INTRODUCTION TO THE ADAPTING TO RISING TIDES EXISTING CONDITIONS AND STRESSORS REPORT

The Adapting to Rising Tides (ART) project evaluated the current condition of shoreline and community assets, and the stressors affecting them, because understanding existing conditions and stressors can inform an understanding of individual asset resilience (or lack thereof) to projected climate impacts, including sea level rise and storm events. Stressors can also provide information on current and future trends and how those trends may affect resilience. The existing conditions and stressors were analyzed and summarized for each asset category included in the ART project assessment. This analysis served as a foundation for the ART vulnerability and risk assessment, which examined asset exposure to five potential climate impacts, sensitivity of assets to these impacts, and the ability of assets to accommodate or adjust to these impacts with little financial or structural intervention.

The following Existing Conditions and Stressors report chapter includes:

- a definition of the asset category;
- a synthesis of information about current conditions and stressors; and
- discussion of these conditions through the lenses of sustainability organized by society and equity, environment, economy and governance.

The complete ART Existing Conditions and Stressors Report is available at the ART Portfolio website.

ENERGY, PIPELINES AND TELECOMMUNICATION INFRASTRUCTURE

I. Definition

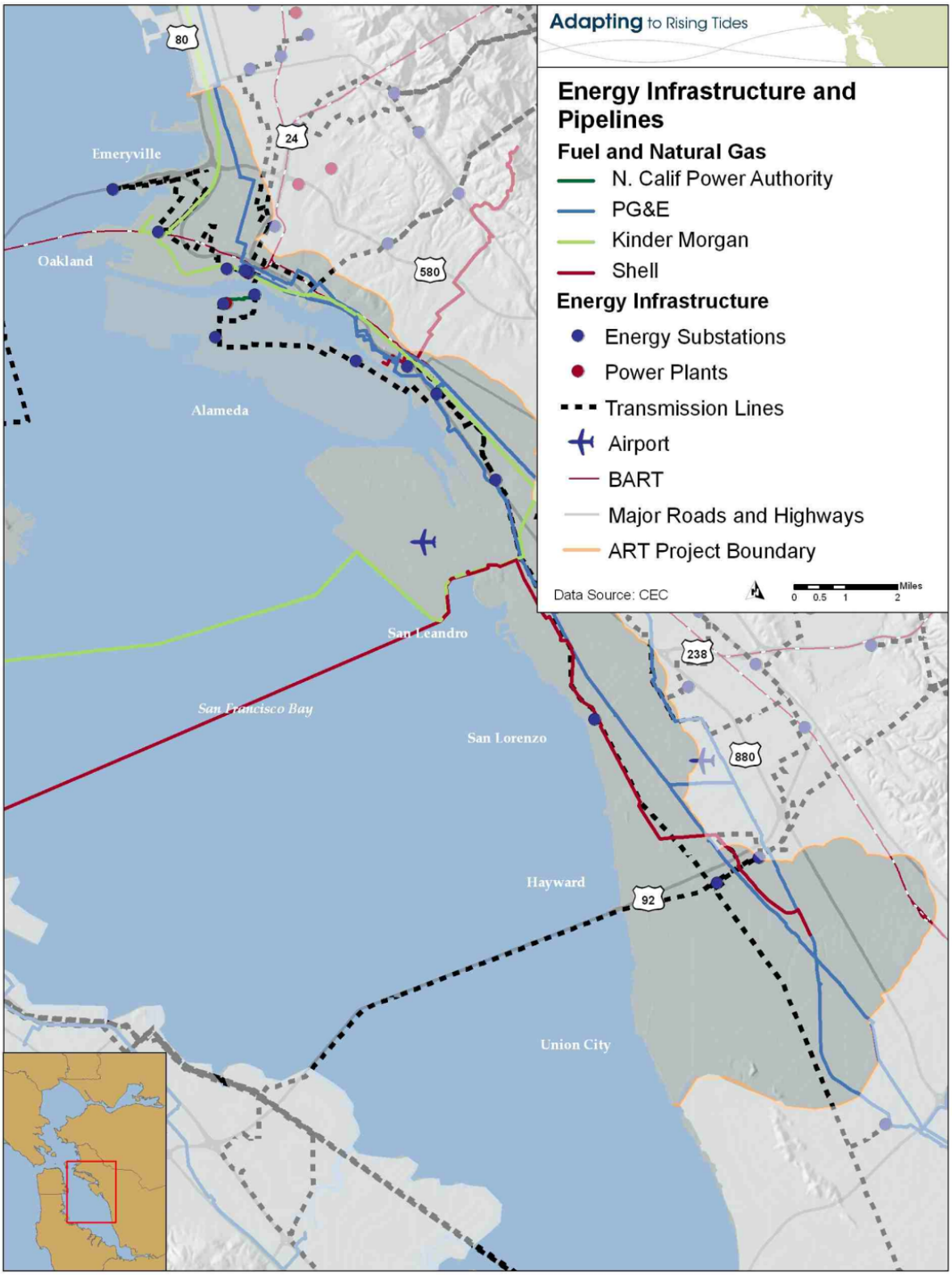
This asset category includes the electric transmission network, pipelines, and telecommunication infrastructure that carry electricity, natural gas, petroleum/fuel, and phone/Internet cables throughout the project area. This essential infrastructure provides electricity and natural gas to homes and businesses, fuel for multiple modes of transportation, and cables that allow shoreline residents to communicate. Much of this infrastructure connects the project area with other parts of the region, state, and nation. For example, the fuel pipelines connect refineries outside the project area with major consumers of fuel within, such as OAK and the truck terminals that distribute to local providers.

II. Locations and Physical Features

In general, the underground pipelines that carry various types of liquid fuel and natural gas run more or less parallel to the shoreline (see Figure 1). The electricity grid is a more complex network, but major overhead transmission lines run parallel to the shoreline with a number of substations situated near the shoreline. Many of the pipelines and much of the telecommunication infrastructure are located in railroad and California Department of Transportation (Caltrans) right-of-ways. The telecommunication infrastructure is either buried underground or carried overhead via utility lines. In many cases data accessibility regarding this infrastructure is limited due to security concerns and data gaps, making it challenging to accurately inventory the relevant infrastructure within the project area. However, there are publically available maps and digital geospatial data depicting much of the pipeline and electricity infrastructure.

Electrical transmission lines on the Hayward side of the San Mateo-Hayward Bridge. Source: Rafael Montes, BCDC.

Figure 1. Map of Energy and Pipeline Infrastructure in the ART Project Area



III. Ownership

Much of the infrastructure is owned by private companies; regulatory oversight is provided by a number of federal and state agencies.

The Federal Energy Regulatory Commission regulates some aspects of the transmission of electricity, natural gas, and oil while the California Public Utilities Commission (CPUC) regulates the natural gas and the electricity grid at the state level. The natural gas and electrical grid in the project area is almost exclusively owned and operated by PG&E.

The fuel pipelines are overseen by the Office of Pipeline Safety (OPS)/U.S. Department of Transportation at the federal level and the CPUC and State Fire Marshall at the state level. The OPS develops regulations and other approaches to risk management to ensure safety in design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. The fuel pipeline infrastructure is owned by private companies such as Shell and Kinder Morgan, but the property where the pipelines are located is often owned by a separate private entity such as Southern Pacific Railroad.

The Federal Communications Commission (at the federal level) and CPUC (at the state level) regulate certain aspects of the telecommunication infrastructure. The telecommunication/fiber optics lines are owned by a number of service providers such as AT&T, Qwest, and Comcast, but the property where the infrastructure is located may be owned by separate entities.

IV. Asset Characteristics

While there is no data that reflects the source of electricity, natural gas, and petroleum within the subregion, there is statewide data on the source and type of energy consumed within the state. California's electricity sources are 56% natural gas, 15% nuclear, 13% renewable, 12% hydroelectric, and 1% coal. Of the state's natural gas, 46% comes from the Southwest, 22% comes from the Rocky Mountain area, 19% comes from Canada, and 13% comes from in-state sources. The state also consumes crude oil from a variety of sources: 47% comes from foreign sources, 14% comes from Alaska, and 13% comes from in-state sources. (Source: California Energy Commission, 2010.)

Electricity is largely carried by overhead transmission lines until it reaches a substation, from which it is distributed via utility lines to individual homes and businesses. Electricity is also carried via underground conduits. A portion of the electricity grid that serves Alameda County is powered by hydroelectric energy generated in the Sierra Nevada mountain range.

Natural gas is transported via underground pipelines. A major natural gas pipeline parallels I-880. Liquid petroleum jet fuel, gasoline, and diesel fuels are transported via pipelines that cross the subregion. The fuel is often refined at regional refineries and then consumed by large consumers such as OAK or distributed to the market via rail and truck. In general, these pipelines are buried at a depth of 3 to 4 feet in high-carbon steel pipelines. Most of these pipelines are buried along the shoreline; some cross the Bay, such as at the Carquinez Strait.

Many of the pipelines were built in the 1960s and 1970s and are maintained regularly as mandated by state and federal regulations.

Telecommunication infrastructure tends to be buried underground in cables at a depth of 2 to 5 feet. There are locations along the cables that allow for periodic maintenance and replacement. Additionally, telecommunication infrastructure is located in cables that are carried by overhead telephone lines.

V. Existing Stressors

Much of the state's electricity grid has been in place for decades and is in need of improvements. The CPUC has begun the process of modernizing the grid, and these improvements will lead to a safer, more efficient, and more reliable "smart" grid. However, in addition to aging energy infrastructure, natural hazard risks due to earthquakes, wildfires, floods or landslides has the potential to stress or disrupt power supply and distribution. Likewise, much of the telecommunication infrastructure has been in place for decades. However, due to rapid changes in technology and consumer behavior, it is unclear how long the existing telecommunication infrastructure will be in use.

The pipelines' role in the regional economy is subject to a number of forces beyond the operators' control. The pipelines are built to support the energy needs for the current economy. If there are significant changes to the economy or consumer behavior, or rapid changes in technology/fuel efficiency, then changes to the existing infrastructure may be needed. The existing pipelines could accommodate certain changes in demand by increasing the volume of material moving through the pipelines or by increasing the size of the pipeline.

Due to the importance of this asset category, much of the infrastructure has been built to withstand minor changes in environmental conditions such as wind, rain, and heat. However, if these conditions change significantly in the future, there may need to be some modifications to the infrastructure.

Likewise, pipelines and other transmission infrastructure have been constructed in accordance with regulations that should minimize the impact of a major seismic event. However, such an event could still significantly affect the infrastructure depending on its magnitude and location.

As mentioned earlier, it is difficult to access accurate data on the location of pipeline infrastructure. This poses a challenge to local communities and agencies that manage other resources in the same vicinity.

VI. Economy

The facilities described in this asset category provide the electricity, fuel, and telecommunication infrastructure that are fundamental drivers of the economy. These facilities are critical to the ART project area's economic engine, and provide a source of jobs and tax revenues to governments. Any disruption of these assets could have significant direct and indirect economic impacts within the project area as well as throughout the region and state.

VII. Equity

The majority of the pipelines/energy transmission lines run along the shoreline and cross a wide section of land use types and communities. However, as the large consumers of the fuel and energy tend to be industrial/commercial consumers, residents adjacent to industrial and commercial areas are likely to be more exposed to the potential for adverse public health and environment impacts associated with an accidental release or spill.

VIII. Governance

Much of the regulatory oversight is at the state and federal level. There appears to be minimal oversight at the local level. However, local agencies that maintain general plans, specific plans, and zoning ordinances can guide the placement of infrastructure within this asset category. For example, the Union City General Plan Public Facilities and Service Element contains policy PF-G.1.2, which reads as follows: "The City shall promote technological improvements and upgrading of utility services in Union City to serve existing and future needs while minimizing noise, electromagnetic, and visual impacts on existing and future residents."

IX. Environment

Under normal operating conditions, there are no significant impacts upon the environment from this infrastructure. However, a spill or accident could lead to significant impacts upon public health and the surrounding environment, both immediate and long-term. Furthermore, the placement of new infrastructure would likely have localized impacts upon the environment and could further degrade it. In some instances the infrastructure could serve as a barrier to movement along a corridor and could also serve as a visual barrier.

References

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