Electrification of the Alameda Corridor and the San Pedro Bay Port Rail Network– Concept Paper

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The long-discussed electrification of the Alameda Corridor, and the connecting rail network of the Ports of Los Angeles and Long Beach, needs an up-to-date design and cost estimate.

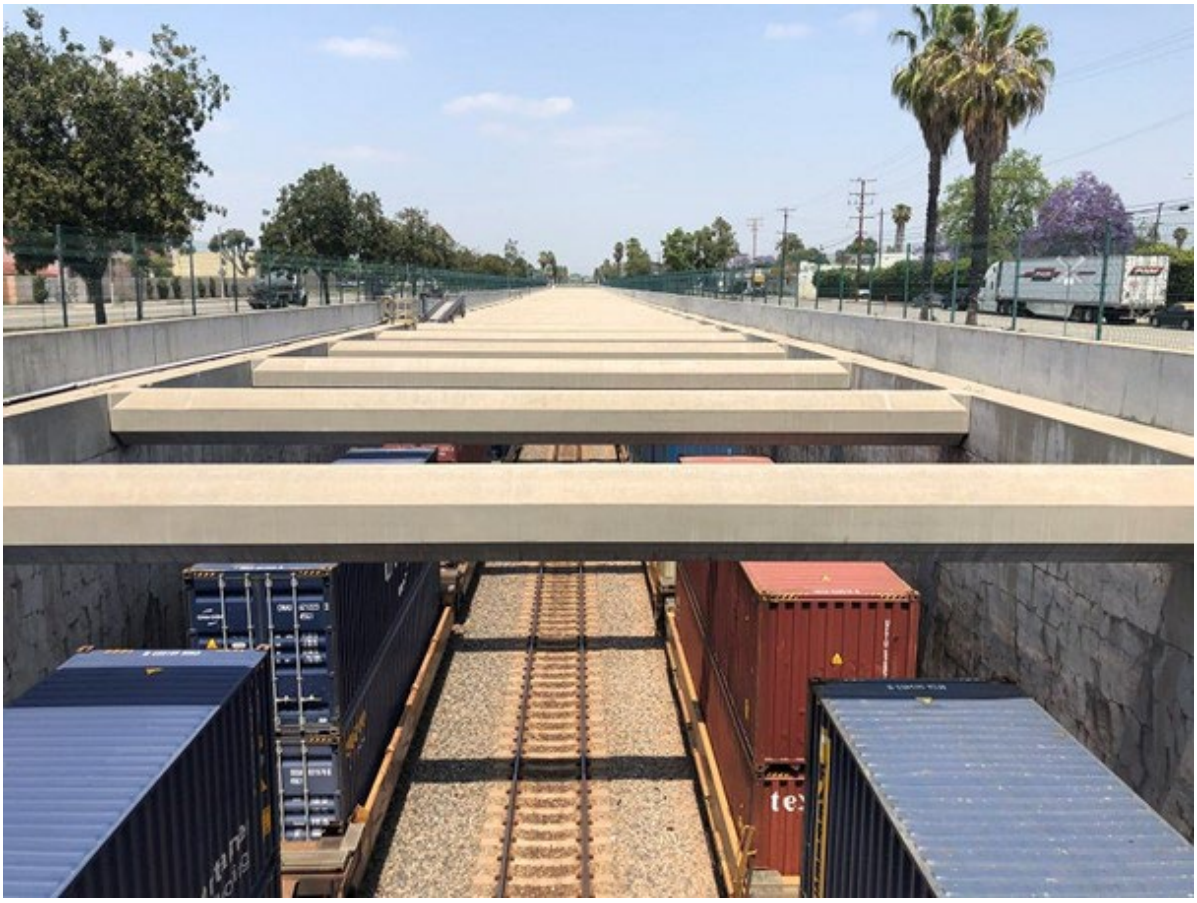
1. Port of Los Angeles Electric Rail Electric Demonstration Project

A new traction power substation, adjacent to existing LADWP Distribution Station No. 119 near the SSA terminal, would provide power to key lines of the port-wide railroad network. The electrification would be done in phases, each with several miles of electrified track constructed. The initial start-up demonstration consisting of a 50/25 kV-50 MVA traction power substation, several miles of track electrified with an overhead contact system (OCS), and a catenary-battery hybrid all-electric locomotive would have a capital cost of approximately $10 million.

2. Electrification of the Mid-Corridor Trench

The two photos below show the Mid-Corridor Trench of the Alameda Corridor, just north of East Myrrh Street in the city of Compton. The trench arrangement with the cross beams in the photos continues north from Compton to East LA for about 10 miles (16 km). The remaining 10 miles of the Alameda Corridor (combining the length both north and south of the Mid-Corridor Trench) would have more conventional OCS infrastructure. A rough estimate is that the clearance between the top of the double-stacked 'high cubes' and the overhead concrete cross beam is about 5 feet (1.5 m). This clearance should be enough for up to 50 kV catenary, at certainly enough for 25 kV. One of the three tracks would be electrified at a time, allowing trains to operate normally on the other two tracks.

If a clever way could be found to anchor catenary supports with easy-to-drill bolts into existing structural concrete, that means electrifying the Alameda Corridor would be rather straightforward. Structural drawings of the cross-beams in question, should be requested from the Alameda Corridor Transportation Authority. The Alameda Corridor cross beams are spaced (horizontally) about 25-30 feet (8.5 m) apart. From my understanding that is about 1/6th the typical span between OCS support structures in a typical electrification arrangement. So that it in turn means that the beams could be distributing the weight such that the vertical anchors need to support 1/6th the weight that a 'normal' OCS support would be required to carry. In principle the conductor bar option makes a lot of sense for the Mid-Corridor Trench as there is a reduced tension load, less structurally and mechanically complex, and should be easier to install. There will be a need to consult with structural engineers to identify any needed reinforcement material or other enhancements to the structure.

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3. Existing electric utility substations adjacent to Alameda Corridor, and connecting mainline tracks

(background map: California Energy Commission)

This concept paper briefly looks at six candidate sites for traction power substations. They were chosen for their close proximity to both existing electric utility substations and the Alameda Corridor or connecting mainlines on either end. All six of these sites may not be needed. However, a rail electrification corridor extending up the Alameda Corridor from the Port of Los Angeles to the Hobart or East LA railyards (a minimum distance of 20 miles) would benefit from having redundant substation power capacity. For such a heavily used, vital freight movement corridor, reliability and resiliency are key. With two (2) 50 MVA substations on either end, and four (4) 30 MVA stations in between would result in a total "East LA to Terminal Island" electric rail corridor capacity of 220 MVA. This would be roughly equivalent a power demand of up to 10 full-length linehaul freight trains operating at once.

The optimal number and size of traction power substations, and total electric rail system power capacity, will depend on construction costs and economic factors, overall electric train traffic, reliability considerations and other factors. While there is some economy of scale in building higher-capacity substations, site conditions may make it cheaper overall to two build two new 50 MVA substations on existing vacant lots next to existing utility substations than to build a single new 100 MVA substation that requires acquiring and demolishing adjacent properties/buildings. Substations can also be planned to easily accommodate future capacity additions.

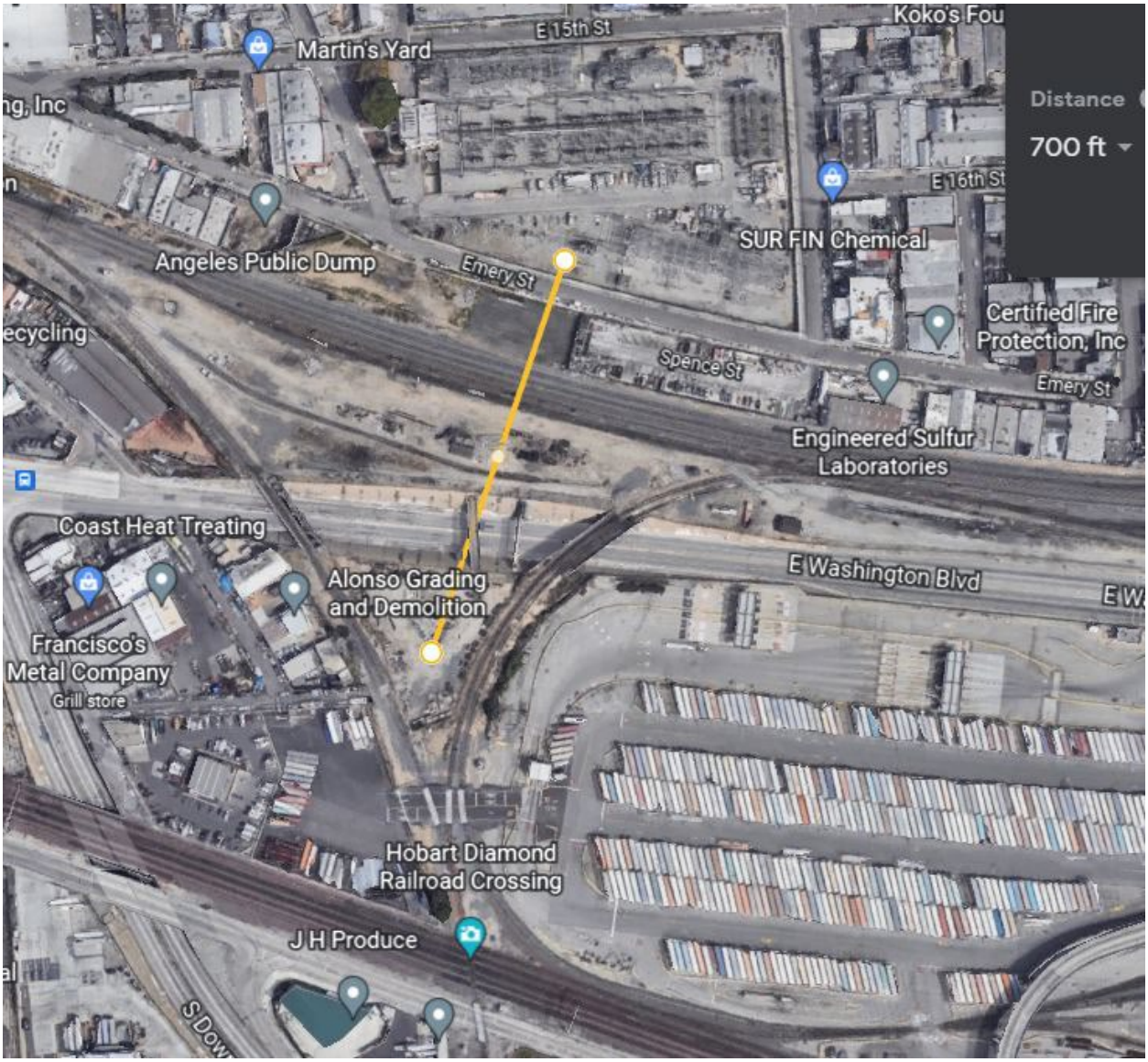
Electrification of the Alameda Corridor or the port rail network could start with only one traction substation for initial, minimal electrified traffic on one single-tracked run of OCS. Additional track segment OCS runs (several miles at time) and traction power substations, switching and paralleling stations, etc. could all be built incrementally as needed.

Southern California Edison (SCE) and Los Angeles Department of Water Power (LADWP) will need to be intimately involved in the planning, design, permitting, construction and operation of the traction power substations.

The traction power substations offer an opportunity to for electric utilities to benefit, not only for the revenue generated by power sales. Grid-connected large-scale battery energy storage systems, capacitor banks and other power quality equipment would improve reliability and quality of grid electric power. All of these could be located at or adjacent to a new traction power substation.

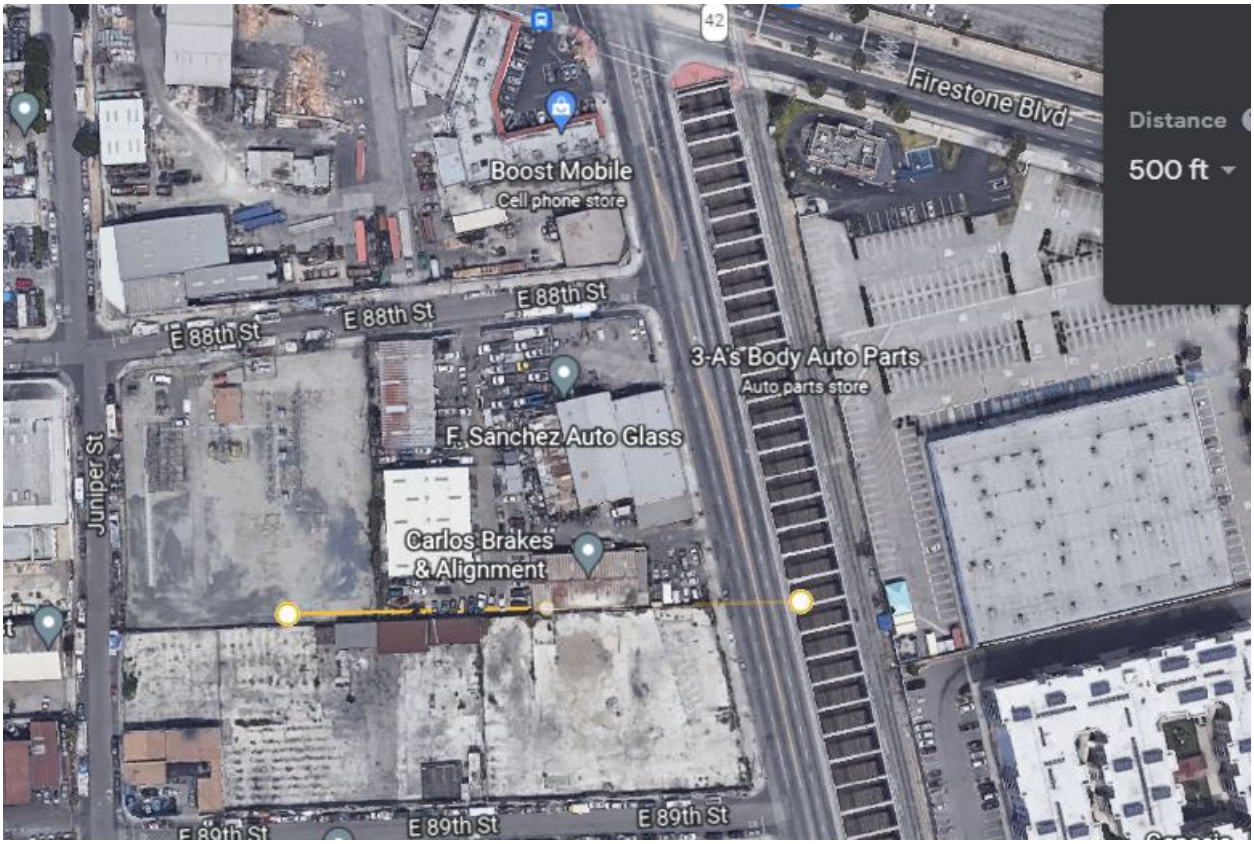
LADWP Station F Substation

3445 Emery Street
Los Angeles, CA 90023



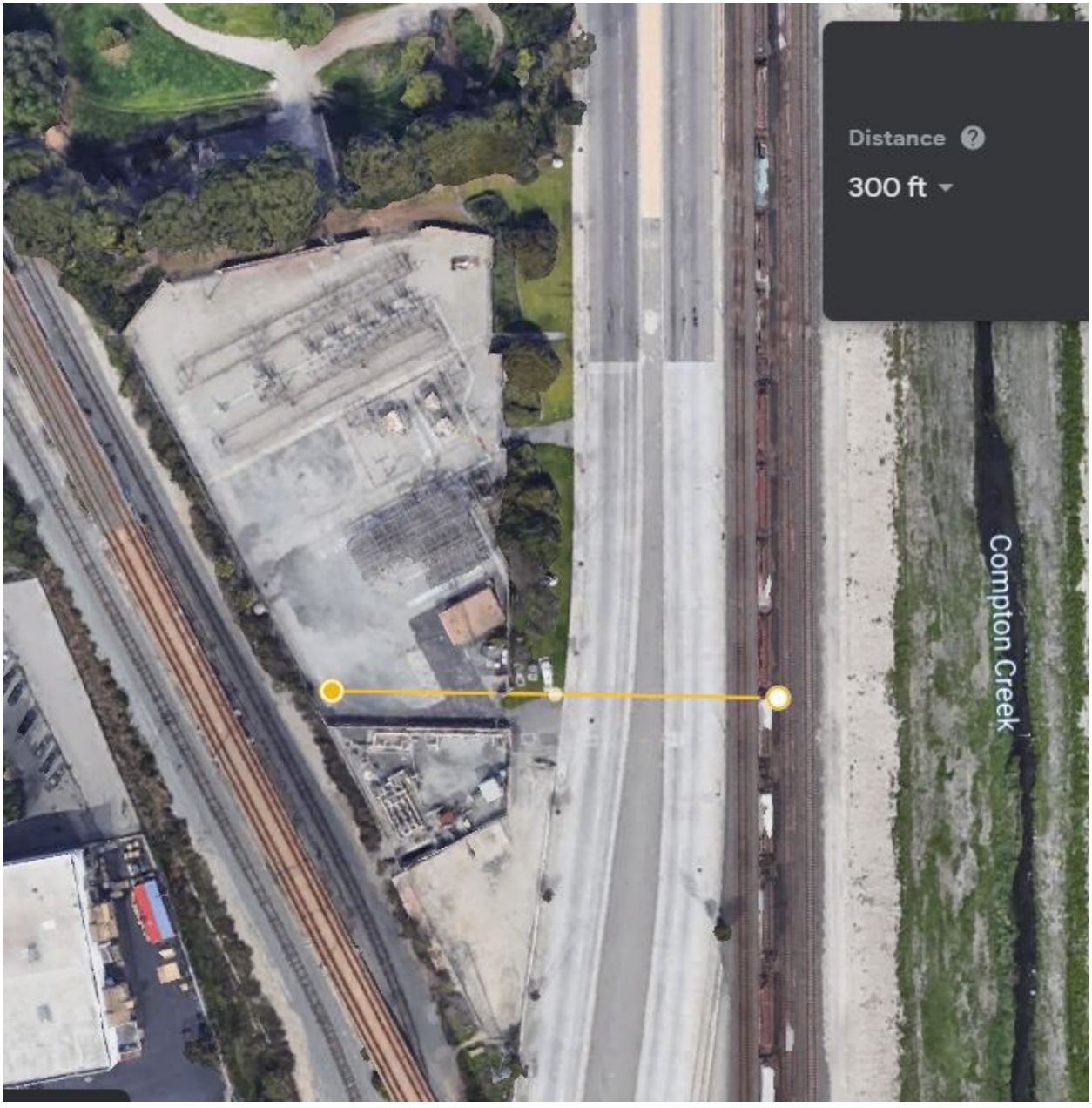
SCE Calden Substation

2201 E 88th Street
Los Angeles, CA 90002



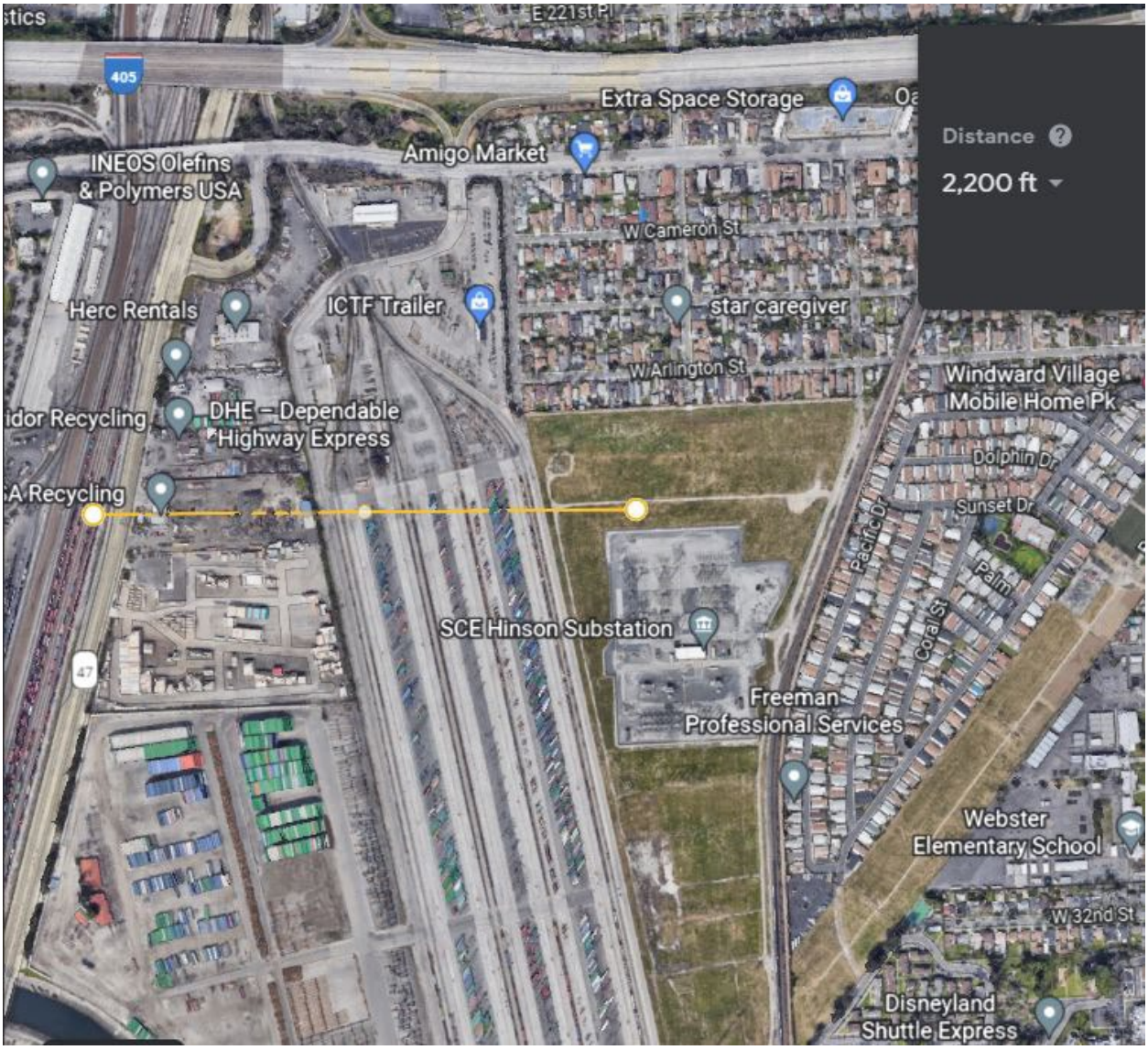
SCE Carson Substation

18515 Alameda Street
Compton, CA 90220



SCE Hinson Substation

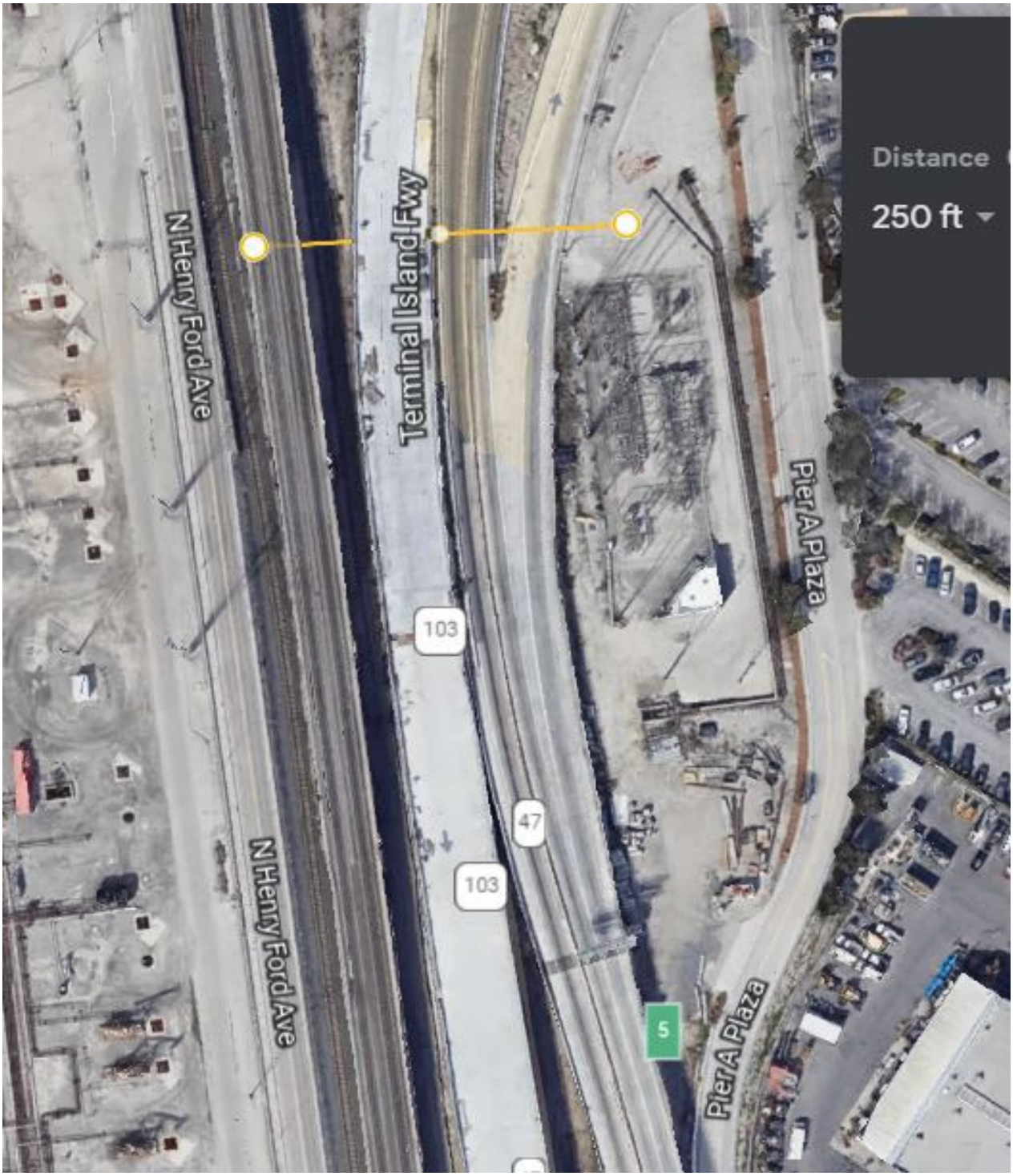
2100 W Arlington Street
Long Beach, CA 90810

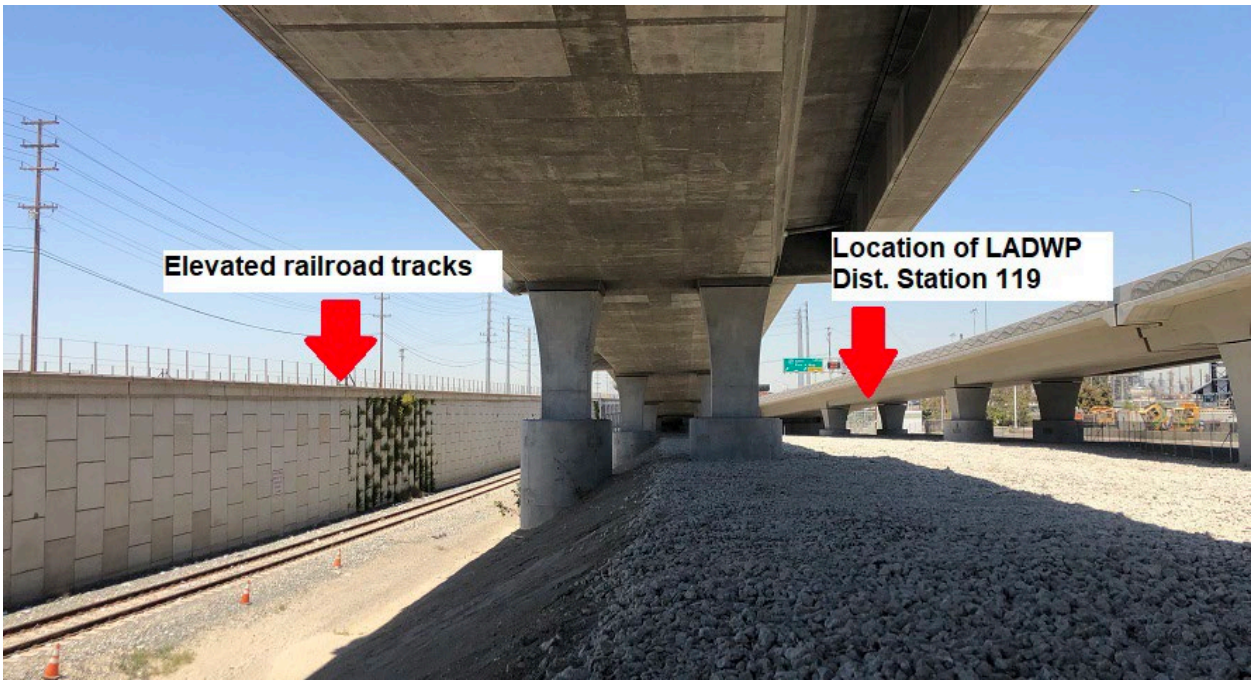


SCE Hinson substation from north (May 13, 2022 photo)

LADWP Harbor Substation (Dist. Station No. 119)

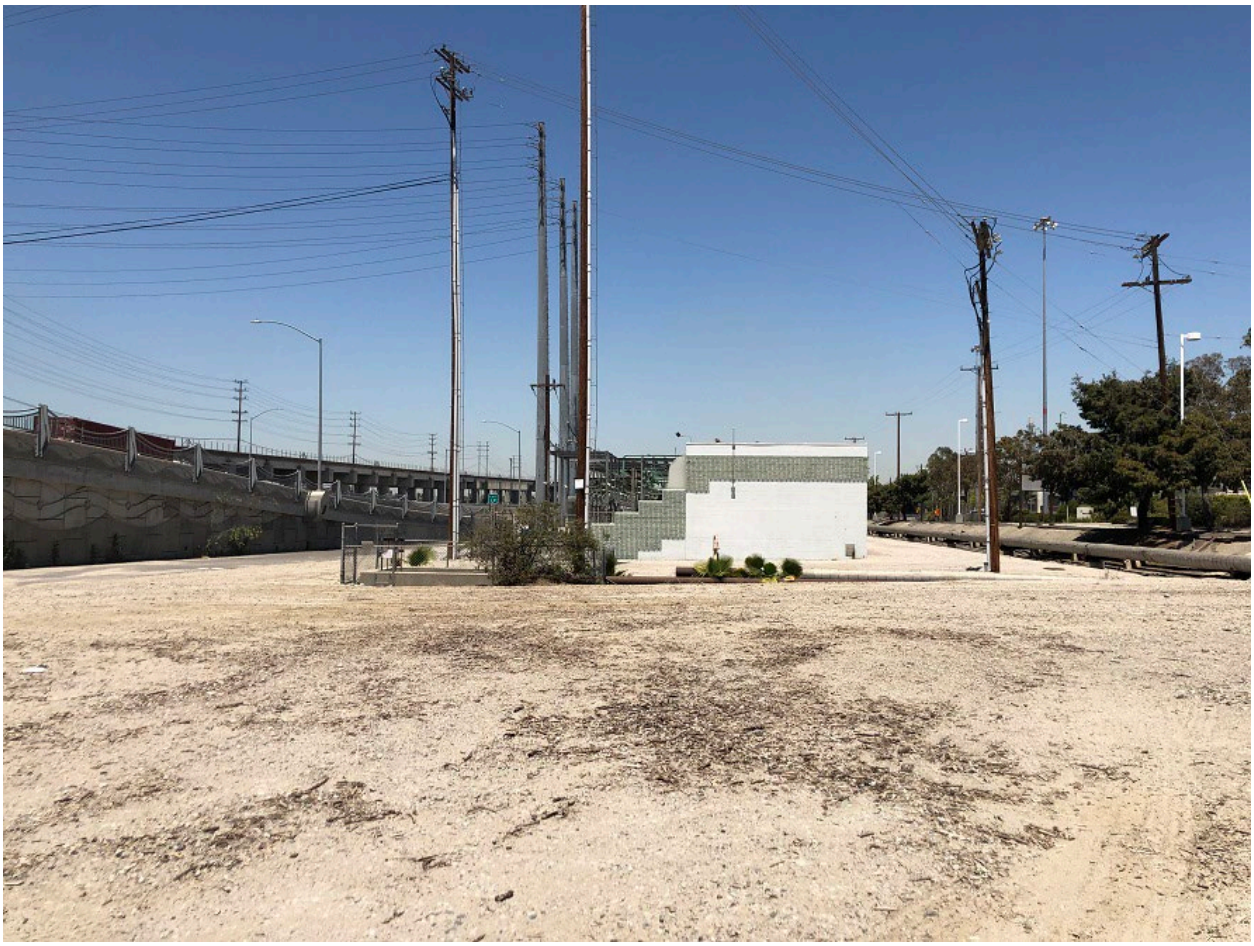
220 N Henry Ford Ave
Wilmington, CA 90744





Railroad tracks to immediate west of Terminal Island Freeway, near Distribution Station No. 119

Distribution Station No. 119 from north (May 13, 2022 photo)



Distribution Station No. 119 from south (May 13, 2022 photo)