Background
Wastewater treatment plants are considering the use of wetlands for additional treatment of municipal wastewater effluent due to cost-effectiveness and capacity of natural processes to remove nutrients that can cause eutrophication and other contaminants. By placing wetlands between existing flood control levees and the tidal mud flats, we expect to gain three key benefits: improving water quality, protecting coastal urban infrastructure against storm surges, and providing a wildlife habitat to native living organisms (Fig. 1).

In the Oro Loma Sanitary District, an experimental system (the living levee) was constructed (Fig. 2).
- Generally, gravel and non-native plants are used in constructed wetlands to remove contaminants.
- The living levee mimics natural wetlands composed of fine sediments in which reducing conditions dominate
- Mapping redox gradients is an initial step to study removal mechanisms.

Research Goals
- Observe how the temporal reduction sequence has developed spatially
- Verify if the temporal reduction sequence varies over seasonal scales

Approach

Sampling Methods
- Pore water samples were collected using Pushpoint samplers
- At cell G, the samples were taken along 2D transects at four different depths (Fig 5)
- We took two sampling trips, one in early spring (March) and one in late spring (May) to compare variation in seasons
- Samples were collected in triplicate

Analytical Methods
- Nitrate, phosphate, sulfate and chloride concentrations were measured using Ion Chromatography
- Iron and Manganese concentrations were measured using ICP-MS

Results
- Collecting samples from all of the cells A-L is an ideal situation
- Due to limited time and labor, our samples were collected from cell G (Fig. 5) because this cell has been characterized better than other cells.

Conclusions
- Redox gradient mapping matches with the temporal reduction sequence in the living levee
- Spatial variations in concentrations do not vary much seasonally.
- The denitrifying zone was not expanded as much as anticipated in the winter.
- Significant portions of the slopes are dominated by iron and manganese reducing microorganisms, which may have significant implications for the biogeochemistry of this system.

Next Steps
- Continue redox mapping in other cells to observe any peculiarity or variation between cells since each cell in the system has various combinations of soil types, hydrology, and plant communities.
- Explore possible reasons for observed variations and unexpected trends in the data.

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