Lot Development and Site Design

INTRODUCTION

In many instances poor lot orientation is a primary contributor to noise and vibration and other land use conflicts between freight and other uses. While we would not advocate situating multi-family residential, educational, medical, or other institutional type facilities such as schools, daycare facilities, and elderly residential facilities adjacent to freight facilities, there are options that could be implemented to offset some of the land use conflicts that arise Between freight and other uses.

Very little information is apparently available to guide a developer on how to orient residential, education, medical, and other uses adjacent to freight facilities. However, there are guidelines for considering health and safety issues in the siting of HUD-assisted projects. The Department of Housing and Urban Development is required under Section 2 of the Housing Act of 1949 (42 USC 1441) to assure that all HUD-assisted projects are located in a safe and healthful environment. As a part of this, precise procedures were developed for collecting data on sites and exposing hazard calculations for developing appropriate separation distances (and mitigation options if required). In 1984 a guidebook was issued regarding procedures required under 42 USC.[1] In 1987 HUD issued an additional guidebook[2] regarding siting of HUD-assisted projects near industrial or commercial operations handling explosive or flammable materials.[3]

There is also guidance regarding noise and vibration that has been developed over the past twenty five years by the Federal Aviation Administration (FAA), Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), and Federal Transit Administration (FTA) on sound and vibration issues and how to mitigate for these effects. However, none of these agencies have developed specific guidelines or design manuals for planners and developers to use.

DEVELOPMENTS NEAR EXISTING CORRIDORS

There are simple options that can be utilized to assist in mitigating conflicts between land use and reducing the opportunities for conflicts to arise. As an example, shifting units within the lot so that they are not placed in such proximity to the freight activity could be a first critical step to avoid or eliminate conflict. The next series of pictograms and pictures highlight how planning, lot design, and the use of buffers and easements—both natural and through re-orientation of a

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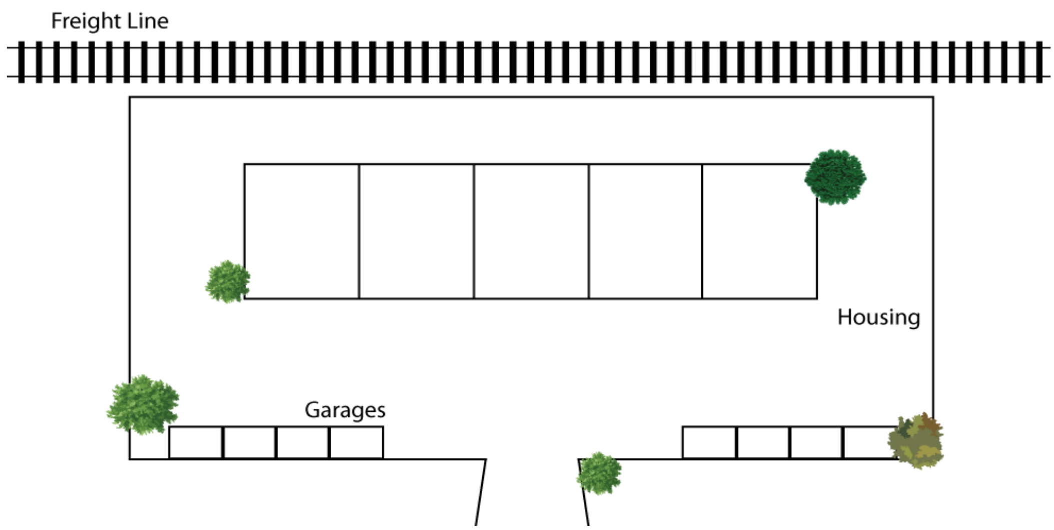
[1] United States Department of Housing and Urban Development: Office of Community Planning and Development Urban Development Siting with Respect to Hazardous Commercial Facilities. Prepared by Rolf Jensen & Associates Inc. April 2, 1982.
[2] United States Department of Housing and Urban Development: Office of Community Planning and Development. and Office of Environment and Energy. Siting of HUD-Assisted Projects Near Hazardous Facilities: Acceptable Separation Distances from Explosive and Flammable Hazards. April 1987.
[3] Because these guidebooks were specifically tailored for HUD-assisted projects, it may be that planners and developers may have not seen this guidance as they have not worked on projects that implemented HUD-assisted projects, or other low income or other subsidized housing which will often utilize HUD standards and procedures.

development or lot layout—can help to mitigate for the noise, vibration, air quality, and other issues that may arise.

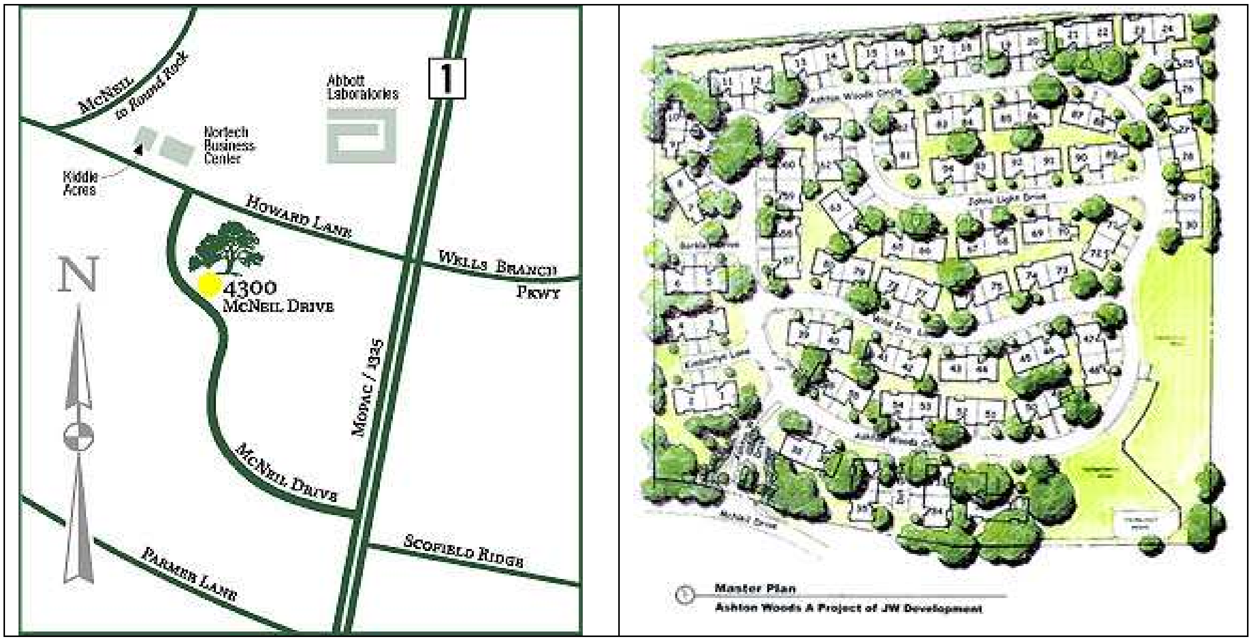
Often the placement of residential uses on a lot will lead to residential/freight activity conflicts. Figure 1 shows a poor lot orientation adjacent to a freight line that could subject the residents to noise, vibration and possibly pollutant effects because of the close proximity of the residences to the freight facility.

FIGURE 1: POOR LOT ORIENTATION



There are numerous examples of such developments that subject residents to adverse effects from nearby freight facilities. Often the development will not show the freight route on promotional property materials. Ashton Woods in Austin, TX is an example. Figure 2 shows this property's location and community plan, but there is no mention of the adjacent rail line.

FIGURE 2: PROMOTIONAL MATERIALS FOR ASHTON WOODS, AUSTIN TX



Source: http://www.ashtonwoodsaustin.com/communityplan.html

Figure 3 from Google Earth shows the reality on the ground, with the rail line running feet from these houses. This rail line is shared by freight, Austin's commuter rail line (Capital Metro), and the transit rail maintenance facility. Complaints have already been received by Capital Metro from residents regarding noise.[4] As a result Capital Metro's Manager of Transit Oriented Development has instituted a new policy to ensure that adequate notification between city, developers, buyers, and Capital Metro takes place. A new process for city applications for site plan approval, zoning variances, or other city development office applications concerning property within 500 feet of the rail right or way was implemented in May 2010.[5]

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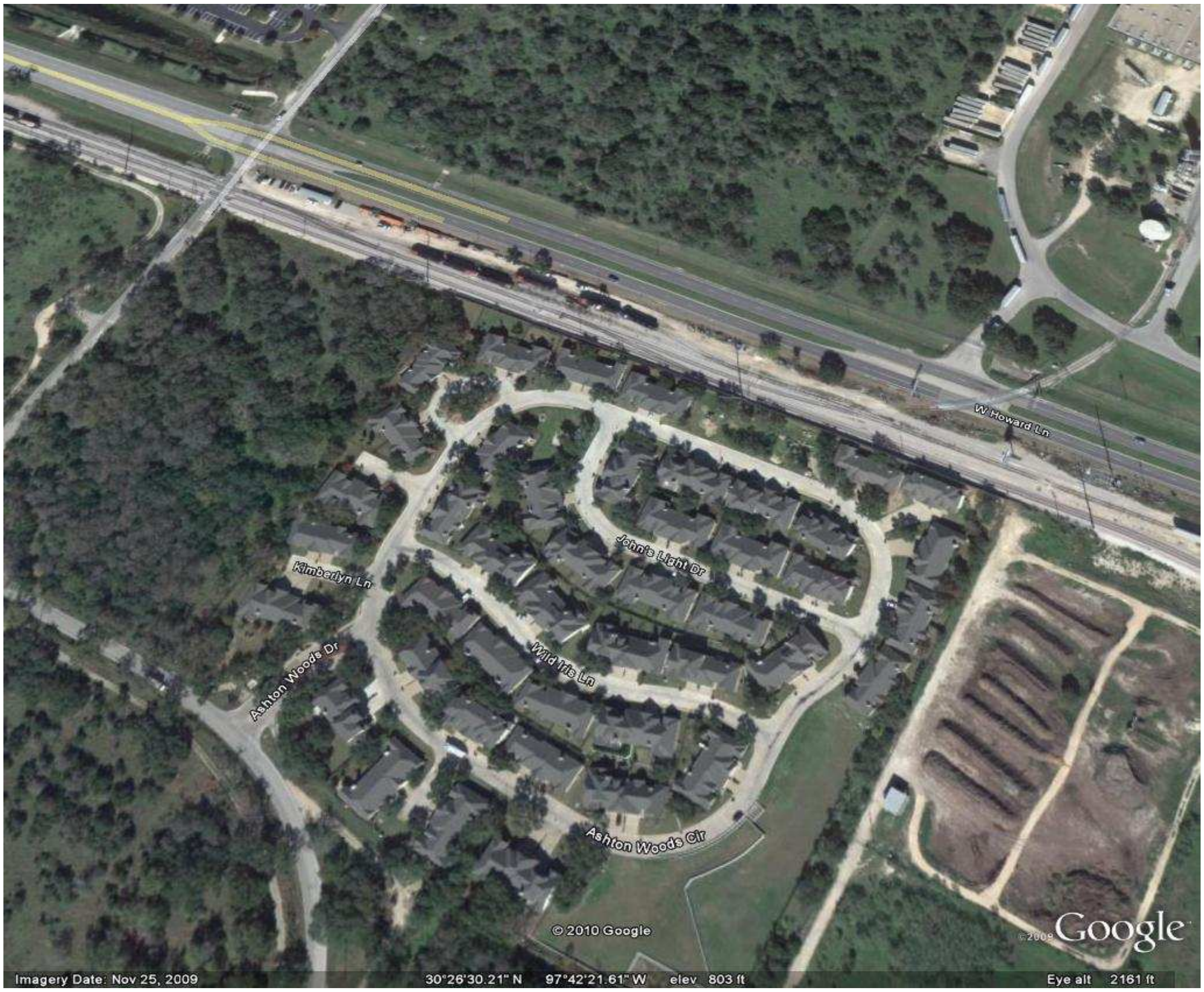
[4] Personal communication with Lucy Galbraith, Manager Transit Oriented Development, Capitol Metro, Austin, TX. May 27, 2010.
[5] This will be discussed in the fact sheet regarding notification and indemnification procedures.

FIGURE 3: POOR LOT ORIENTATION: ASHTON WOODS, AUSTIN TX



The audible landscape (i.e., consideration of noise impacts) in relation to subdivision-type projects is particularly critical and lot orientation can lead to adverse noise impacts on residences. Figure 4 shows how the Ashton Woods project gives little consideration for buffering close to the rail and highway adjacent to the project. Figure 5 shows how landscaping, a buffer zone, and cluster zoning could improve the audible landscape for this development without compromising the number of units that could be built.

FIGURE 4: ACTUAL AUDIBLE LANDSCAPE: ASHTON WOODS, AUSTIN TX

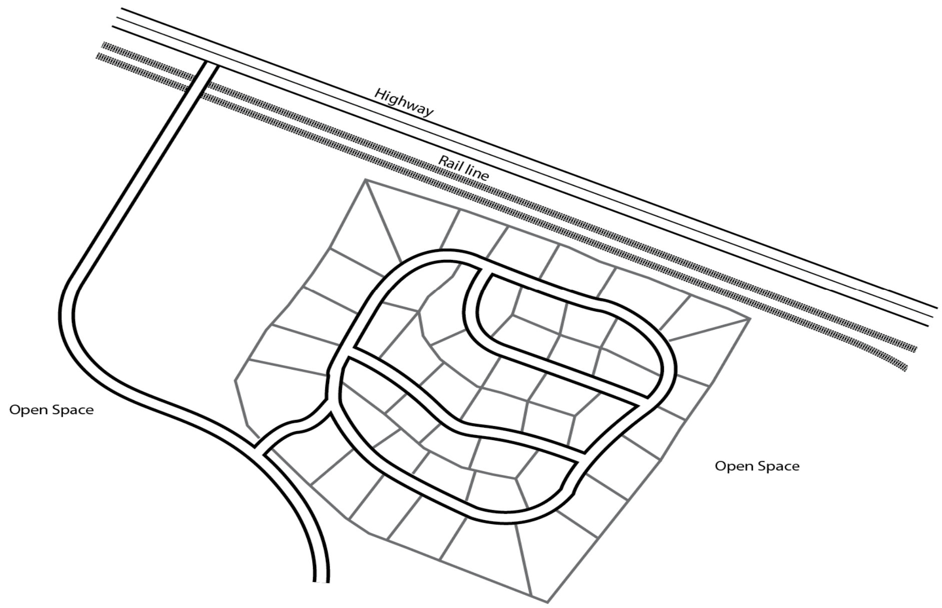
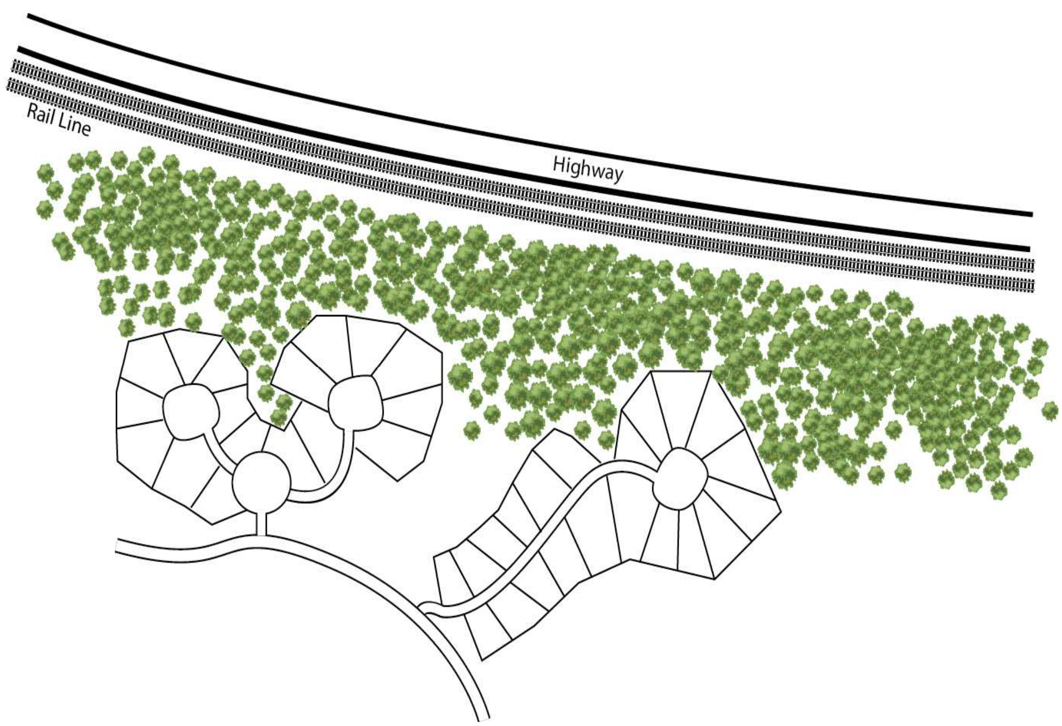
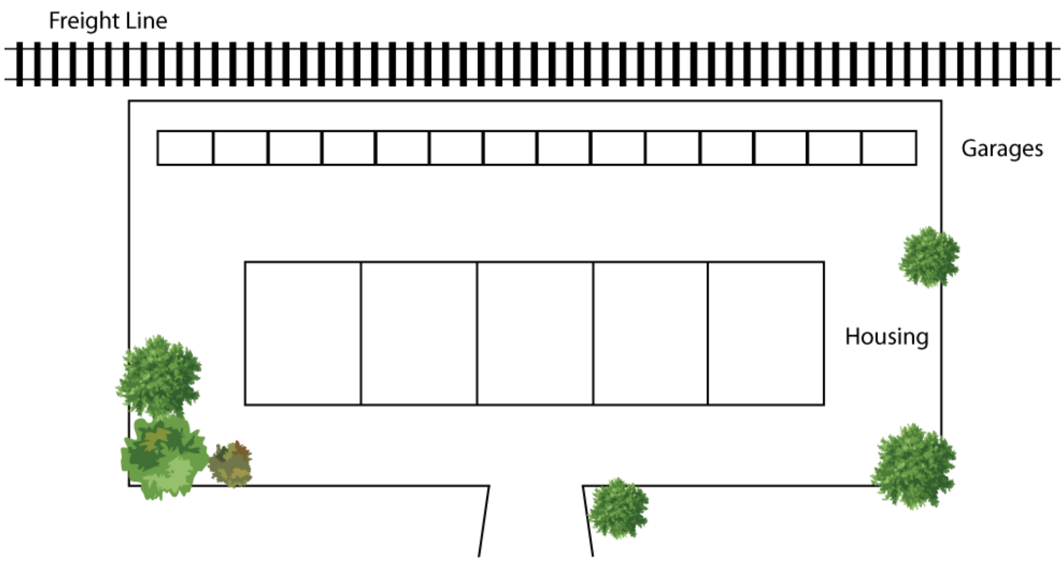


FIGURE 5: CONCEPT OF IMPROVED AUDIBLE LANDSCAPE



Another way of improving the audible landscape is by placing a row of garages in-between the freight route/facility and the residences. A pictorial of how this might look can be seen in Figure 6.

FIGURE 6: IMPROVED LOT ORIENTATION



The optimal solution for mitigating or avoiding conflicts in this type of development would require not only garages to be placed to provide a buffer for the noise and vibration, but also the placement of vegetation that could absorb some of the pollutant effect. This would ideally be placed in a non-access easement on the freight facility side of the lot. This can be seen in Figure 7.

FIGURE 7: OPTIMAL LOT ORIENTATION

RESIDENTIAL UNIT LAYOUT

When odd lot sizes and lot remnants are developed for residential use, there are often few options for siting of the units, and poor design of the residential units contributes to conflicts between households and freight facilities. Again little guidance could be found to discuss how to re-design a property layout so that vibration and noise could be reduced. For example, in Figure 8 the master bedroom and living areas of these townhomes face out to the rail track. Figure 9 has similar deficiencies with bedroom windows facing onto the railroad.

Deficient design: master bedroom and living areas facing onto freight track

FIGURE 8: POOR LOT ORIENTATION AND LAYOUT

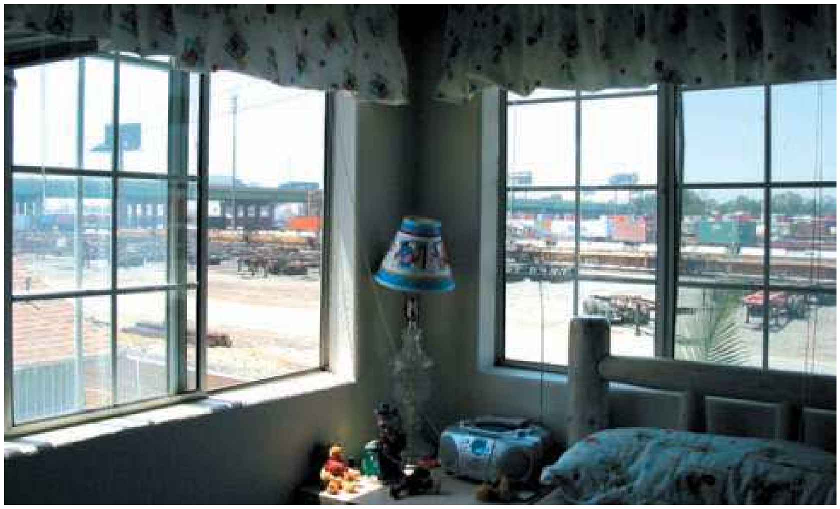
Source: Carolyn Cook, Federal Railroad Administration

Example of market pressure leading to development of odd-sized lot in poor proximity to track and signal

FIGURE 9: POOR LOT ORIENTATION AND LAYOUT

Source: Rick Crawford, Norfolk Southern Railroad

FIGURE 10: POOR LOT ORIENTATION AND LAYOUT



Source: http://hydra.usc.edu/scehsc/pdfs/D-1-3%20Trade%20Health%20Environment.pdf

As these figures illustrate, many units have windows and room layouts that can cause noise/vibration or other conflicts to be felt by residences. Figure 10 shows a house close to warehousing facilities near the Ports of LA/Long Beach California. Figure 11 shows a poor residential design layout with the living and dining area facing out onto the freight facility/route area without any buffering or other elements to mitigate for conflicts that may arise. This property is also situated far back on the lot putting it in close proximity to the freight facility.

FIGURE 11: POOR RESIDENTIAL DESIGN LAYOUT

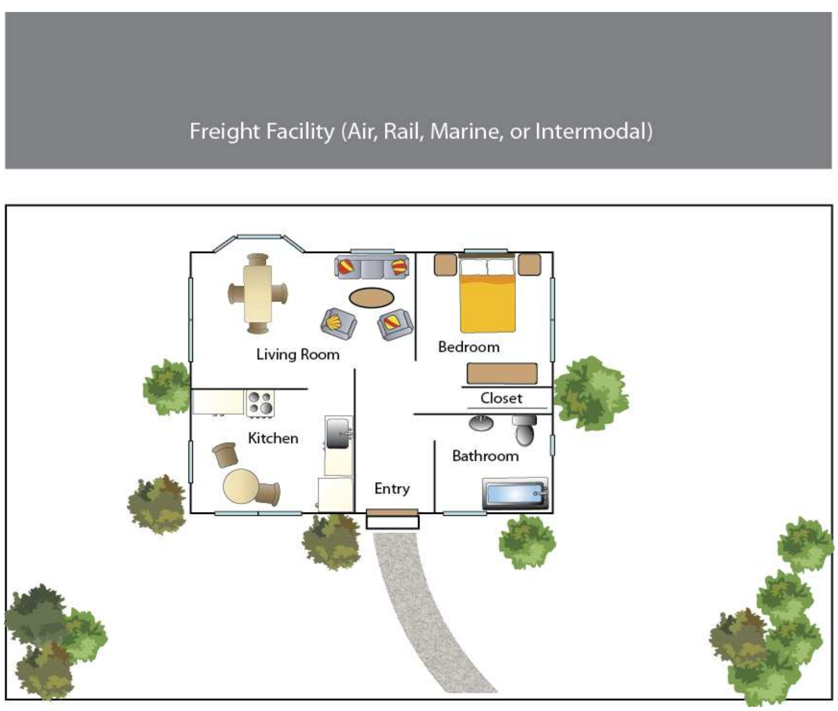


Figure 12 shows an improved unit design layout. Here the closet and bathrooms are utilized to create a buffer between the main living and sleeping areas. This elongates the pathways that the freight activities noise and vibration take to the residential unit thus reducing the decibel rating. Landscaping on the side lot lines will also assist in noise and vibration mitigation.

FIGURE 12: IMPROVED RESIDENTIAL DESIGN LAYOUT

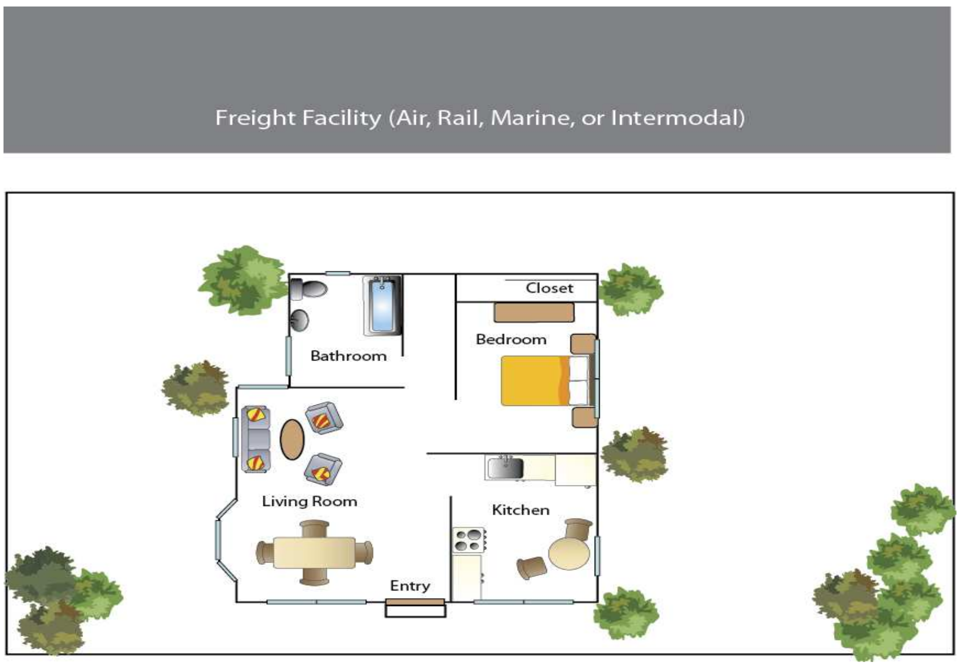
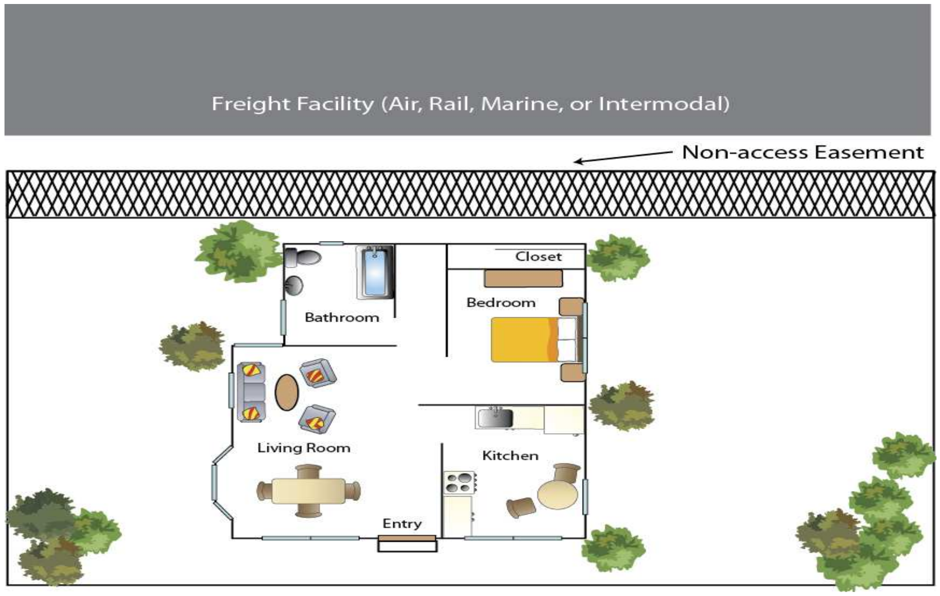


Figure 13 shows how an optimal layout with the residential development utilizing similar internal buffering technicques. Here the property places less-used rooms closer to the freight activity, which increases the space and time that noise has to travel, thus reducing decibel levels. The placement of a non-access easement also shifts the property closer to the front lot lines which again provides a buffering space for decibel levels to be reduced.

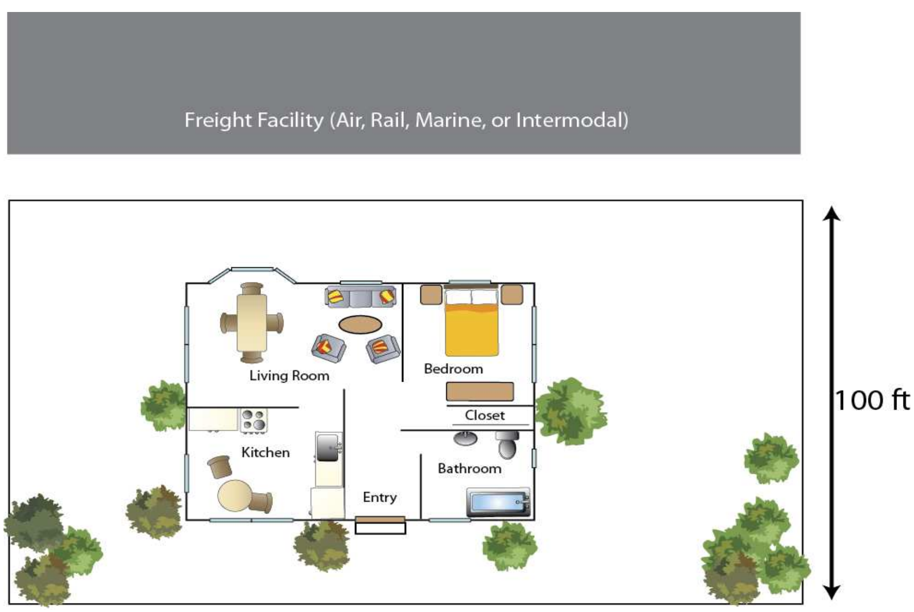
FIGURE 13: IMPROVED RESIDENTIAL DESIGN LAYOUT ACCOMPANIED WITH NON-ACCESS EASEMENT



LOT DEPTH

Another tool identified, and which is being used by some jurisdictions, is increased lot depths adjacent to highway and rail corridors. However, such lot depths are applicable to all freight modes/facilities and routes. By increasing the lot depth the residential, educational, health, or other type of facility can be placed further forward on the lot. This provides not only a buffering zone but also provides distance for sound and vibration to dissipate. Figure 14 shows an atypical lot depth of 100 feet with a poor residential layout.

FIGURE 14: ATYPICAL LOT DEPTH AND POOR RESIDENTIAL LAYOUT



Figures 15 and 16 show how this could be improved by

- Utilizing lot depth to shift the property layout, and
- Re-orientating the property's design layout to put less used rooms closer to the freight facility/route.

Figure 15 increases lot depth and shifts the building layout. Figure 16 shows the optimal residential design layout that adds non-access easement to the site to show how an optimal lot depth, building layout, and buffering component can mitigate for freight impacts.

FIGURE 15: IMPROVED RESIDENTIAL DESIGN LAYOUT COUPLED WITH INCREASED LOT DEPTH

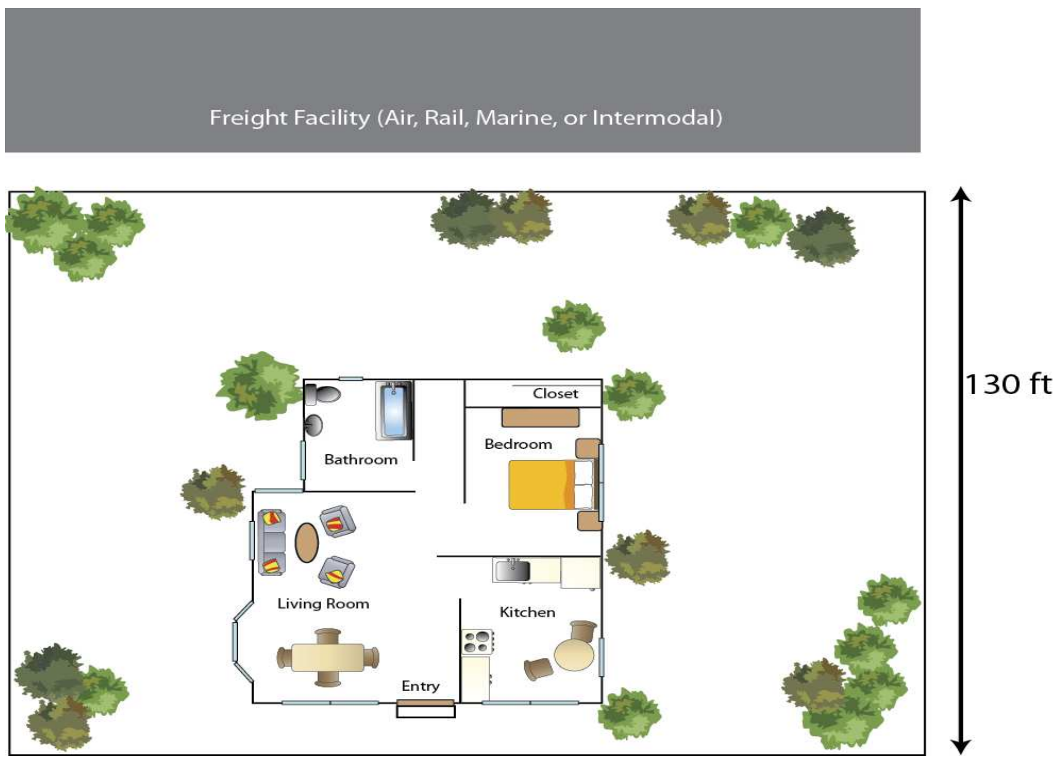


FIGURE 16: OPTIMAL RESIDENTIAL DESIGN LAYOUT, INCREASED LOT DEPTH ACCOMPANIED WITH SITE NON-ACCESS EASEMENT

MITIGATION OF EXISTING CONFLICTS BETWEEEN FREIGHT AND OTHER LAND USES

The examples thus far have focused primarily on new developments and methods for avoiding conflicts between freight and residential uses. However, there are many types of existing conflicts between freight and other land uses, and approaches to mitigating these conflicts. Two examples are provided here.

- Placing a school and playground on the opposite sides of a corridor, encouraging children to cross the highway or railroad to get to the playground.
- Placement of hospitals, EMS and elder care facilities close to railroad grade-crossings that operate on a 24/7 basis.

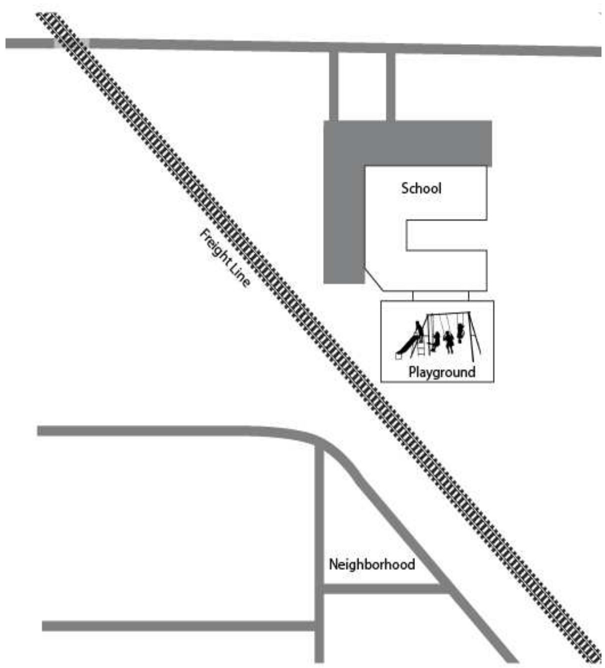
Figure 17 shows a student entering into a Ball Junior High School in Anaheim California after crossing the Union Pacific tracks which separate the school and neighborhoods.

FIGURE 17: EXAMPLE OF TRESPASS ACROSS RAILROAD TRACKS BY CHILD TO ENTER SCHOOL PREMISES

Source: Jon Waide, FRA Region 7 Law Enforcement Liaison Officer

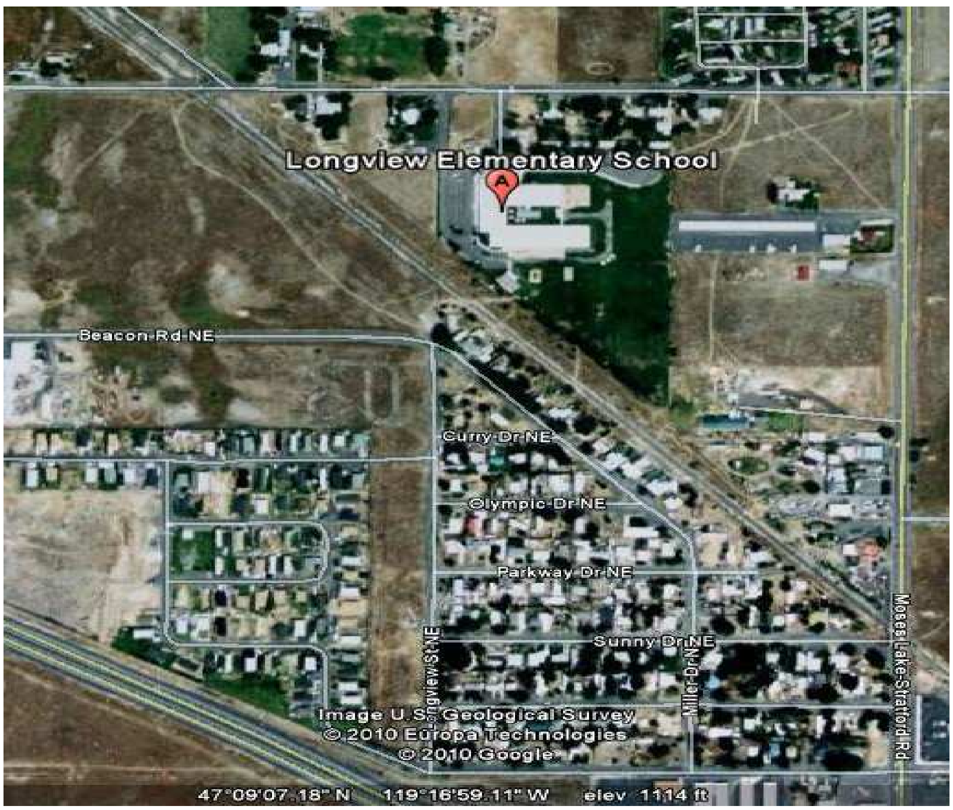
Figure 18 illustrates a freight line that separates a school and playground from a neighborhood served by the school.

FIGURE 18: EXAMPLE OF POOR LOT ORIENTATION: SCHOOL/EDUCATIONAL



As an example, the Columbia Basin Railroad tracks separate Longview Elementary School in Moses Lake, Washington from a neighborhood served by the school. More than 400 students attend the elementary school and over half of the students live across the tracks south of the school. Students cross the tracks at this location as a shortcut to reach the school. There is no legal crossing in the vicinity, and the most direct path to the school from these neighborhoods is across the railroad tracks. The closest designated crossing is located east of the school on Maple Street. Students walking from these southern neighborhoods to the school using the Maple Street crossing have to travel approximately nine-tenths of a mile on surface roads with inconsistent sidewalks. Although the School District provides bus service to the neighborhoods south of the school and actively encourages its use, there are many children who cross the tracks illegally to attend school and to use the playground area and equipment after hours.

FIGURE 19: LONGVIEW ELEMENTARY SCHOOL, MOSES LAKE, WA



Columbia Basin Railroad currently operates two trains per week at 10 miles per hour on the tracks near the school. However, the Port of Moses Lake is aggressively pursuing expansion of industrial activity at the Port, which could increase rail traffic on this line in the future. In March 2010, the Washington Utilities and Transportation Commission approved funding $38,844 to put fencing beside the school.[6] The School District will be responsible for maintenance. Columbia

[6] Washington Utilities and Transportation Commission. Docket TR-100191 Moses Lake School District: Requesting Disbursement from the Grade Crossing Protective Fund. March 25, 2010. Available at: http://wutc.wa.gov/rms2.nsf/177d98baa5918c7388256a550064a61e/14e9a9127c388899882576f10064086e!OpenDo

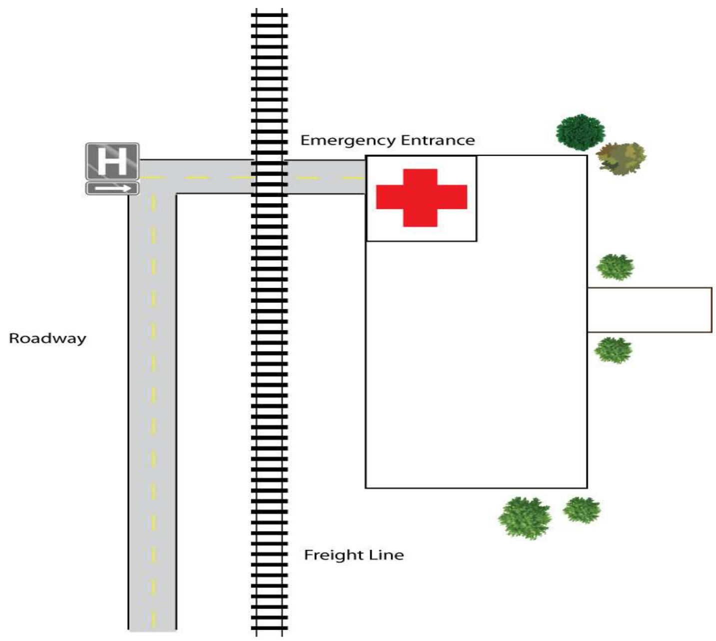
Basin Railroad supports this fencing project, including installing the fence on railroad right-of-way.

The School District currently maintains a chain link fence around the perimeter of the school, including fencing between the playground and the north side of the railroad tracks. However, the fence is frequently cut or otherwise vandalized to gain access to the school grounds. The proposed additional fencing would be installed on the south side of the railroad tracks, directly behind homes in the closest neighborhood to the school. The intent is to further discourage unsafe activity on and around the railroad tracks in the vicinity of the school, though it is clear that fencing alone will not fully solve the problem

In addition to the fencing project, the School District is pursuing a railroad safety educational and awareness campaign. In 2009, Operation Lifesaver representatives, including Commission staff, conducted educational presentations at the school on how to be safe around trains and railroad tracks. Annual Operation Lifesaver presentations and other efforts are planned to raise awareness among students and school staff of railroad safety issues.

Figure 20 illustrates another example of existing conflict; an at-grade railroad crossing that crosses the road to an emergency facility.

FIGURE 20: CONFLICT BETWEEN RAIL CROSSING AND HOSPITAL EMERGENCY FACILITY



An example of this is the Via Christi's Regional Medical Center St. Francis Campus in Wichita, Kansas. The facility has 400 staffed beds, and is the site of Kansas' largest Level I Trauma

cument.

Center and neuroscience center. It is located on N. St. Francis Street at the juncture with Santa Fe Street, adjacent to the BNSF line which had an at-grade crossing. This was part of what is known as the Central Rail Corridor that runs north-south through Central Wichita and crosses many of the major throughfares. In the late 1990s, the city comissioned a study to develop and evaluate solutions to the traffic and safety impacts that were predicted because of a doubling of train movements. The study recommended improvements to the Central Rail Corridor, including several bridge and grade separation structures on BNSF's existing corridor, and consolidation of BNSF routes.[7]

The project utilized context-sensitive design principles and was completed in early 2008. Along this corridor the railroad was raised so that the grade-crossings disappeared. This meant that access to the EMS center at Via Christi would no longer be impeded from an easterly direction by the at-grade crossing. Figure 21 shows the location of Via Christi in relation to the railroad corridor, Figure 22 shows the bridge that was built, and Figure 23 illustrates the raised railroad.

[7] Wichita Central Rail Corridor. T-Wall Retaining System Project Summary. Available at: http://neelco.com/projects.php4?f=sum0004

FIGURE 21: VIA CHRISTI MEDICAL CENTER, WICHITA, KS

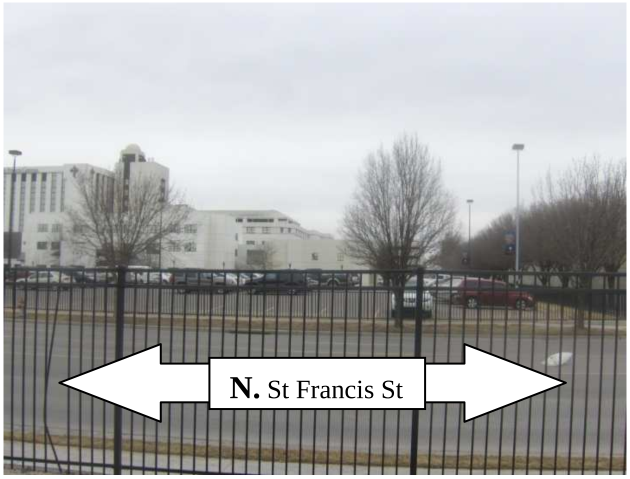


FIGURE 22: RAISED RAILROAD AND BRIDGE BESIDE VIA CHRISTI MEDICAL CENTER

FIGURE 23: ARIAL VIEW OF RAISED RAILROAD CORRIDOR