

The Gateway Cities
Air Quality Action Plan

Health Impact Assessment Update & Noise Chapter Review – DRAFT

Technical Roundtable September 14, 2011, and
Advisory Roundtable September 15, 2011

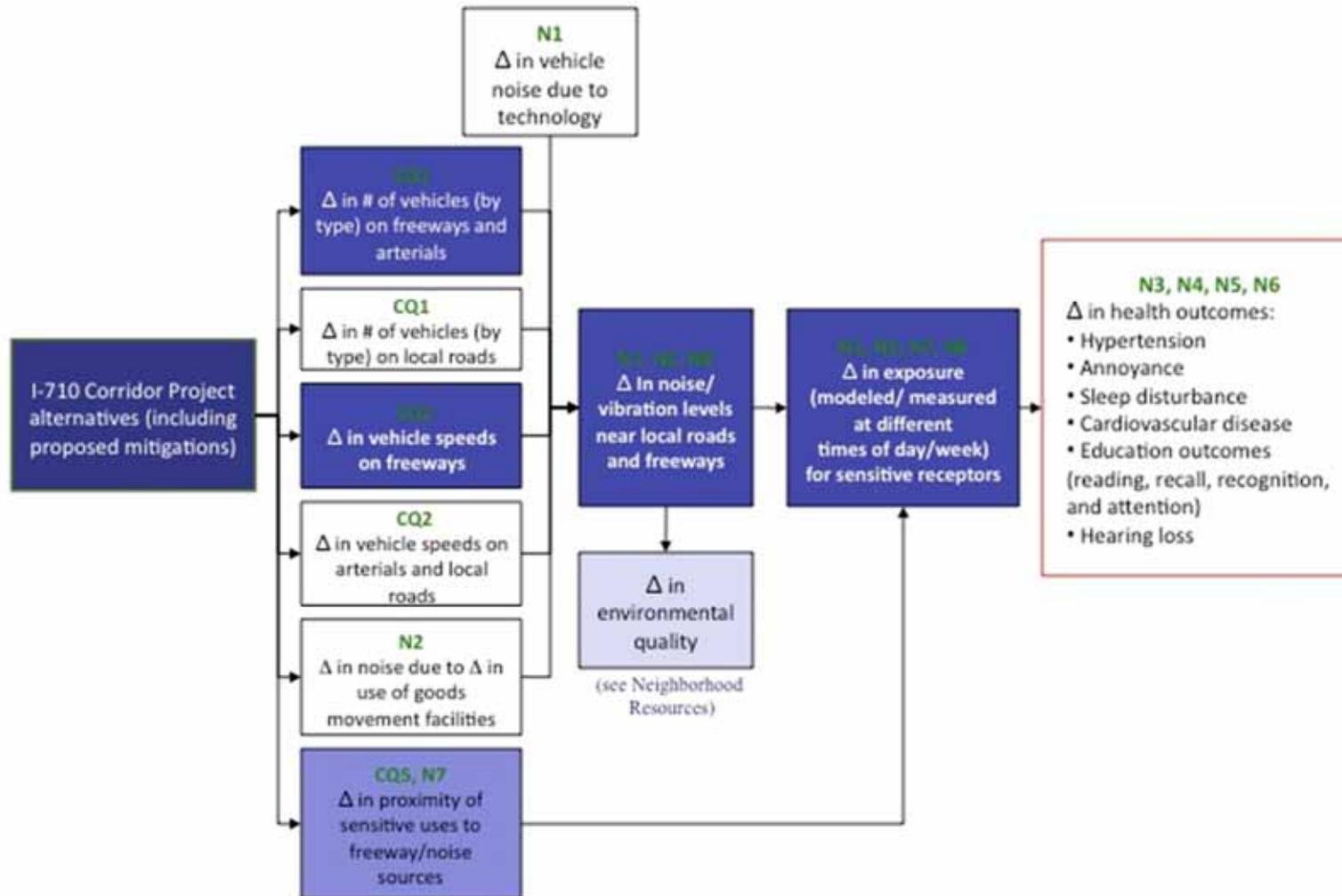
This document is a preliminary draft representing the opinions of Human Impact Partners, and does not represent the opinions (or endorsement) of Metro and the GCCOG. This AQAP study is not part of the I-710 Corridor Project studies, but upon completion, it will be submitted to Caltrans for review and consideration for use in preparing the I-710 Corridor Project EIR/EIS.



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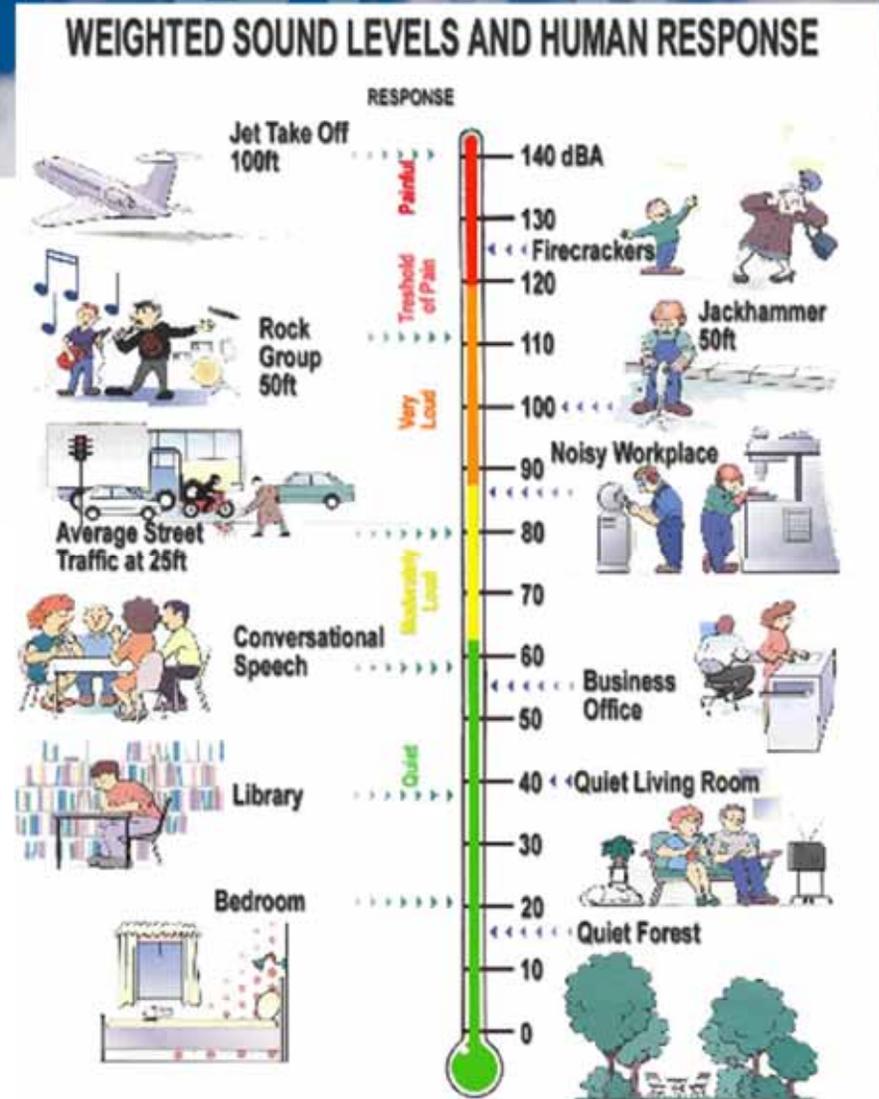


Noise: Pathways to Health



Common Noise Levels

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Definitions

- **Decibel (dB)** = measure of sound intensity, computed based on the ratio of two sound levels [$\text{dB} = 10 \log (\text{Power1} / \text{Power0})$]
- **A-weighted dB (dBA)** = takes into account the frequency range of the human ear
- **L_{eq} (hours)** = equivalent average continuous noise level integrated over a period of time
 - **$L_{\text{eq}}[\text{h}]$** = 1 hour period
- **L_{d}** = A-weighted daytime noise
- **L_{n}** = A-weighted nighttime noise
- **L_{dn}** = A-weighted day-night equivalent noise level over a 24 hour period with a 10 dB penalty given to noise during sleeping hours

Literature review

The literature contains significant evidence on causal links between noise and the following conditions:

- Sleep disturbance
- Annoyance
- Speech interruption
- Learning & educational outcomes
- Stress
- Cardiovascular disease

Examples from the Public Health Literature

- Studies show an increase in the percentage of awakenings at night at noise levels of 55 – 60 dBA (WHO 1999 & Miedema 2002)
- Subjective reports of annoyance are the most widely studied impact of noise and the relationship has been quantified (Miedema 2001)
- Chronic road noise can affect cognitive performance of children including attention span, concentration and remembering, and reading ability (London Health Commission 2003 & Stansfeld 2005)
- There is a dose-response relationship between environmental noise from traffic and high blood pressure (Van Kempen 2002, Barregard 2009, & Babisch 2006)
- Increasing traffic noise, increases the risk of myocardial infarction at noise levels above 50 – 60 dBA (Selander 2009, Babisch 2005, 2006, 2008)

FHWA & Caltrans Policy

Federal (23 CFR 772) and state policy:

- Traffic noise prediction
- Traffic noise analysis
- Analysis of noise abatement
- Informing local officials

Simplest summary: keep noise levels below 67 dBA

FHWA & Caltrans Noise Guidelines

Activity Category	Activity Leq(h) (dBA) ¹	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B ²	67	Exterior	Residential
C ²	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E ²	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	--	--	Undeveloped lands that are not permitted.
¹ The Leq(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.			
² Includes undeveloped lands permitted for this activity category.			

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World Health Organization Noise Guidelines

Environment	Health effect	Sound level (dBA)	Time (hours)
Bedrooms	Sleep disturbance	30	8
Inside dwellings	Speech intelligibility	35	16
School classrooms, indoors	Disturbance of communication	35	School hours
Outdoor living areas	Annoyance	50-55	16
Industrial, commercial and traffic areas	Hearing impairment	70	24
Music through earphones	Hearing impairment	85	1
Ceremonies and entertainment	Hearing impairment	100	4

<http://www.who.int/docstore/peh/noise/guidelines2.html>

Existing Conditions

- Community concern regarding noise
- Caltrans noise measurements
- Other sources of noise
- Existing health conditions related to noise

Community Concern Regarding Noise

Tier 2 Final Report:

“Excessive noise is a serious concern in the corridor. Noise has been shown to impact learning ability, skills development and quality of life. While not all noise can be eliminated, noise can be controlled through design and operational strategies, sound walls and retrofit of homes, schools and equipment. Noise must be controlled and we must find the means to do so.”

“Noise issues go beyond simply building more soundwalls. A comprehensive analysis of noise along the corridor must lead to a plan that recognizes the health impacts to our communities and seeks to resolve those impacts by providing appropriate relief. Future improvements must consider noise as a primary public health issue and find ways to mitigate those impacts.”

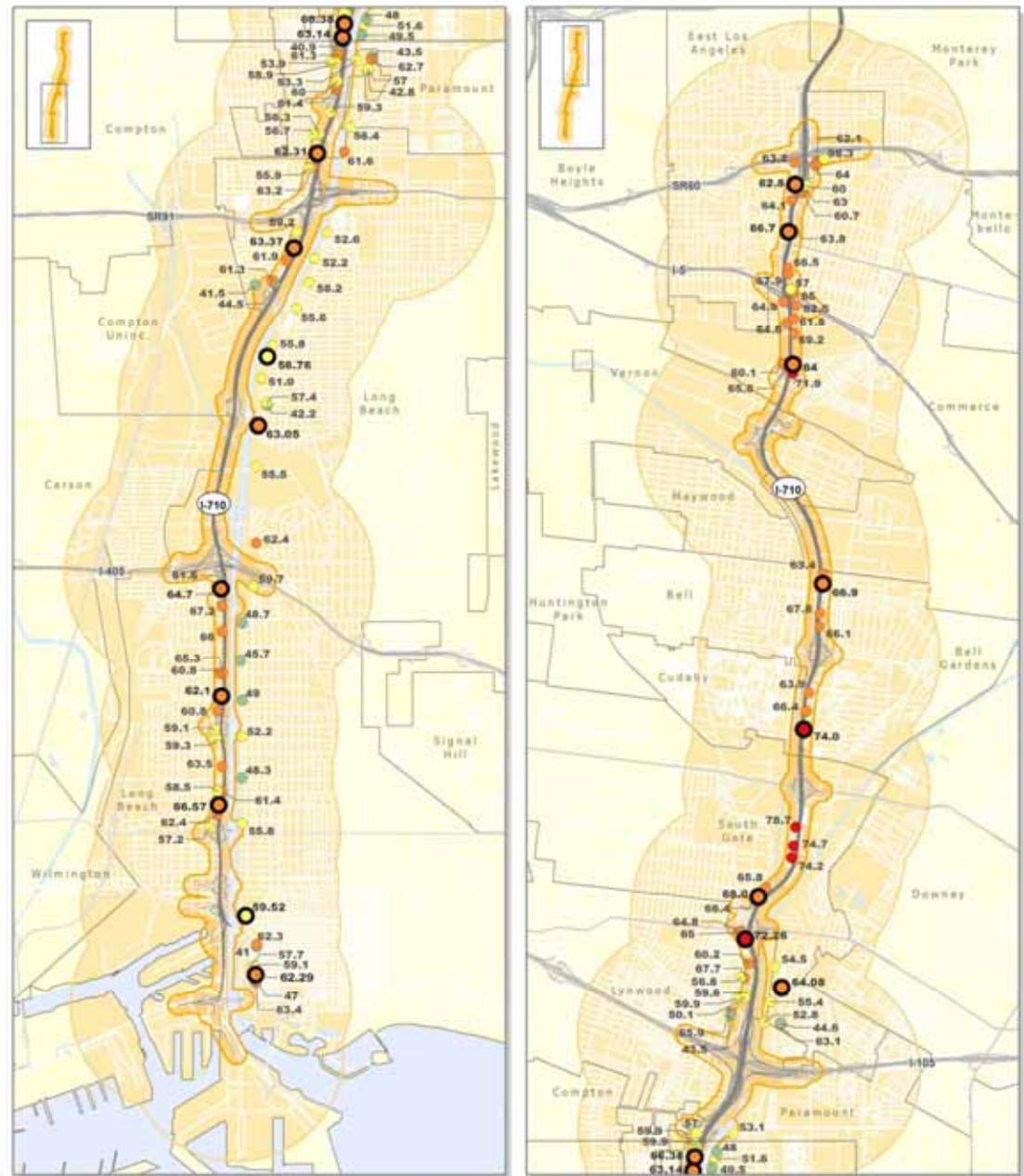
“Major infrastructure improvements must be conditioned on achieving a net decrease in noise impacts upon the affected communities.”

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Caltrans Noise Measurements

- Existing conditions

Noise Range (dBA) for single 10 min. measurement	# of Sites
40 - 50	13
50 - 60	43
60 - 70	46
70+	4



10 minute Noise Measurement Sites

Noise Level (Avg dbA)

- 40.1 - 50.0 (Green dot)
- 50.1 - 60.0 (Yellow dot)
- 60.1 - 70.0 (Orange dot)
- 70.1 - 80.0 (Red dot)

● 24-Hour Site

150 meter buffer (Orange outline)

1 mile buffer (Yellow outline)

12 HAP IMPACT PARTNERS

0 1 Mile

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Residential Areas & Noise



Other Noise Sources

Potential major sources of noise besides freeway traffic noise:

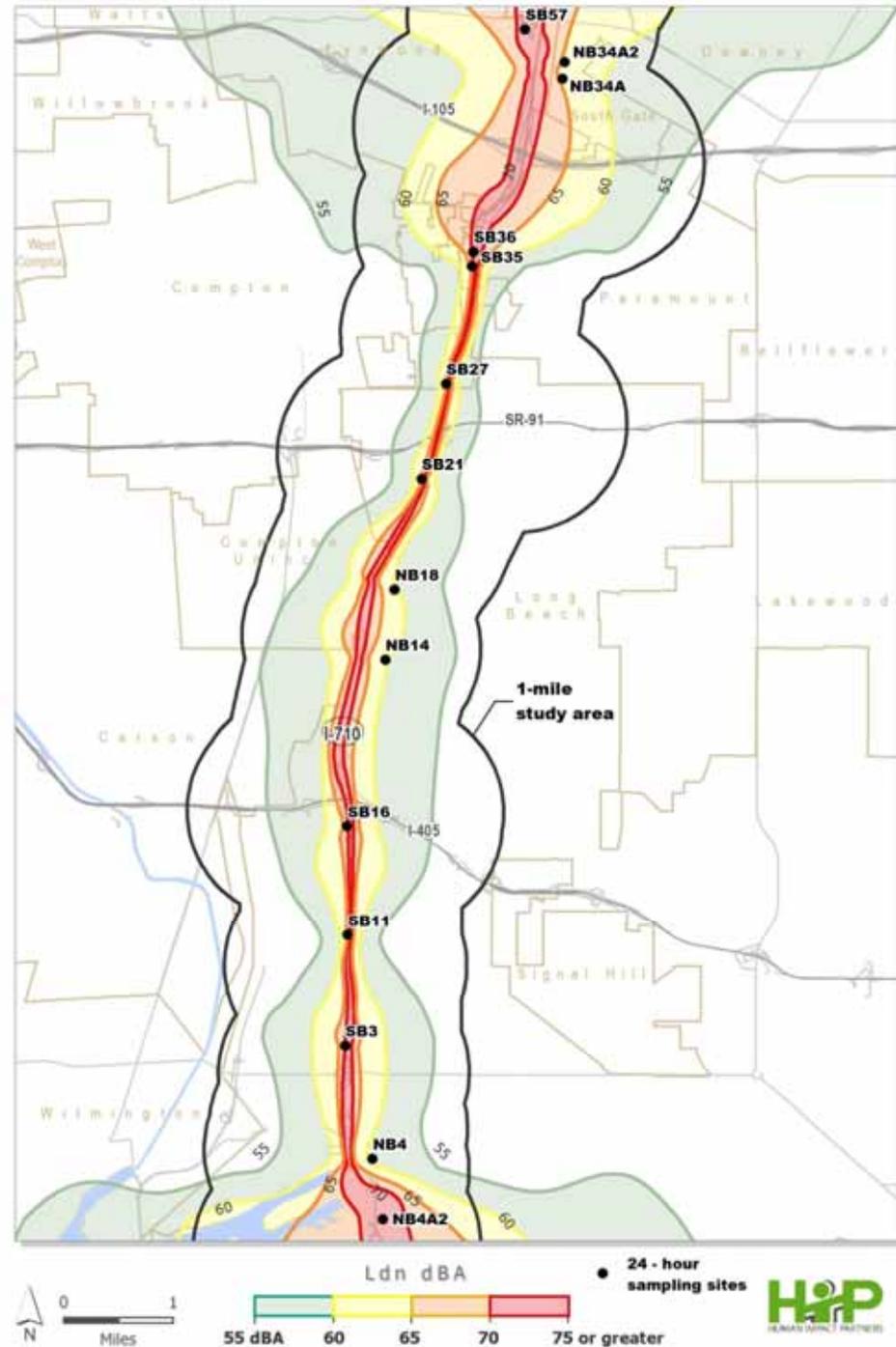
- Truck traffic on arterial streets and local roads used to move between the freeway and other destinations described in this list;
- Intermodal facilities (the ICTF and the Hobart Railyard) where containers are moved between truck and rail;
- Transloading facilities where goods are moved from one container type to another;
- The Port of Long Beach;
- Warehouses and distribution centers;
- Container storage facilities; and
- Truck repair facilities.



Current Noise Estimates (L_{dn})

- Based on 14 24-hour measurement sites that were available from Caltrans (only for southern portion of the freeway)
- Estimated based on physics (i.e., 3dB reduction with each doubling of distance from a line source)
- L_{dn} = A-weighted day-night equivalent noise level over a 24 hour period

Source: HIP



Existing Conditions Data

- Between 22,000 and 35,000 people would currently be expected to report being highly **annoyed** due to noise near the southern portion of the I-710 (calcs based on Miedema 2001)
- Between 5,000 and 7,500 people would be expected to report experiencing highly **disturbed sleep** due to noise near the southern portion of the I-710 (calcs based on Miedema 2001)
- **Cardiovascular disease** rates are not higher in the study area; because there are multiple factors that contribute to CVD and CVD may not be diagnosed consistently, we do not know how much noise is contributing to CVD in the study area
- Schools near the I-710 have fewer students who test as proficient in math and reading, potentially indicating **cognitive performance** issues. Noise measurements in schools are higher than WHO recommendations. We do not know how much noise contributes to lower proficiency in the schools because lower proficiency is caused by multiple factors.

Impact Analysis

- Noise Emissions
- Noise Exposure
- Noise-related Health Outcomes

Change in Noise Emissions (2035): Summary

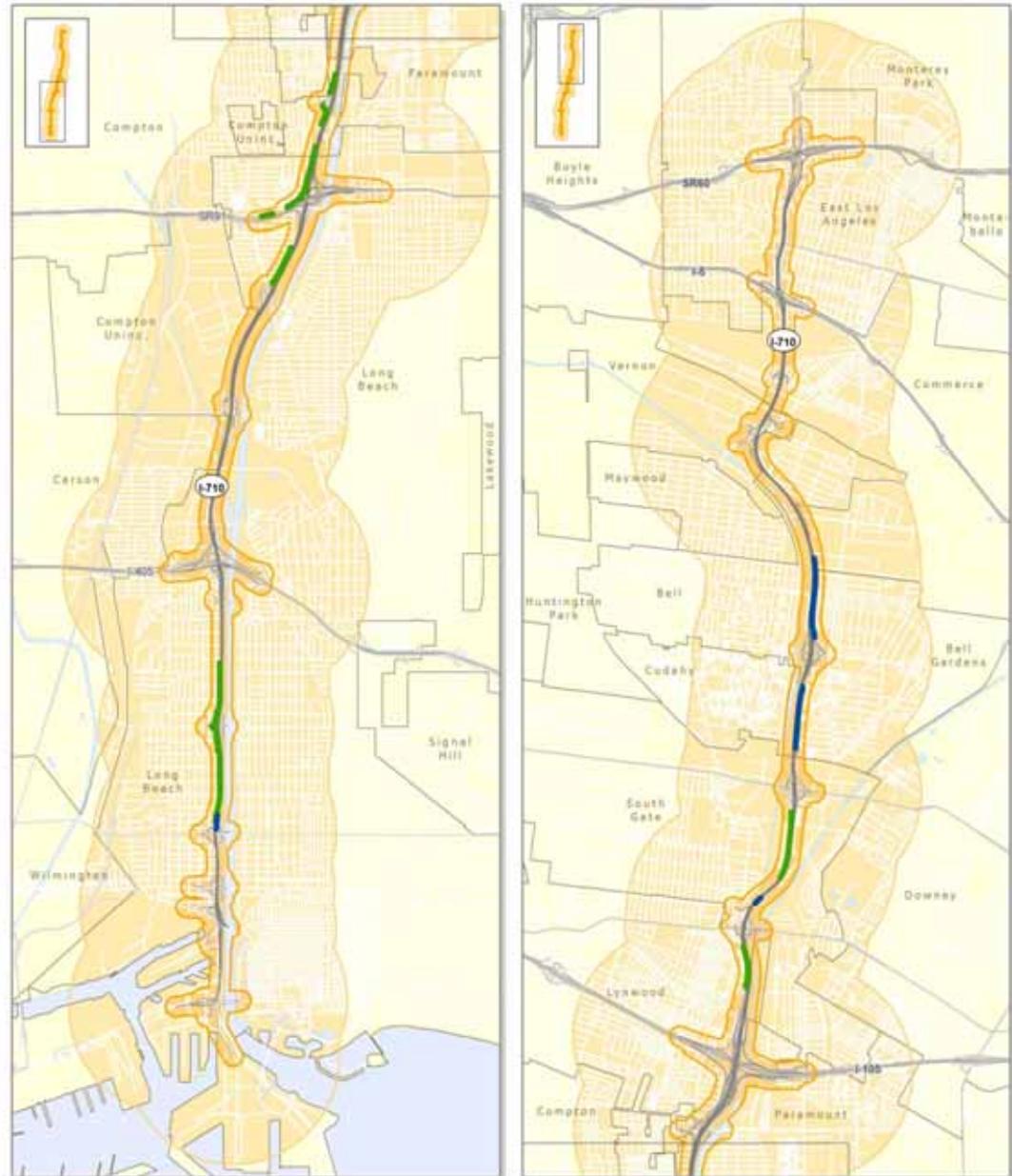
Alternative	Changes in Noise Emissions by Source Compared to 2008 levels and Relative to Each Other		
	Freeway	Arterials	Other Goods Movement Infrastructure
Alt 1	↑↑	↑↑↑	↑↑
Alt 5A	↑↑↑	↑↑	↑↑
Alt 6A	↑↑↑	↑↑	↑↑
Alt 6B	↑↑↑	↑	↑↑
Alt 6C	↑↑↑	N.D.	↑↑

Note: The number of '↑' signs indicate the relative increase in noise from each source.

*Other goods movement infrastructure refers to warehouses, intermodal facilities and similar noise-producing that may be located near sensitive receptors

Freeway Noise Exposure

- Early Action Report proposed possible soundwalls
- Caltrans has preliminarily identified possible additional soundwall locations next to all sensitive receptor sites
- Freight Corridor may be designed with soundwalls for receptors on same side of LA River; screenwall for opposite side



150 meter buffer
1 mile buffer

Proposed Soundwalls

— West — East

H&P
HEALTH AND PLANNING PARTNERS

0 1
N Mile

Freeway Noise Exposure

- No noise modeling data available yet from Caltrans
- Alternative 6:
 - High truck volumes & speeds
 - Freight Corridor further from residences on same side of LA river and closer to residences on opposite side;
 - Some areas with existing soundwalls, some with proposed soundwalls
- HIA can't predict changes in noise or compare to other alternatives (but modeling in process as part of EIR/EIS)

Impact Assessment Terms

Impact - refers to whether the alternative will improve health (+), harm health (-), or not impact health (~).

Magnitude – Reflects a qualitative judgment of the size of the anticipated change in health effect (e.g., the increase in the number of cases of disease, injury, adverse events (Negligible, Minor, Moderate Major)

Impact Assessment Terms

Severity – Reflects the nature of the effect on function and life-expectancy and its permanence
(High = intense/severe; Moderate; Low)

Strength of Causal Evidence – Refers to the strength of the research/evidence showing a causal relationship between noise and the health outcome (♦ = plausible but insufficient evidence; ♦ ♦ = likely but more evidence needed; ♦ ♦ ♦ causal relationship certain).

Causal effect means, the effect is likely to occur irrespective of the magnitude and severity

Summary of Health Outcomes (2035)

Even if noise is reduced to 67 dBA by new soundwalls, the following health outcomes are anticipated:

Health Impact/ Alternative	Impacts of Alternatives		Health Outcome		Uncertainties
	Impact	Magnitude	Severity	Strength of Causal Evidence	
Annoyance					
Alt 1	-	Estimates pending noise modeling data from Caltrans	Low	◆◆◆	Modeled changes in noise exposure were not available for this analysis; magnitude is not estimated
Alt 5A					
Alt 6A					
Alt 6B					
Alt 6C					
Sleep Disturbance					
Alt 1	-	Estimates pending noise modeling data from Caltrans	Mod-High	◆◆◆	Modeled changes in noise exposure were not available for this analysis; magnitude is not estimated
Alt 5A					
Alt 6A					
Alt 6B					
Alt 6C					
Cardiovascular Disease (including hypertension and myocardial infarction)					
Alt 1	-	Estimates pending noise modeling data from Caltrans	High	◆◆	Modeled changes in noise exposure were not available for this analysis; magnitude is not estimated
Alt 5A					
Alt 6A					
Alt 6B					
Alt 6C					
Cognitive Impairment and Academic Achievement					
Alt 1	-	Estimates pending noise modeling data from Caltrans	Mod-High	◆◆◆	Modeled changes in noise exposure were not available for this analysis; magnitude is not estimated
Alt 5A					
Alt 6A					
Alt 6B					
Alt 6C					
Hearing Impairment					
Alt 1	~	None	Mod	◆◆◆	
Alt 5A		None			
Alt 6A		None			
Alt 6B		None			
Alt 6C		None			
Explanations:					
<ul style="list-style-type: none"> ○ <i>Impact</i> refers to whether the alternative will improve health (+), harm health (-), or not impact health (~). ○ <i>Magnitude</i> reflects a qualitative judgment of the size of the anticipated change in health effect (e.g., the increase in the number of cases of disease, injury, adverse events): Negligible, Minor, Moderate, Major. ○ <i>Severity</i> reflects the nature of the effect on function and life-expectancy and its permanence: High = intense/severe; Mod = Moderate; Low = not intense or severe. ○ <i>Strength of Causal Evidence</i> refers to the strength of the research/evidence showing causal relationship between noise and the health outcome: ◆ = plausible but insufficient evidence; ◆◆ = likely but more evidence needed; ◆◆◆ = causal relationship certain. A causal effect means that the effect is likely to occur, irrespective of the magnitude and severity. 					

Source: HIP

HIP Preliminary Recommendations

- Noise analysis
- Goods movement, transportation, and land use planning
- Noise mitigations through design
- Funding, enforcing and strengthening noise-related regulations
- Post build-out monitoring and mitigations

Note:

- ✧ Recommendations marked by this kind of bullet would have co-benefits for other health outcomes related to air quality, physical activity, traffic safety, etc.

HIP Preliminary Recommendations 1

- Noise analysis
 - Complete the noise modeling for the I-710 alternatives and use the results to quantitatively predict changes in annoyance and sleep disturbance and qualitatively assess changes in other health outcomes under the proposed alternatives.
 - In the final noise report, describe existing and future noise levels using multiple measures including separating daytime and nighttime noise.

HIP Preliminary Recommendations 2

- Goods movement, transportation, and land use planning
 - ✧ All strategies for moving freight by other means, such as increasing on- and near-dock state-of-the-art rail, should be implemented.
 - ✧ Planning departments should ensure that all local land use planning improves the separation of residential and other sensitive uses from the goods movement infrastructure. This is the best long term solution to noise issues in the community, but it will be most difficult to implement. For example:
 - Develop truck parking facilities and truck stops with services (e.g., restaurants, repair shops) near the freeway so that drivers do not need to drive further into the communities and near sensitive uses.
 - Pass city ordinances restricting potential land uses to reduce conflict between sensitive receptors and noise-producing facilities.

HIP Preliminary Recommendations 3

- Goods movement, transportation, and land use planning
 - ✧ Use the Conditional Use Permit process to require goods movement related facilities to:
 - Post signage informing drivers of idling regulations and truck routes;
 - Require new facilities to locate loading docks and driveways as far away as possible from sensitive receptors; and
 - Use cargo handling equipment with noise mitigation technology.
 - ✧ Starting with existing residential streets that are walkable/bikeable, expand the network of walkable/bikeable streets in low-noise areas throughout the I-710 corridor to provide quiet and pleasant streets that can be used for active transportation and for physical activity.

HIP Preliminary Recommendations 4

- Noise mitigations through design
 - Construct sound walls in all locations in the corridor that are adjacent to a residential area, school, or park. For these soundwalls, use greening and aesthetic principles found in the project's Urban Design and Aesthetics Toolbox Report.
 - Use low-noise (e.g., rubberized) road surfaces, evaluating alternative materials with regards to their effects on air quality.
 - ✧ Consider using variable tolling (e.g., congestion pricing) and/or changes to port gate hours to reduce variation of noise and peak noise periods.
 - Create and fund a program that provides private property owners funding and technical assistance to augment acoustical insulation in private residences.

HIP Preliminary Recommendations 5

- Funding, enforcing and strengthening noise-related regulations
 - ✧ If Alternative 6C is adopted, use revenue from tolling to fund mitigations to noise impacts. Funds could be used, for example, for enforcement of truck routes, parking, idling regulations, and speed limits; installation of truck noise reduction technology; sound insulation at schools; and vegetative buffers between freeways and parks.
 - ✧ For any alternative selected, fully fund and if necessary strengthen enforcement of truck route and parking regulations as well as idling regulations.
 - Enforce and, if needed, strengthen regulations regarding truck noise (e.g., engine brake laws) and consider funding truck noise reduction programs.
 - ✧ Enforce speed limits, considering photo-enforcement as a cost effective means to limit noise.

HIP Preliminary Recommendations 6

- Post build-out monitoring and mitigations
 - After the project is completed, regularly monitor noise levels at schools, community centers, libraries, and senior facilities and commit to retrofit these facilities (e.g., providing upgrades to windows and ventilation systems) to keep indoor noise below levels considered harmful by the World Health Organization standards.
 - After the project is completed, regularly monitor indoor noise levels in residences (daytime and nighttime) in close proximity to the freeway and near goods movement infrastructure (e.g., train yards and warehouses) and retrofit them to noise insulate either the residences (through windows and ventilation) or, if possible, noise producing equipment in goods movement facilities.