Change in Predicted Total Sand Transport as a Result of Sand Mining for the Low-Outflow Year

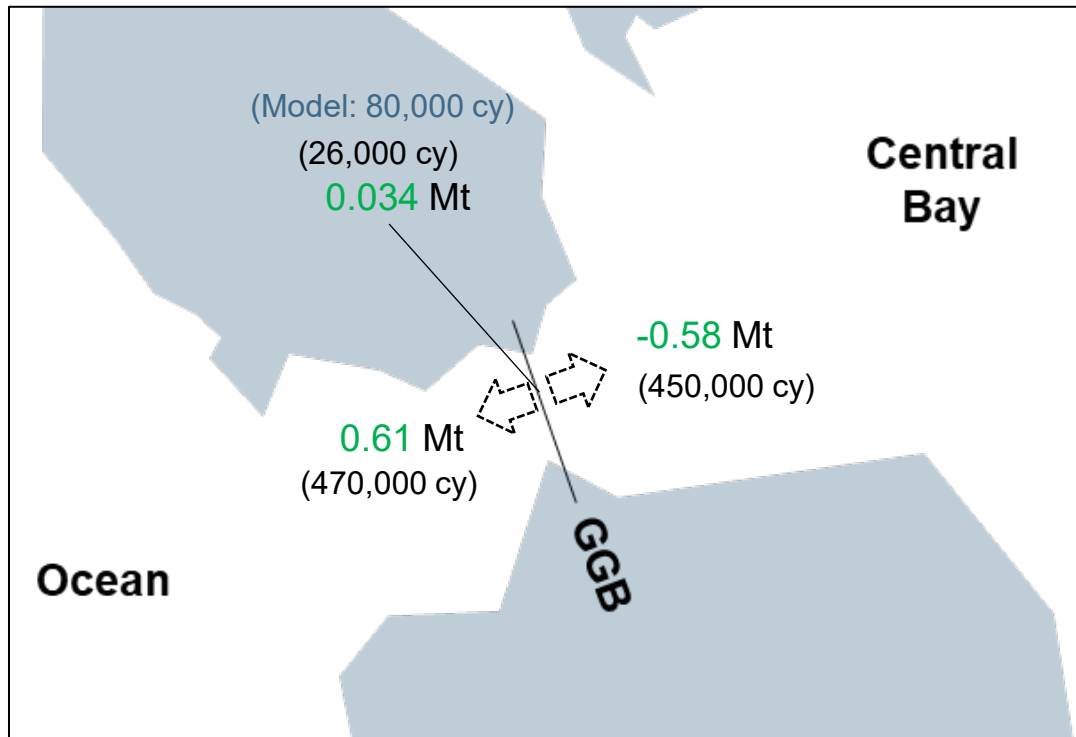


Notes:
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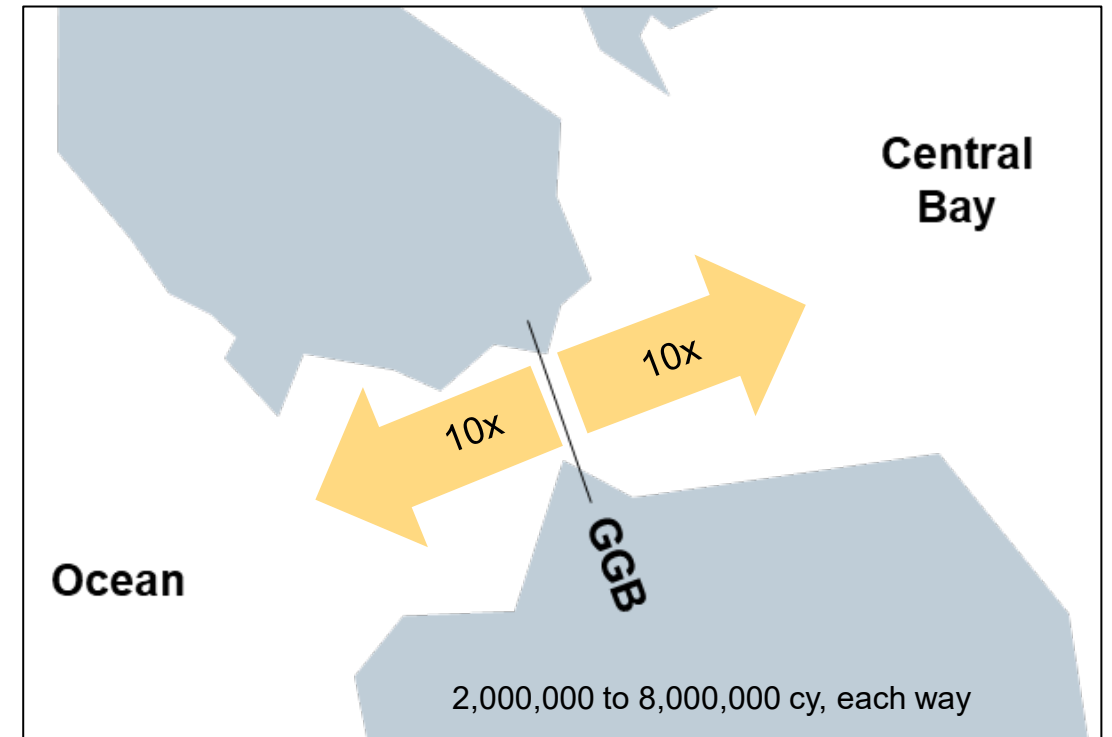
GGB – Net flux (uncertainties and time scales)

- Net residual flux functionally zero
- AQEA model: 1-year simulation
- Sand budget: 20-year averages

- Large amount of sand moves both ways through GGB
- Bi-directional fluxes 10x larger than net residual flux (McKee et al., 2023)



Net Flux, **functionally zero**



Total Flux, Bi-directional

ISP Report - Speculation on impacts

- In multiple instances, the ISP Report states that “sand mining may have an impact” beyond the Bay, referring to outer coast beaches.
- Equally important to clarify that sand mining may not have an impact beyond the Bay, especially with updated Sand Budget results.
- Elsewhere in the ISP Report it is noted that impacts beyond the Bay remain unquantified:
 - “Effects of mining to beaches and ecologically important shoals remain unquantified” (ISP Report, p. iv.)
 - “The unquantified bi-directional exchange of sand between the Bay and Pacific Ocean; the source and trajectory of sand supplies to Bay beaches and shallow environments; contributions of wave-induced and density-driven sand transport to the overall budget; and the uncharacterized variation of sand transport due to grain size differences are all key information gaps.” (ISP Report, p. iv.)
 - “While this removal of sand could have effects beyond the Bay (i.e., outer coast), this potential impact is not resolved by these sand studies owing to the dynamic nature of processes coupling in-Bay and out-of-Bay sand reservoirs, the likelihood of parallel fluctuations in sand transport along the open coast, and the potential for multi-decadal time lag before effects are reliably observed.” (ISP Report, p. 3-3)

Overall Comments

- Between Sand Science Studies and prior CEQA and Permitting Studies, **we know a lot:**
 - Bay is a disconnected system, and effects should be examined at the individual lease area scale
 - Majority of mining activity occurs in areas of inactive sand transport
 - Depletion depends on location, and is largely limited to the lease areas
 - Sand reserves are substantial
- 2012 EIR and Coast & Harbor Engineering: Based on bathymetric analysis and modeling conducted, 10 years of sand mining would not have substantial effect on morphology, hydrodynamics, or sediment transport outside of the lease areas (e.g., the offshore bar and outer coast).
- State Lands is conducting supplemental peer review and modeling under CEQA for each of the lease areas.