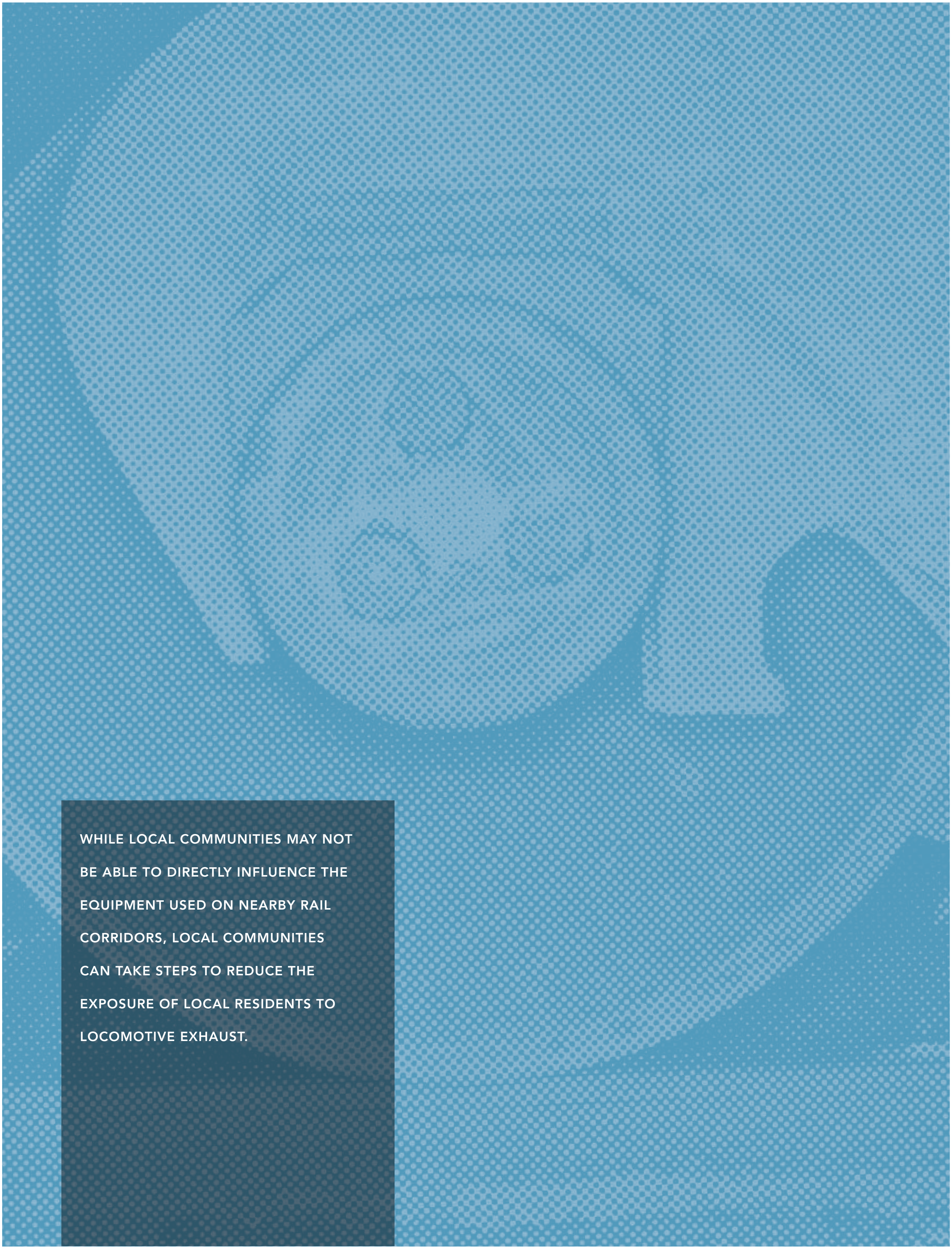


WHILE LOCAL COMMUNITIES MAY NOT BE ABLE TO DIRECTLY INFLUENCE THE EQUIPMENT USED ON NEARBY RAIL CORRIDORS, LOCAL COMMUNITIES CAN TAKE STEPS TO REDUCE THE EXPOSURE OF LOCAL RESIDENTS TO LOCOMOTIVE EXHAUST.

CHAPTER FOUR

rail lines

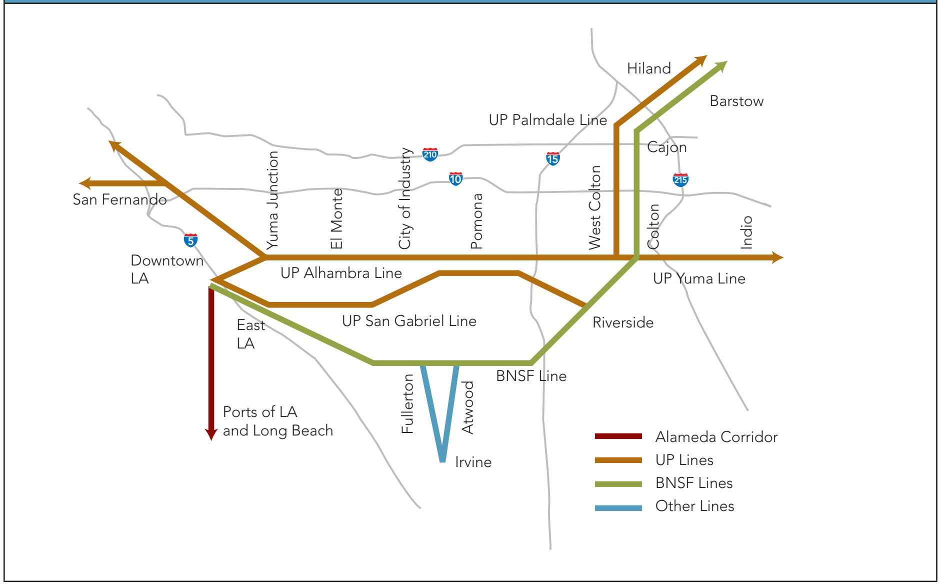
photo by Bruce Montgomery

THE BURLINGTON NORTHERN SANTA FE Railway (BNSF) and the Union Pacific Railroad (UP) own and operate most rail lines in the six-county region. Pacific Harbor Lines is a short-line railroad, moving cars and equipment in and between the SPB ports and intermodal railyards. There are three main locomotive types operating in this region: 1) line-haul freight locomotives, 2) yard or switching locomotives, and 3) passenger locomotives. Line-haul and switching locomotives are involved in goods movement and account for the majority of the region's rail line environmental impacts.

UP and BNSF own five main rail alignments in the area and the majority of rail freight moves along these main lines. BNSF's main line is the San Bernardino Subdivision between Barstow and downtown Los Angeles. The line is comprised of over 64 miles of tracks. UP's main lines are the Los Angeles Subdivision and the Alhambra Subdivision. These two alignments include 119 miles of track. UP currently handles over 50 freight trains per day and BNSF handles over 100 along their most heavily used rail line segments.[28]

Of special note is the Alameda Corridor (Corridor), a 20-mile freight rail expressway running between the SPB ports and the transcontinental railyards near downtown Los Angeles. The Corridor primarily transports imports and exports that move to and from the SPB ports to outside

FIGURE 4-1 UP AND BNSF REGIONAL RAIL SYSTEM (NOT TO SCALE)



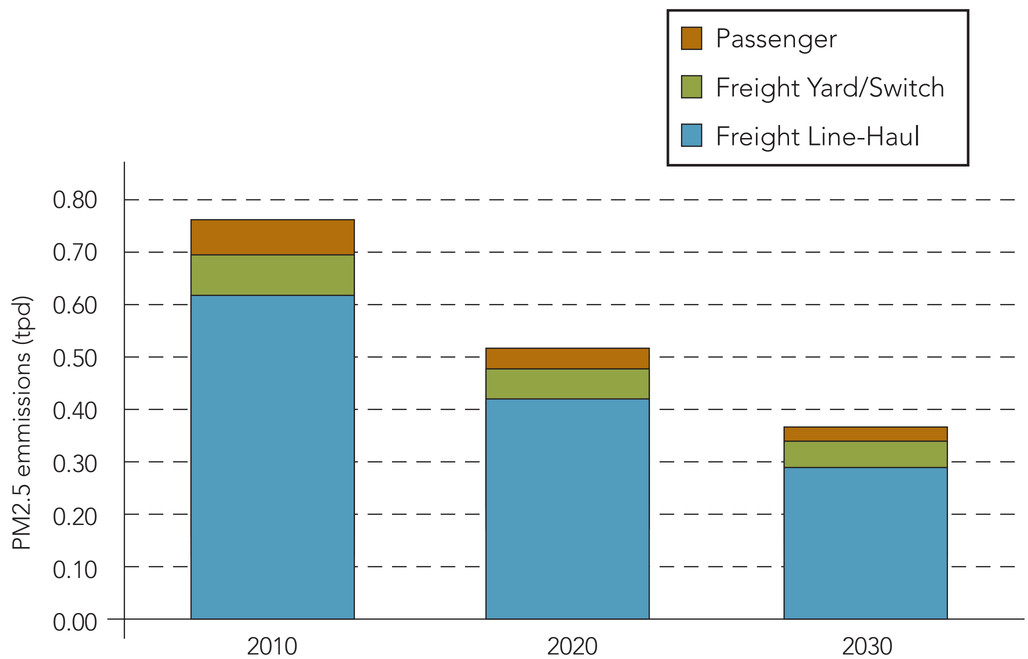
regions. Half of the Corridor is the Mid-Corridor-Trench, a ten-mile, below-ground railway that eliminated many at-grade railroad crossings. The Corridor currently handles an average of 55 train movements per day but is built to handle up to 150.[29]

AIR QUALITY

Air Quality Impacts

Railroad locomotives currently contribute 5-7% of total goods movement emissions in the region.[30] As a result of the new EPA standards, locomotive PM emissions will decline by 2020. More than 80% of railroad PM emissions come from line-haul freight locomotives. Railroad locomotives will produce 0.76 tons of PM emissions (PM2.5) per day in 2010, as shown in Figure 4-2.

FIGURE 4-2 BASELINE RAILROAD PM2.5 EMISSIONS IN SOUTH COAST AIR BASIN



Source: ARB, adjusted to reflect new EPA locomotive emission standards adopted March 14, 2008.

Like truck emissions, locomotive emissions are concentrated in corridors and at intermodal stations or railyards. The levels of emissions vary depending on the number of trains per day, the number of locomotives per train, and the types of locomotives. The busiest segments produce a significant amount of PM emissions per day. The magnitude of rail line emissions is generally much smaller than highway truck emissions. For example, the busiest truck corridor (I-710) produces ten times more emissions per mile than the busiest rail corridor. Table 4-1 on the following page shows the primary freight rail segments in the region with their corresponding daily train volume and PM2.5 emissions per mile.

Railroad emissions are greater where there is a large amount of train travel, such as in the Inland Empire (Riverside and San Bernardino Counties). In comparison, truck traffic and truck emissions are greatest in Los Angeles County. The health impacts of highway or rail segment emissions are greater in areas where population is dense.

THE BUSIEST TRUCK CORRIDOR (I-710) PRODUCES TEN TIMES MORE EMISSIONS THAN THE BUSIEST RAIL CORRIDOR.

TABLE 4-1 TRAIN VOLUME AND EMISSIONS, 2006

Rail Segment	Average Train Volume (trains/day)		
	Freight	Passenger	PM2.5 Emissions per Mile (grams / day)
BNSF Railway			
Barstow—San Bernardino	108	4	1,828
San Bernardino—Colton Crossing	100	19	1,782
Colton Crossing—West Riverside	116	19	1,980
West Riverside—Atwood	72	30	1,310
Atwood—Fullerton	64	14	1,110
Fullerton Jct.—Hobart	64	64	1,376
Hobart—Redondo	38	64	985

continued

Air Quality Improvement

Strategies to improve air quality include:

- Gen-set locomotives or hybrid locomotives
- Building filtration systems
- Restrictions on siting

Rail line emissions can be reduced by replacing older locomotives with newer, cleaner engines, or retrofitting the locomotive. The two major railroads in Southern California (UP and BNSF) currently operate locomotives that meet EPA emission standards. More stringent standards will begin to take effect in the next several years. In the future, railroads can further reduce their emissions by replacing their locomotives or by rebuilding existing engines.

Gen-set locomotives or hybrid locomotives save fuel and produce fewer emissions on short-haul railroad trips. Many of these locomotives are already in use

TABLE 4-1 TRAIN VOLUME AND EMISSIONS, 2006 *(continued)*			
	Average Train Volume (trains/day)		
Rail Segment	*Freight*	*Passenger*	*PM2.5 Emissions per Mile (grams / day)*
Union Pacific Railway			
Indio—Garnet	51	2	793
Garnet—Colton Crossing	51	2	793
Colton Crossing—West Colton	35	2	596
West Colton—City of Industry (Alhambra Line)	29	2	488
City of Industry—Yuma Jct.	27	2	450
Yuma Jct.—Pasadena Jct.	19	0	305
Pasadena Jct.—Ninth Street	24	12	448
West Riverside—Mira Loma	43	12	775
Mira Loma—East Los Angeles (San Gabriel Line)	39	12	748
East Los Angeles—Ninth Street	26	12	525
Yuma Jct—Santa Clarita	4	25	190
Alameda Corridor			
San Pedro Bay Ports—Downtown LA	55	0	902

Note: Emissions estimates reflect rail lines only and do not include railyard emissions (discussed in Section 5).
Source: Train volumes based on Leachman, R., Hicks, G., Fetty, G., Rieger, M. (2005): Inland Empire Railroad Mainline Study—Final Report; emissions calculated by ICF.

in the region.

While local communities may not be able to directly influence the equipment used on nearby rail corridors, local communities can take steps to reduce the exposure of local residents to locomotive exhaust. These strategies include building filtration systems and restrictions on siting new community services (e.g., schools, daycare centers) near the corridor.

NOISE

Noise Impacts

Locomotive and freight car pass-bys, train horns and whistles, and wheel friction on tight curves are the main rail line noise sources. Noise impacts vary depending on the number and types of locomotives, the weight of freight cars, and how the track is constructed. The level of train noise depends upon the distance from the track, the elevations of noise sources, and the duration of a train pass-by. The FTA and FRA have developed models and methods to estimate passenger train noise impacts.[31, 32] The same tools can be applied to freight train noise impacts.

Noise exposures from trains are often calculated as one-hour or twenty-four-hour averages. Train noise exposure is influenced by several factors, including the lengths of the locomotive(s) and freight cars, the train speed, the condition of the track, and time-of-day. Figure 4-3 shows the average exposures for a typical train configuration for various numbers of trains per day.

Many cities and counties have noise exposure standards. The FTA's noise impact criteria are an example of how the significance of noise impacts may be defined.

The FTA defines three categories for land uses that are sensitive to noise impacts, or "sensitive receptors."[33] Categories 1 and 2 include land uses for which quiet is an essential element (e.g., recording studios, outdoor amphitheaters, and residences). Noise impact criteria are most restrictive for Category 1 and 2 land uses. The FTA criteria are stated in two alternative forms.

The first applies when surrounding noise levels are below 43 dBA L_{eq} The second form is a set of total, or absolute, noise levels. The absolute noise criteria are shown in Table 4-3.

FIGURE 4-3 TYPICAL FREIGHT TRAIN NOISE EXPOSURES

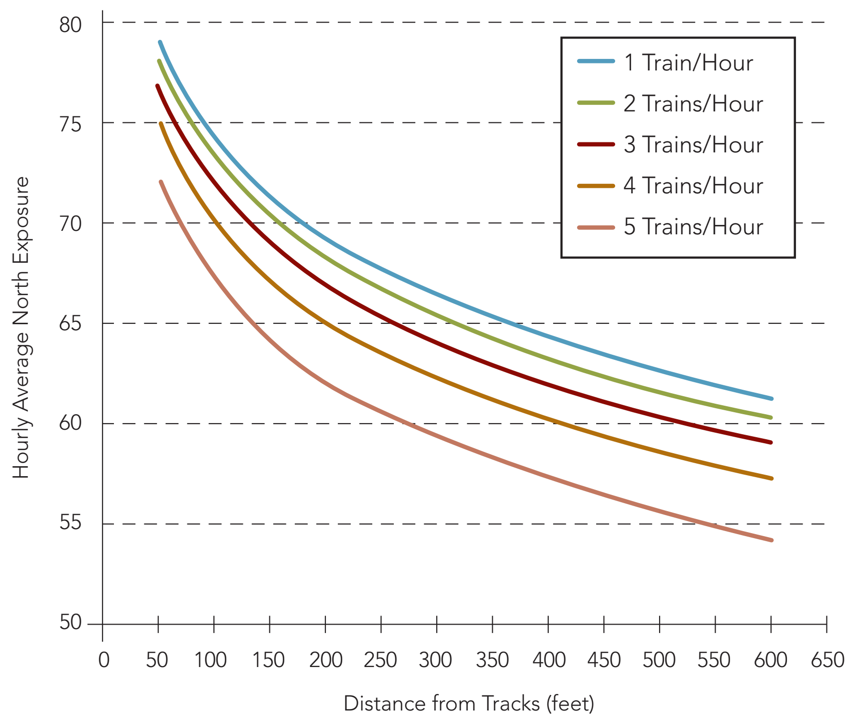


TABLE 4-3 FTA NOISE IMPACT CRITERIA

Existing Noise Exposure (dBA)	*Allowable Project Exposure (dBA)*
45	51
50	53
55	55
60	57
65	60
70	64
75	65

Source: FTA. 2006. Transit Noise and Vibration Impact Assessment. Office of Planning and Environment. FTA-VA-90-1003-06. May.

Noise Impact Improvement

Several strategies reduce noise impacts from freight trains and include:

- Land use planning to avoid incompatible uses
- **Soundproofing** of affected dwellings
- Installation of **noise barriers**
- **Quiet zone** infrastructure improvements
- Operational changes to reduce train horn noise

Noise shielding at specific locations is a common strategy. Installation of noise barriers along affected properties and/or soundproofing of affected structures can reduce noise impacts. Providing noise shielding along the railroad right-of-way may be effective in some cases if the barrier is located close to the rail line. In general, a noise barrier is typically not effective unless located close to the source or to the affected party.

Infrastructure improvements along rail lines can reduce the need to sound train horns, thus reducing noise impacts to communities near a railroad crossing. Infrastructure improvements include a quiet zone (with certain safety measures installed), grade-separation, or dead-end streets. However, these infrastructure improvements may be costly and are the responsibility of local governments not the railroads. Local communities can reduce noise exposure from trains through land use planning and policies. Such strategies and policies move residents away from train traffic, reduce noise exposure, or discourage new development near rail lines.

CASE STUDY
CITY OF COLTON

Located at the crossing of two main lines and near two major railyards, the City of Colton community experiences frequent noise from locomotive horns. The Community Feedback Group identified soundproofing of homes and quiet zone infrastructure as possible improvements for consideration.

TRAFFIC AND SAFETY

Traffic and Safety Impacts

Rail lines can affect local and regional traffic in several ways. Rail lines can have significant local traffic impacts at railroad crossings. The interrupted flow of traffic at railroad crossings can cause heavy local congestion, with local residents experiencing lost productivity and increased fuel costs.

Congestion levels at intersections are expressed in terms of Level of Service (LOS), a letter grading system ranging from A (best) to F (worst).[34] Grades are assigned based on the average delay per vehicle (in seconds per vehicle).

Intersections with LOS A operate with little delay, while intersections with LOS F experience heavy congestion. This grading system is presented in Table 4-4.

TABLE 4-4 LEVEL OF SERVICE DEFINITIONS AT GRADE CROSSINGS

Level of Service	*Average Delay per Vehicle (seconds/vehicle)*
A	< 5
B	5—10
C	10—20
D	20—30
E	30—45
F	> 45

Source: Transportation Research Board. 2000. Highway Capacity Manual, 4th ed. National Research Council. Washington, DC.

Vehicle delay is greater at busy rail crossings, and depends on both the amount of vehicle traffic and rail traffic (see Table 4-5).[35] Other factors that influence delay include the train length and the number of roadway lanes. At-grade railroad crossings with relatively low vehicle traffic volumes and few train trips operate at LOS C or better. In locations with moderate or frequent train movements, rail crossings operate at or below LOS E.

Traffic and Safety Improvement

Rail crossing traffic and safety issues can be reduced by:

- Redirecting traffic from at-grade crossings
- Separating the rail crossing from cars (grade-separated)
- Providing pedestrian over- or under-crossings

Local communities can calm traffic with methods that **redirect traffic** to grade-separated crossings, which are not delayed by trains. Communities can improve safety at rail crossings by installing or **upgrading traffic control systems**. These systems alert cars of approaching trains and restrict car and pedestrian movement across rail lines. These systems also redirect traffic by timing nearby stoplights.

CASE STUDY

CITY OF COLTON

The South Colton community has a rail spur that runs in the middle of a city street with multiple crossings across a short distance. To address safety and traffic congestion impacts, the Community Feedback Group identified the need to study redesigning local traffic circulation and improved crossing infrastructure.

Vehicle-train conflicts can be eliminated with **grade-separation** infrastructure. Grade-separation involves construction of a roadway bridge over railroad tracks or an underpass. More than 40 grade separation projects have been proposed for the UP and BNSF lines in the region. These infrastructure projects are costly. The Trade Corridor Improvement Fund estimates most planned grade separations to cost between $30 and $90 million, with one project costing as much as $189 million.[36] Similarly, safety at crossings with heavy pedestrian traffic may be improved with over- or under-crossings for pedestrians either as part of roadway bridges or under-passes or as stand-alone facilities.

AESTHETICS

Aesthetic Impacts

Aside from rail yards, most of the aesthetic impacts of rail lines are caused by the intensity of use, type of equipment and maintenance and upkeep of tracks and wayside properties. The height of train cars can also contribute to visual impacts—freight trains with double-stacked container cars can reach a height of up to 20 feet, which can reduce views of scenic vistas.

TABLE 4-5 DELAY AND LEVEL OF SERVICE AT RAIL CROSSINGS

Vehicle Traffic	*Rail Traffic*					
	Low 25 trains / day		*Moderate 50 trains / day*		*High 100 trains / day*	
	Delay hrs/day	*LOS*	*Delay hrs/day*	*LOS*	*Delay hrs/day*	*LOS*
Low: 10,000 vehicles / day	0.11	C	0.46	D	1.46	F
Moderate: 25,000 vehicles / day	0.32	C	1.30	E	4.15	F
High: 40,000 vehicles / day	0.60	D	2.41	F	7.70	F

Source: ICF International 2008. Analysis of Goods Movement Emission Reduction Strategies, Task 1 Final Report. Prepared for Southern California Association of Governments. January.

Aesthetic Impact Improvement

Many of the strategies to reduce visual impacts are similar to those for truck routes, including:

- Setbacks
- Barrier walls
- Selective landscaping

Localities can also work with railroads to either negotiate improved maintenance (such as trash removal) or a local jurisdiction can choose to take on maintenance and upkeep. Unlike truck routes, rail lines are typically unlit, except at railroad crossings and railyards (discussed in Chapter 5). Barrier walls can attract graffiti, but this can possibly be reduced or prevented when combined with landscaping or other features. There is typically no need to address spillover light or glare at rail lines.