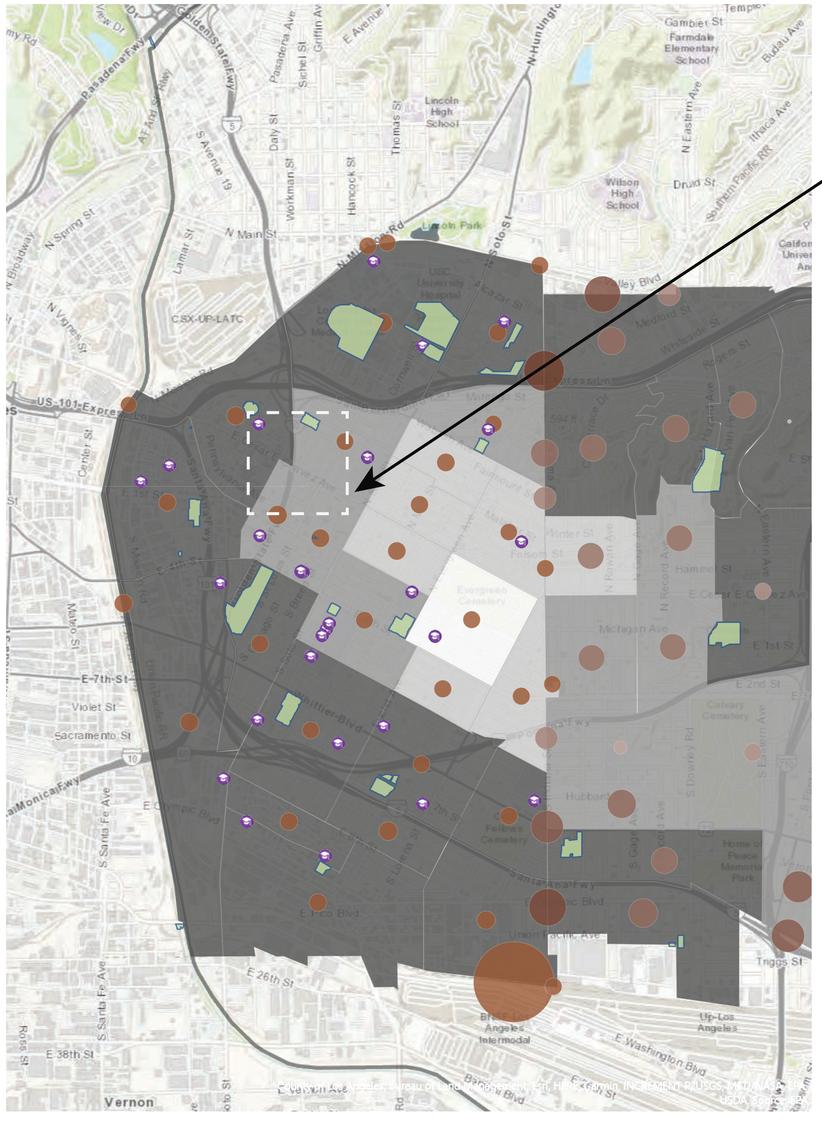
LOS ANGELES **INFRASTRUCTURE**

Freeways

A Research and Visual Analysis of the Physical, Environmental, and Social Impacts



GIS Map, Boyle Hights, Los Angeles

Parks and Open Spaces in Boyle Heights

Boyle Heights Asthma

Public Schools in Boyle Heights

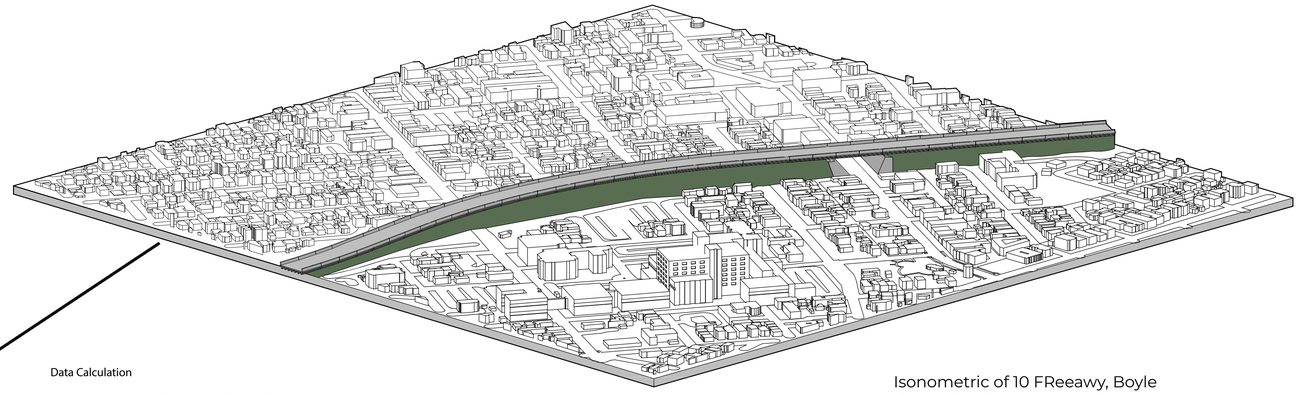
East Los Angles Asthma

10
25
50
75
100
23
25-83

>39-40
>40-50
>50-60
>60-80
>50-60
>60-77
Streams
Lakes
Citations

East Los Angles Pollution

>40-50



Isonometric of 10 FReeawy, Boyle Bights, Los Angles

Data Calculation

Freeway – Concrete Volume & Weight per Mile

Assumptions:
Length: 5,280 ft (1 mile)
Width: 120 ft
Thickness: 0.75 ft (9 inches)

Calculations:
Volume: 5,280 × 120 × 0.75 = 475,200 cubic feet
Convert to cubic yards: 475,200 ÷ 27 = 17,600 cu yd
Add 10% waste: 17,600 × 1.1 = 19,360 cubic yards

Weight (Concrete = 4,000 lbs/cu yd = 2 tons):
19,360 × 4,000 = 77,440,000 lbs
77,440,000 ÷ 2,000 = 38,720 tons

Total Concrete Needed for 1 Mile of Freeway:
19,360 cu yd
77.4 million lbs
38,720 tons

Weight of Freeway Material – L.A. County

L.A. County has roughly 1,000 miles of freeway.
Each mile = 5,280 ft.

Assuming the average freeway is 120 ft wide and 9 inches thick (0.75 ft):

Volume per mile = 5,280 × 120 × 0.75 = 475,200 cu ft

Across 1,000 miles:
475,200 × 1,000 = 475,200,000 cubic feet total

Convert to cubic yards (since 1 yd^3 = 27 ft^3):
475,200,000 ÷ 27 = 17,600,000 yd^3

Concrete weighs about 150 lbs per cubic foot:
475,200,000 × 150 = 71,280,000,000 lbs
Divide by 2,000 to get tons:
35,640,000 tons

Freeway Material Load in L.A. County (Embodied + Ongoing Weight)

Existing (Built) Freeway System

Around 1,000 miles of freeway across the county

Avg. width: 120 feet

Thickness: 9 inches (0.75 ft)

Volume per mile
5,280 ft × 120 ft × 0.75 ft = 475,200 cubic feet

Total volume
475,200 cu ft × 1,000 miles = 475,200,000 cu ft
Divide by 27 ≈ 17.6 million cubic yards

Weight of existing concrete
475.2 million cu ft × 150 lbs = 71.28 billion lbs
In tons 71.28B ÷ 2,000 = ≈ 35.6 million tons

Ongoing Material Input (Maintenance + Repairs)

Resurfacing: every 15–25 years

Spot patching: every 5–10 years

Over ~50 years, added material is estimated at 50–80% of the original weight
That's an additional 17.8M to 28.5M tons

Total Long-Term Material Impact
35.6M tons (original)

17.8M–28.5M tons (maintenance over time)
= Approx. 53.4M to 64.1M tons total

Freeway Maintenance in Los Angeles

Caltrans (California Department of Transportation)
Responsible for:

All state freeways and highways (I-5, I-10, I-405, US-101, SR-60, etc.)

Pavement repairs (resurfacing, potholes)

Bridge and structure maintenance

Ramps, interchanges, and freeway connectors

Noise barriers, lighting, drainage systems

Traffic management systems (signals, cameras, sensors)

Graffiti removal and vegetation control

District 7 serves Los Angeles and Ventura Counties, overseeing major freeways and interchanges.
Funded by state and federal gas taxes, bonds, and maintenance programs under SB 1 (The Road Repair and Accountability Act).

Looking southwest at Whittier Blvd and Soto Ave in Boyle Heights, July 14, 1938. Visible are homes, a Nucoa margarine billboard, and Ramona Grocery.

A city planner demonstrates the intersection of three freeways - the 5, 10, and 101 - on a scale model of Bole Heights.

Two maps showing Boyle Heights, one at the beginning of the era of freeway construction, and one 13 years later when most of the regional connectors recognisable today were completed.

Material Description

Steel
Employed for reinforcement and structural support, including rebar in concrete and components of bridges and overpasses. The East Los Angeles Interchange incorporated about 13,200,000 pounds of reinforcing and structural steel.

Asphalt
Applied as a top layer on road surfaces to provide a smooth and durable driving experience.

Earth Materials
Excavated and used for embankments and foundational support. Approximately 1,500,000 cubic yards of earth were excavated during the construction of the East Los Angeles Interchange.

Concrete Pipes
Installed for drainage systems to manage water runoff and prevent erosion. The project laid 23,545 feet of concrete pipe.

Aggregate Materials
Such as gravel and crushed stone, used in concrete mixtures and as base layers beneath road surfaces to enhance stability.

2020 — Growing discussions on removing or repurposing freeways in dense urban areas. Present: Initiatives for zero-emission transportation, congestion pricing, and freeway redesign to reduce environmental and social harm.

2010 — Present: Rethinking Freeways & Infrastructure Push for freeway capping projects, noise barriers, and transit-oriented development.

2000 — Increased focus on public transit alternatives (Metro Gold Line, Expo Line).

1990 — Studies link freeways to air pollution, asthma, and cardiovascular diseases in nearby neighborhoods.

1980 — First air quality regulations introduced due to high vehicle emissions.

1980-2000 — Environmental & Social Concerns Rise

1960-1970 — Mass displacement of communities in Boyle Heights, Chavez Ravine, and South LA.

1959-1965 — East LA Interchange completed—one of the world's busiest freeway interchanges, disrupting Boyle Heights.

1954-1965 — Construction of major freeways (Harbor Fwy [I-110], Hollywood Fwy [US-101], San Bernardino Fwy [I-10], Santa Monica Fwy [I-10]).

1950 — State and federal funding (Federal-Aid Highway Act of 1956) accelerates freeway construction.

1950-1970 — Freeway Expansion & Neighborhood Displacement

1940 — Arroyo Seco Parkway opens, setting the standard for future freeways.

1934 — Arroyo Seco Parkway (now Pasadena Freeway) planned as the first U.S. freeway.

1924 — First freeway proposal in LA's Major Traffic Street Plan.

1920-1940 — Early Planning & Construction

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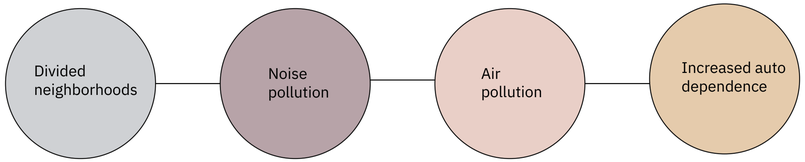
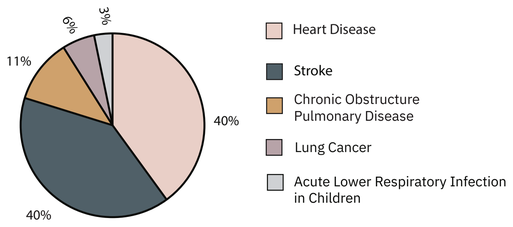
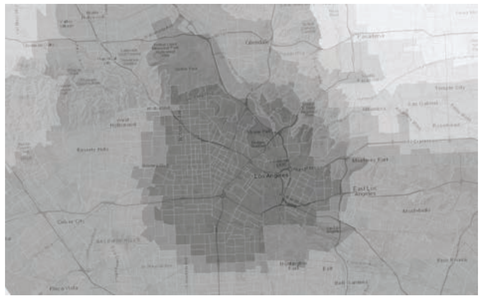
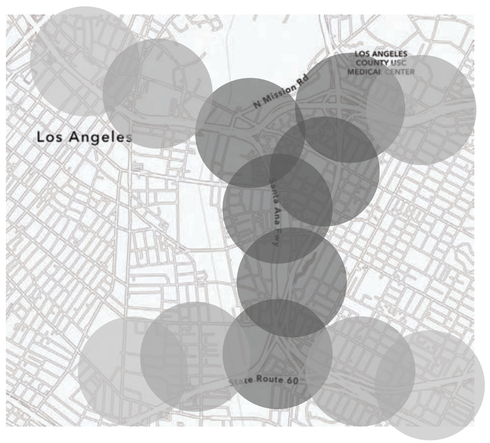


Four Key Problems Caused by Freeways

Health Problems Related to Freeways







Auto Dependence

Quantities: Represent vehicle miles traveled (VMT)—for example, LA freeways handle ~300 million VMT per day.
Flows: Use thickness of lines to depict traffic volume and flow intensity.
Sources & Movement: Compare data over decades to show growth in traffic congestion and reliance on cars over time.

Air Pollution in Boyle Hights, Los Angeles

Quantities: Measure in PM2.5 (particulate matter) & NOx (nitrogen oxides). Near freeways, PM2.5 can be 20-30 µg/m³, exceeding health guidelines.
Flows: Use arrows and contour lines to show how pollutants drift based on wind direction and freeway layout.
Sources & Movement: Illustrate emissions from cars, trucks, and industrial areas, moving into residential zones and dispersing over time.

Lower Air Pollution
Medium Air Pollution
High Air Pollution

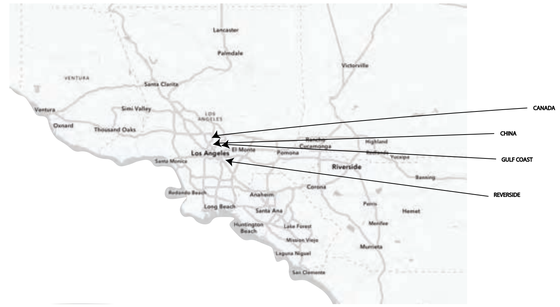
Noise Pollution ib Boyle Hights, Los Angeles

Quantities: Measure in decibels (dB). Freeways in urban areas often exceed 70-85 dB, impacting nearby communities.
Flows: Indicate noise dissipation with concentric rings or gradient shading showing how intensity decreases with distance.
Sources & Movement: Show how noise spreads outward from high-traffic zones and dissipates into residential areas.

Lower Noise Pollutic
Medium Noise Pollu
High Noise Pollutior

Divided Neighborhoods in Boyle Heights, Los Angeles

Quantities: Map out pedestrian crossings per mile, showing reduced connectivity.
Flows: Indicate restricted movement with broken pathways or blocked access zones.
Sources & Movement: Highlight historic changes—before vs. after freeway construction—to show evolving community disconnection.



Geographic Limits of LA's Infrastructure (Material Supply Chains)

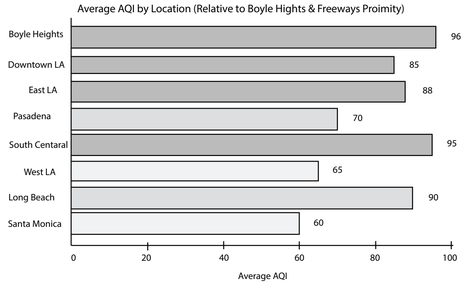
Material	Source Location	Transport Method	LA Entry Point
Aggregate	Vancouver Island, Canada	Ship	Port of Long Beach
Asphalt Binder	Bakersfield / Gulf Coast	Rail / Pipeline	Local Terminals
Steel	China / Korea / Midwest U.S.	Ship / Rail / Truck	Port of LA / Local Rail Yards
Sand & Gravel	Riverside / San Bernardino County	Truck	Direct to Construction Site

Freeways in Los Angeles County

Air Pollution in Boyle Hights, Los Angeles

Earth to Be Excavated (To Place the Freeway Underground)
To build a cut-and-cover trench for the freeway, we excavate the space the road will occupy:
Volume = Length × Width × Depth
3,300 ft × 120 ft × 30 ft = 11,880,000 cubic feet
Convert to cubic yards (27 cu ft = 1 cu yd):
11,880,000 ÷ 27 = ≈ 440,000 cubic yards

Air Quality Index Across Los Angeles in Relation to Freeway Proximity



Types of Freeways

1. Sunken Freeways + Bridges
Sunken freeways are built below ground level, often with overpasses or bridges crossing above.
Pros: Reduce visual and noise impact; preserve street grid above.
Cons: Expensive drainage systems; can isolate neighborhoods

2. Tunnels
Freeways go underground through hills or dense areas using tunnels.
Pros: Preserve surface land and minimize disruption.
Cons: High construction and maintenance costs; ventilation and safety are complex.

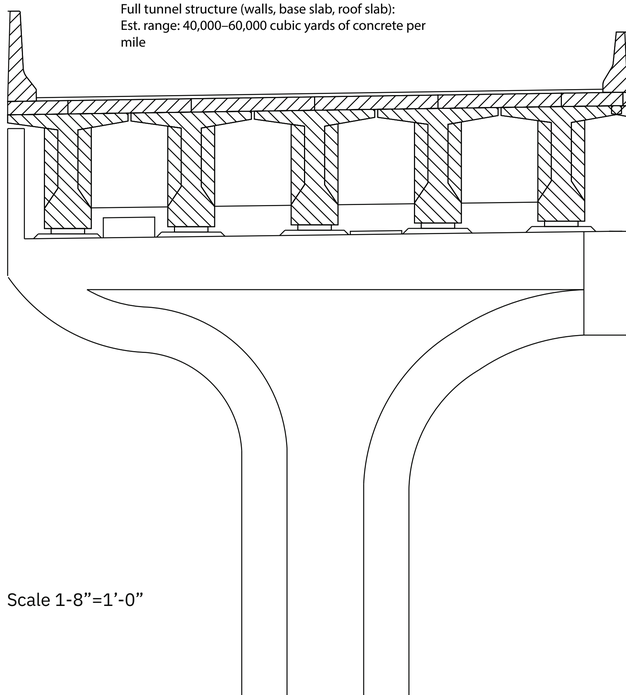
3. Sound Walls
Vertical barriers placed alongside freeways to block noise and sometimes visuals.
Pros: Improve quality of life for nearby residents.
Cons: Can be visually unappealing and create a sense of division.

4. Overpasses and Underpasses
Used to allow roads or pedestrians to cross over or under freeways.
Pros: Maintain traffic flow and connectivity.
Cons: Can be bulky and impact urban aesthetics or pedestrian comfort.

5. Elevated Freeways
Built above ground on columns, often through urban cores.
Pros:Save ground space; efficient in dense areas.
Cons: Cast shadows, increase noise, and divide communities below.

6. Sunken Freeways with Caps (Deck Parks)
Sunken roads covered with landscaped "caps" that create usable park space.
Pros: Reconnect neighborhoods; add green space.
Cons: Extremely costly and complex to build and maintain.

Concrete Volume Estimates (Per Mile)
Road surface only (4 lanes + shoulders, 1 ft thick):
5,280 ft × 60 ft × 1 ft = 316,800 cu ft
316,800 ÷ 27 = ≈ 11,733 cubic yards of concrete per mile
Full tunnel structure (walls, base slab, roof slab):
Est. range: 40,000–60,000 cubic yards of concrete per mile



Scale 1-8"=1'-0"

LOS ANGELES **INFRASTRUCTURE**

Freeways

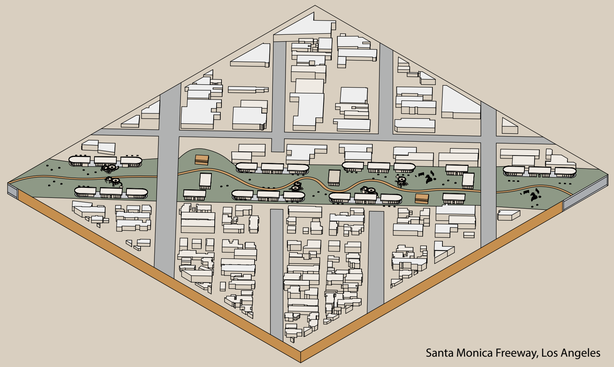
Designing for a Healthier Urban Future

Boston Big Dig, Central Artery / Tunnel Project, Massachusetts

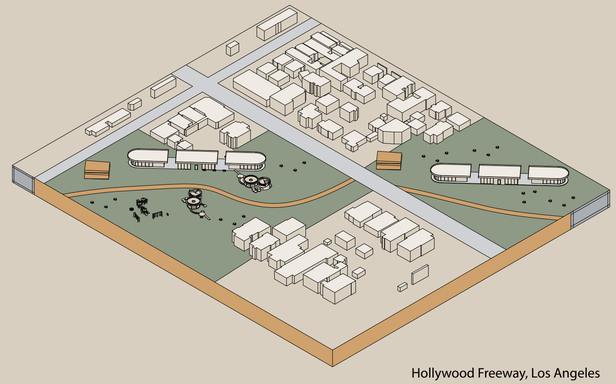
Before

After

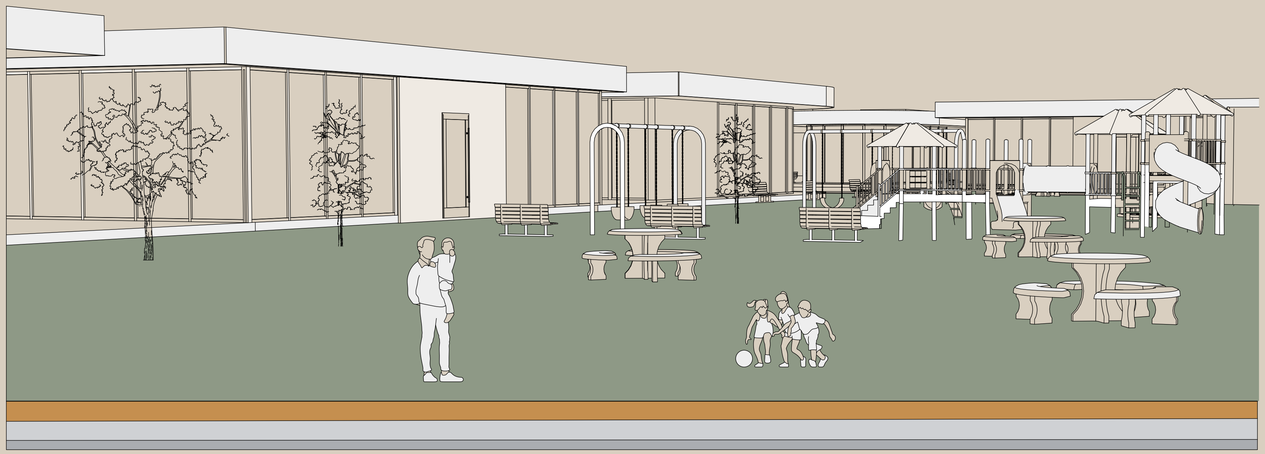
Grand Park: Los Angeles, California



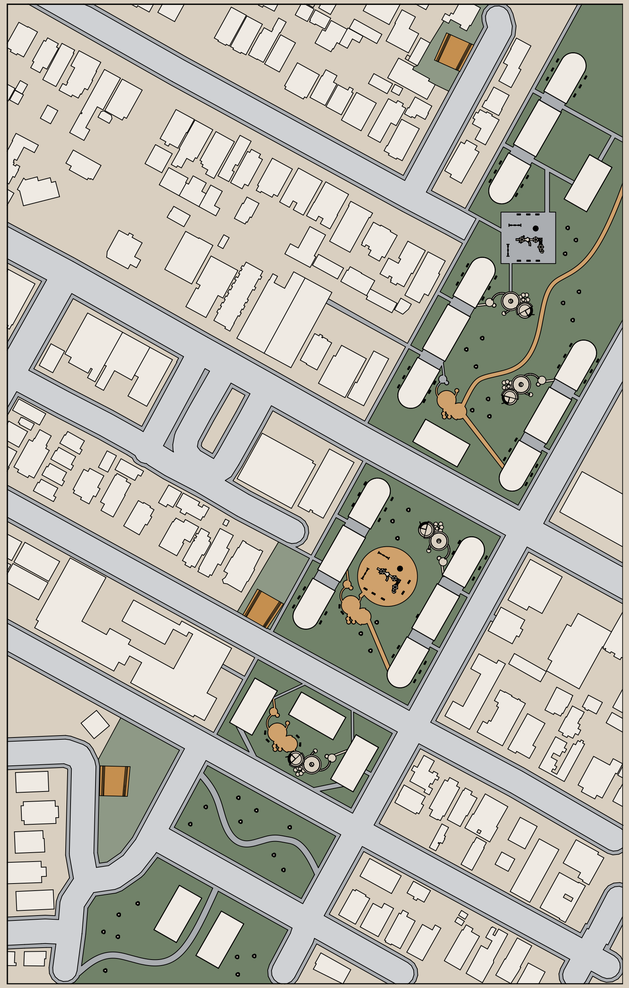
Santa Monica Freeway, Los Angeles



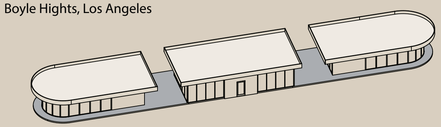
Hollywood Freeway, Los Angeles



Freeway-Top Park



Boyle Hights, Los Angeles

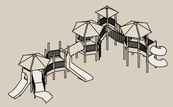


Strip Mall

A strip mall brings convenience to the community by offering easy access to a variety of essential goods and services in one location.

Art Display Pavilion

The Art Display Pavilion celebrates the rich culture of Boyle Heights by providing a vibrant, community-centered space where local artists can showcase their work and honor the neighborhood's deep artistic and cultural roots.

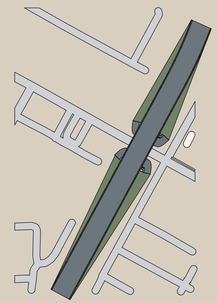


Kids Play Area

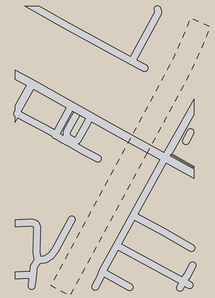
The Kids Play Area offers a safe, engaging space where children can explore, play, and connect with others, fostering creativity and community within a welcoming environment.

Earthship Cooling Center

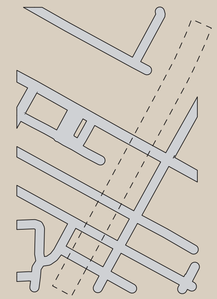
An Earthship Cooling Center provides a sustainable, off-grid space that naturally regulates temperature using passive solar design, thermal mass, and ventilation systems—built using repurposed dirt from a nearby freeway excavation, giving new life to discarded earth while keeping communities cool in hot climates.



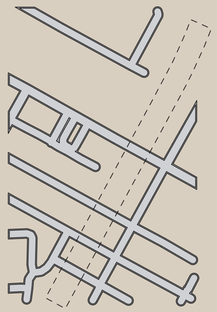
Existing Condition with Freeway



Existing Condition without Freeway



New Street Condition



New Street Condition with Sidewalks

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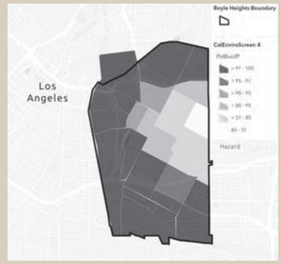
Air Pollution in Boyle Heights



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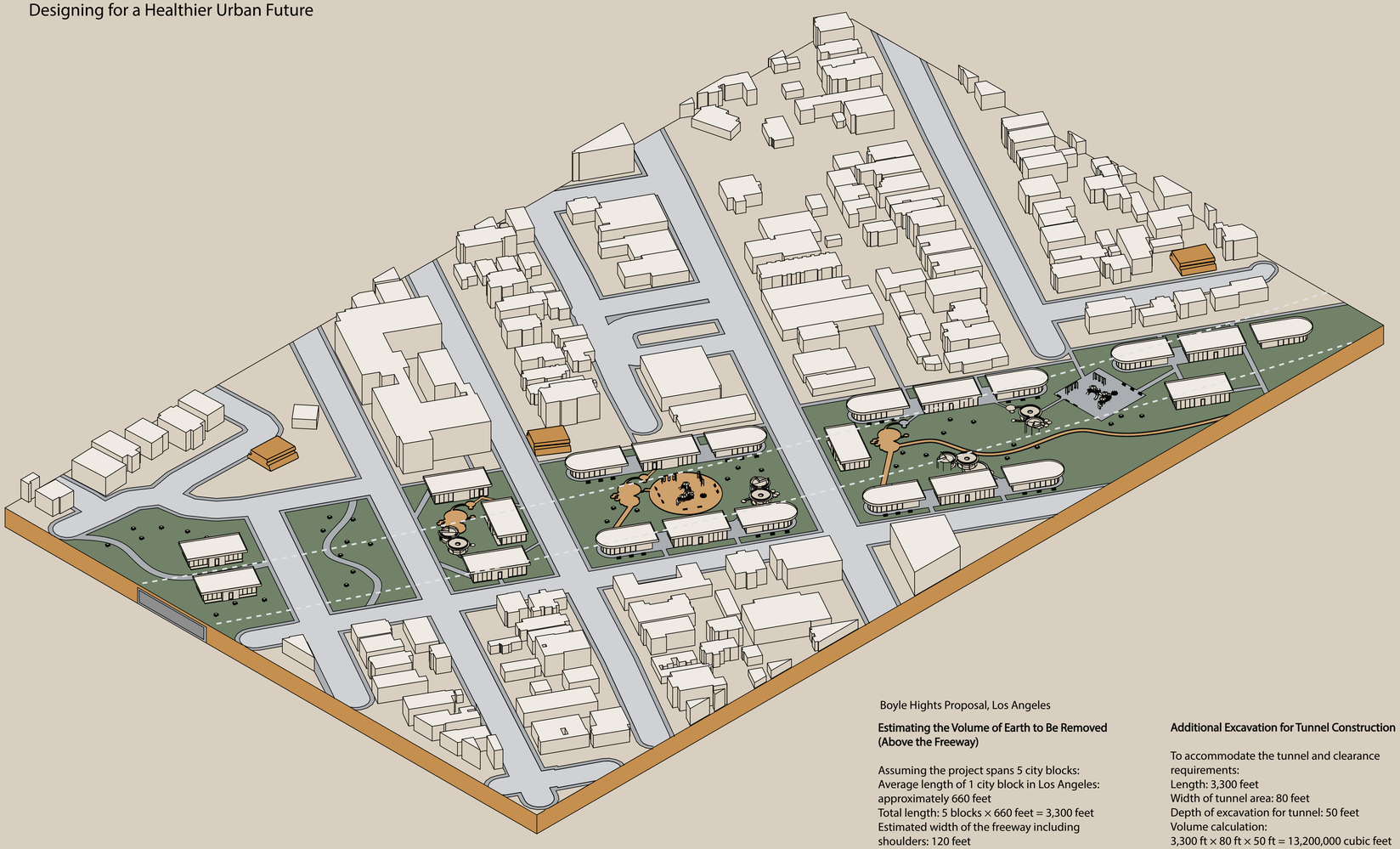
Designing for a Healthier Urban Future



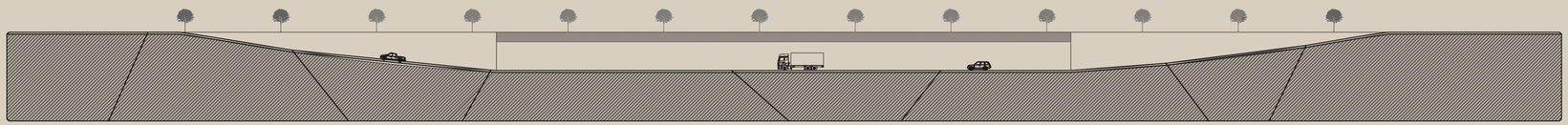
Boyle Hights Proposal, Los Angeles

Estimating the Volume of Earth to Be Removed (Above the Freeway)

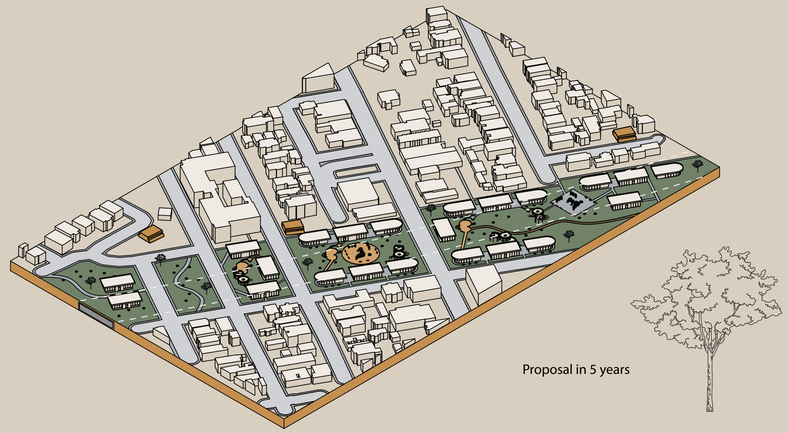
Assuming the project spans 5 city blocks:
Average length of 1 city block in Los Angeles: approximately 660 feet
Total length: 5 blocks × 660 feet = 3,300 feet
Estimated width of the freeway including shoulders: 120 feet
Estimated excavation depth: 30 feet
Volume calculation:
Length × Width × Depth = 3,300 ft × 120 ft × 30 ft = 11,880,000 cubic feet
Convert to cubic yards (1 cubic yard = 27 cubic feet):
11,880,000 ÷ 27 = approximately 440,000 cubic yards

Additional Excavation for Tunnel Construction

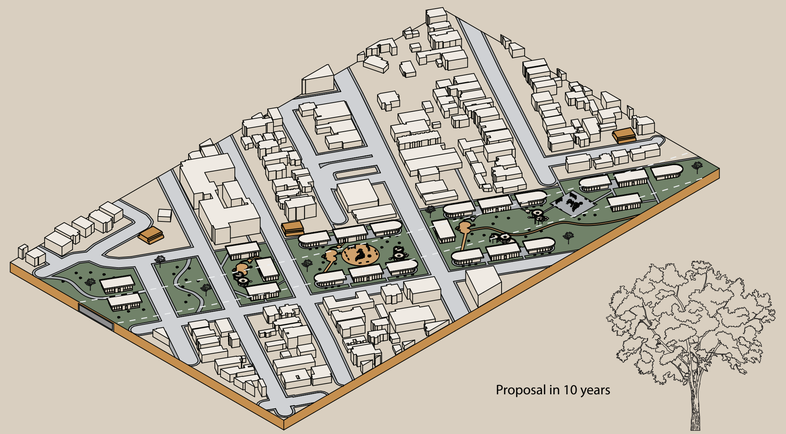
To accommodate the tunnel and clearance requirements:
Length: 3,300 feet
Width of tunnel area: 80 feet
Depth of excavation for tunnel: 50 feet
Volume calculation:
3,300 ft × 80 ft × 50 ft = 13,200,000 cubic feet
13,200,000 ÷ 27 = approximately 488,889 cubic yards
Total Estimated Volume of Earth to Be Removed
440,000 cubic yards (surface excavation)
488,889 cubic yards (tunnel excavation)
= Approximately 928,889 cubic yards of earth



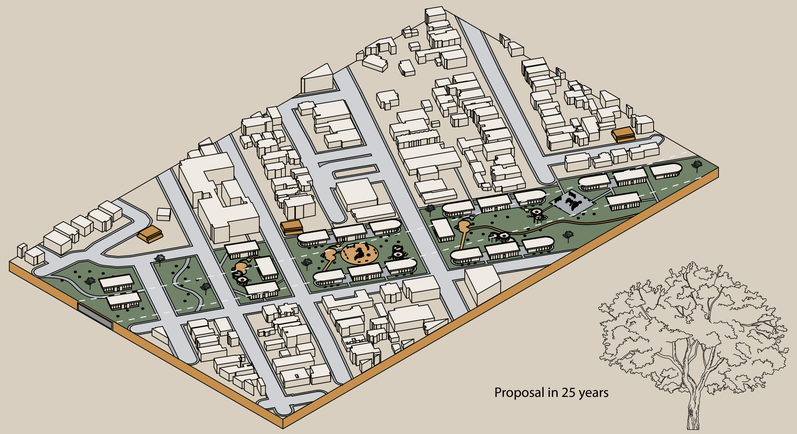
Underground Freeway Section



Proposal in 5 years



Proposal in 10 years



Proposal in 25 years