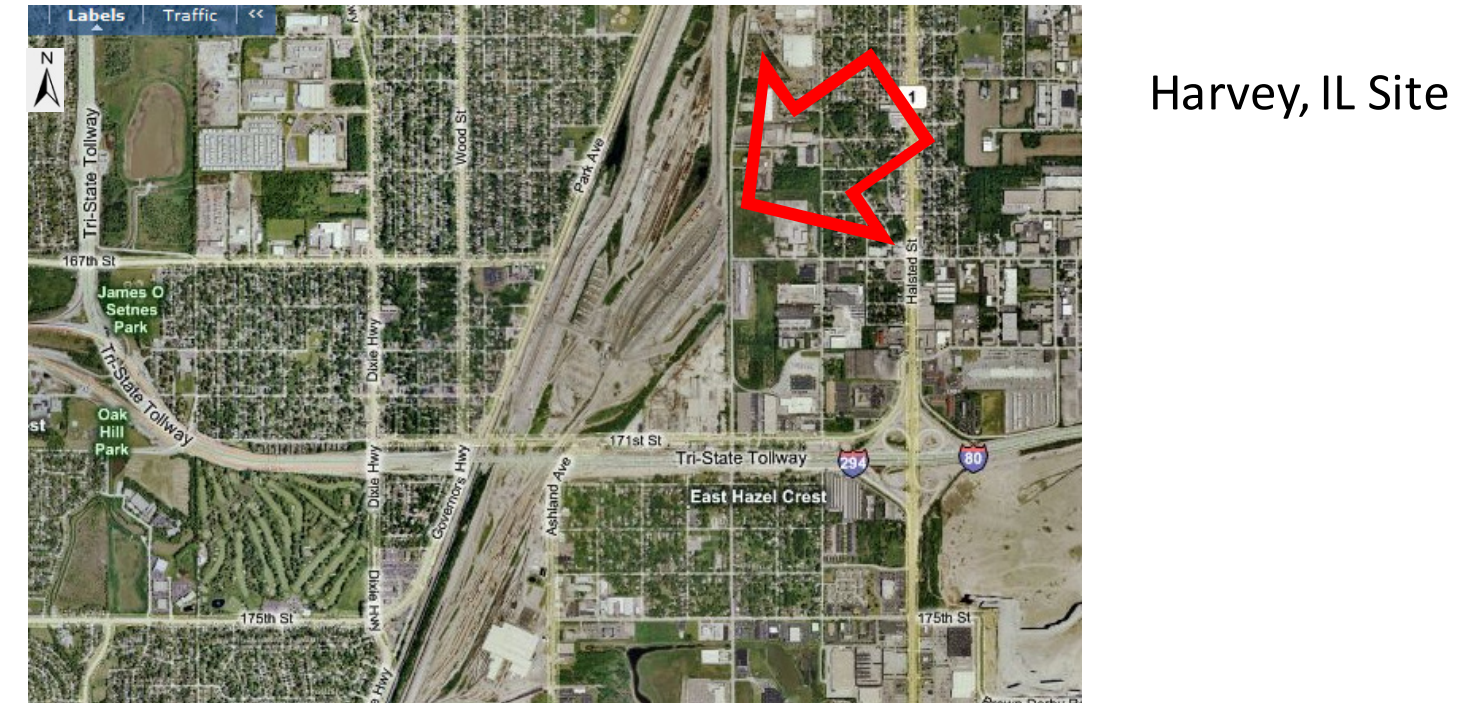


I-80/294 Intermodal Solutions

PURPOSE AND OBJECTIVE

- This IPRO created four possible designs to improve the truck flow in and around Canadian National's (CN) intermodal facility at Harvey, IL.
- A network of highways surrounds the intermodal yard, including interstates 294 and 80 which cross directly overhead. The designs focus on incorporating I-80/294 to allow trucks to directly flow into the yard and keep them off the local streets.
- The designs seek to optimize performance of the yard with minimal cost and positive environmental benefits.



CN's ACQUISITION OF THE EJ&E Rail Lines

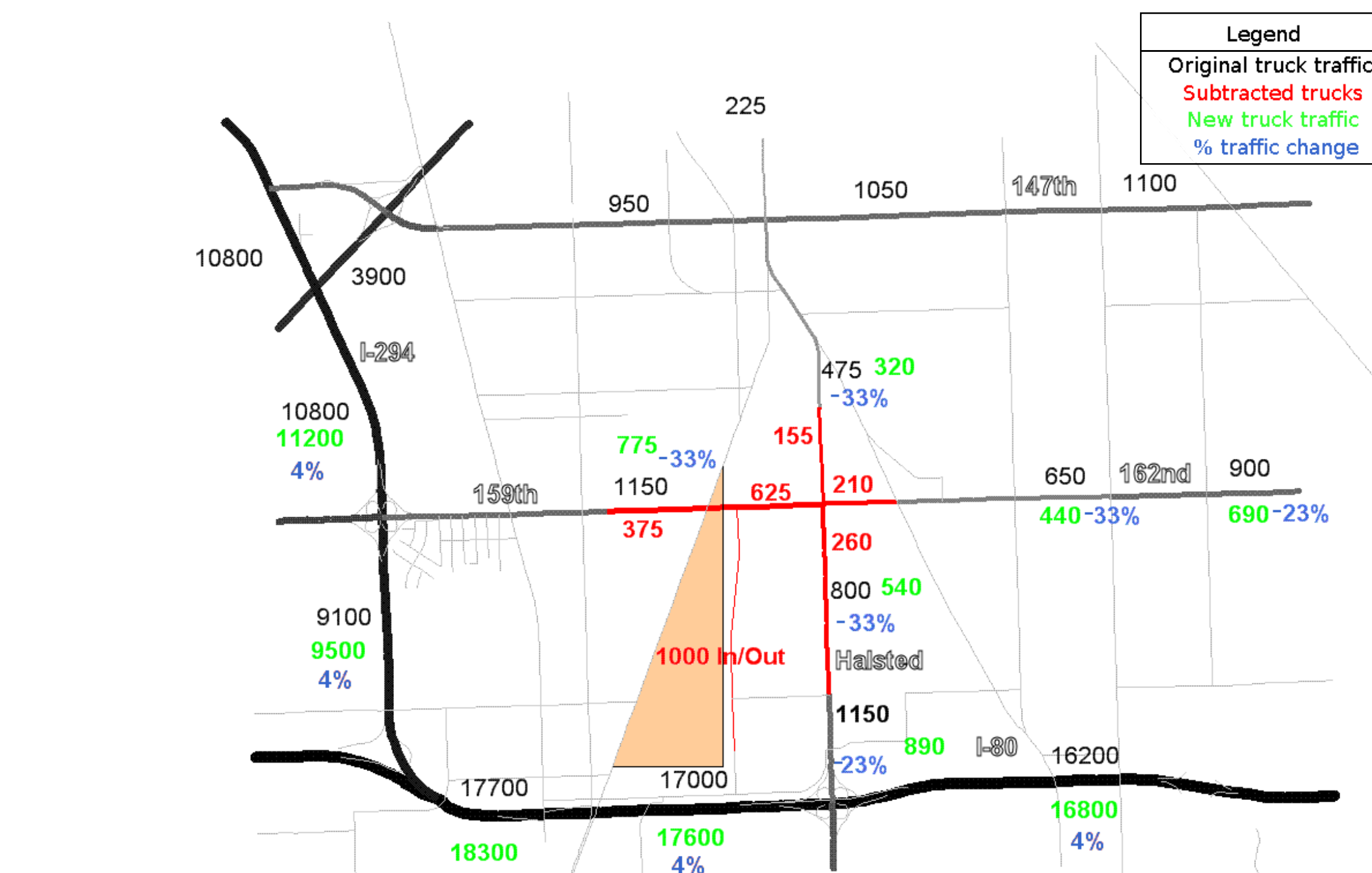
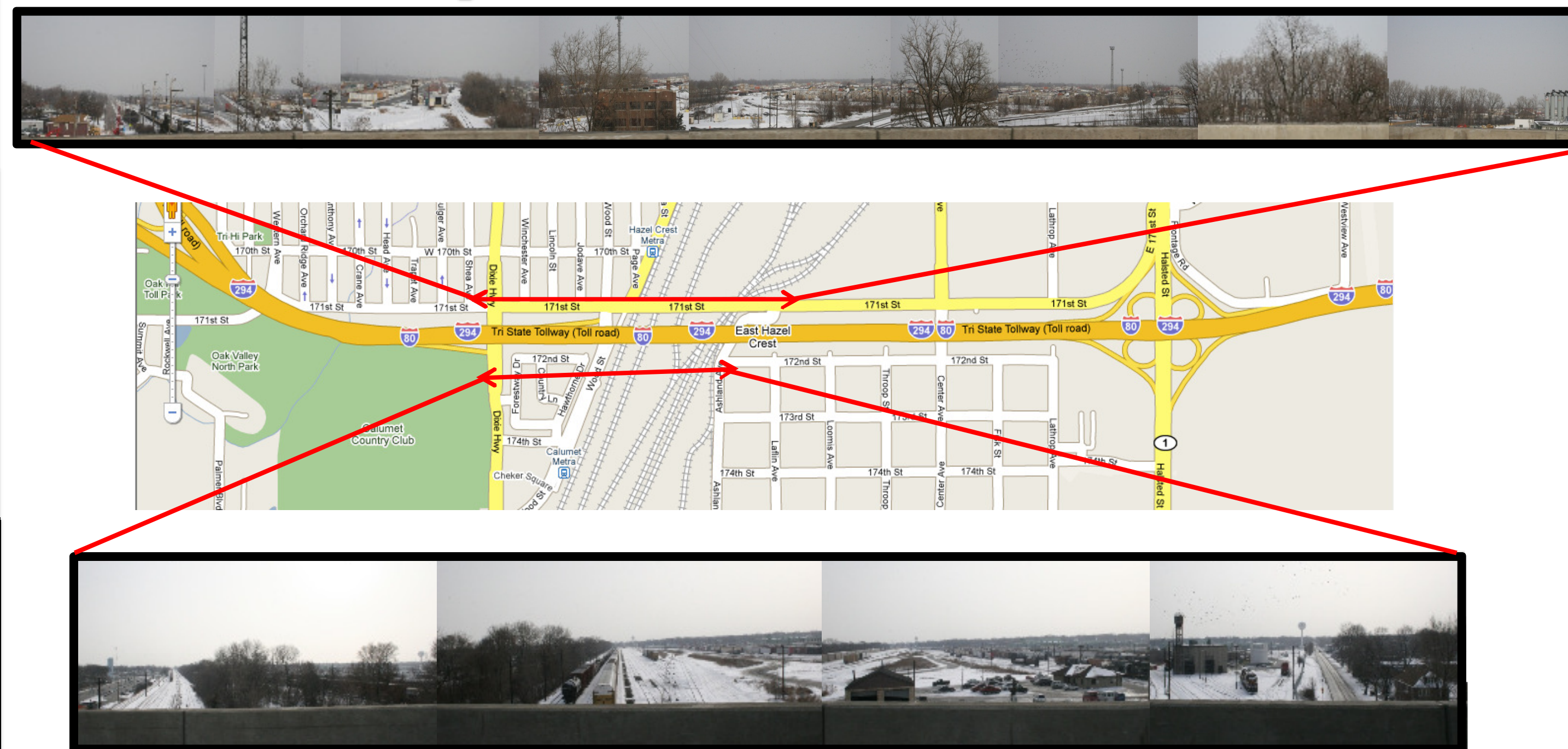
- Chicago is the world's 3rd busiest intermodal hub, surpassed only by Hong Kong and Singapore. It can take a freight train longer to go from the North to the South side of Chicago (approx. 30 miles) than it does from Chicago to Winnipeg, Canada (approx. 860 miles).
- Chicago is a key rail hub, but congestion and infrastructure are currently major issues, CN rail lines converge in Chicago from five directions.
- CN's acquisition of the EJ&E rail lines will reduce congestion in the Chicago-area rail network by taking CN trains off lines that move through the city and moving them to a north-south arc around west Chicago.
- EJ&E operates over 198 main line miles of track encircling Chicago from Waukegan to Joliet to Gary, Indiana to South Chicago.

THE TEAMS:

YARD DESIGN

- Design connections from highway and layout of the yard.
- Create a 3D walkthrough of the bridge connection design.
- MEMBERS:** Cordell Jackson, Karolis Kozys, Malarva Rathakrishnan, Ali Razeq, Richard Rokita, Paul Skopek,
- COMMUNITY IMPACT**
- Research the impact of a large-scale project on the surrounding area.
- Understand zoning laws and environmental impact on the community.
- MEMBERS:** Will Cabrera, Nicole Dennis, Thomas Montgomery, Vaibhav Patel, Jorge Rueda, Cody Snyder

"Centre of the Nation" Harvey, IL Intermodal Yard



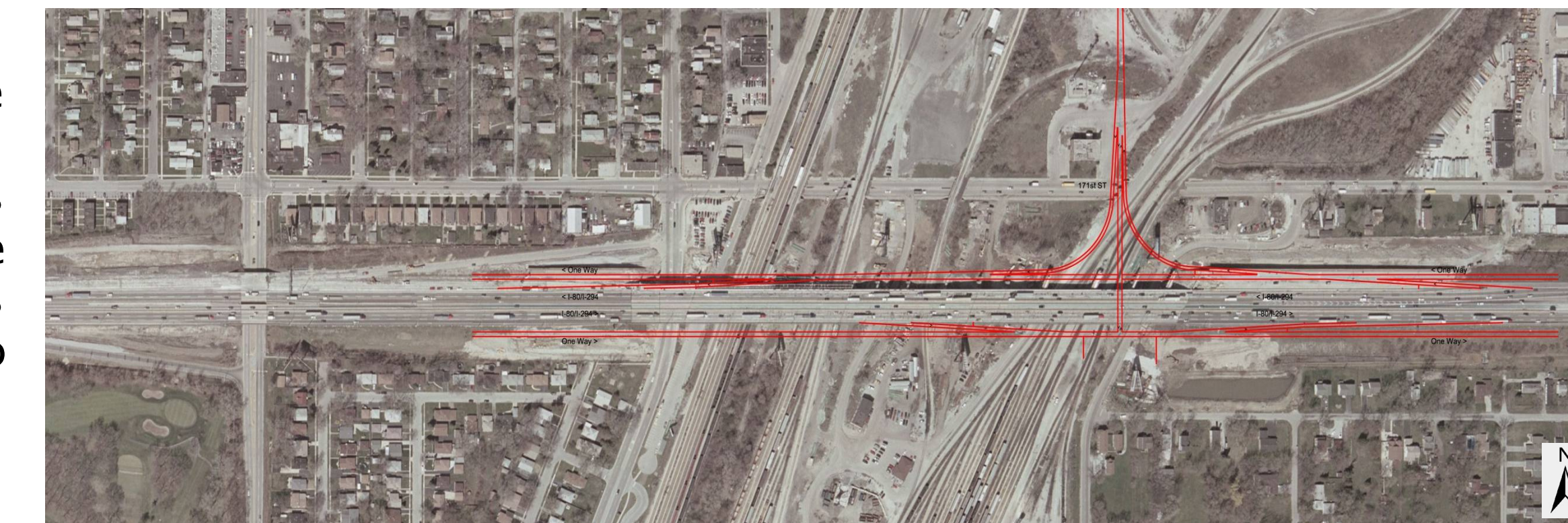
CURRENT AND PROJECTED TRAFFIC IMPACT STUDY

Pictured above are average daily truck traffic numbers in the area surrounding the project site. This data was surveyed by Illinois Department of Traffic. Thicker and darker lines represent streets with more truck traffic. Black numbers are the total truck traffic collected at each sample point. Red numbers illustrate the estimated affect of the proposed off ramp design will have on traffic, taking in to consideration current traffic designated for the yard. The amount changed in traffic is in green and the percentage changed in traffic is in blue. The orange triangle represents the Harvey, IL Intermodal Yard.

Proposed Solutions:

Option 1- Two One Way Frontage Roads

This option requires two frontage roads, one on each side of I-80. The problem encountered with this option is that there is not enough room on the north side of the interstate for a frontage road. Also, there is limited space for on and off ramps onto these roads.



Option 2 Frontage Road Utilizing Center Ave

This option is to use the empty space on the north and south sides of the 294 just past the intermodal yard to put a set of exits and entrances onto Center Avenue. Heading westbound on the 294 trucks will use the exit at Halsted Street to an off ramp onto Center Ave. Trucks will travel north on Center to enter the Intermodal Yard. A westbound entrance ramp will be constructed from Center. Eastbound trucks will exit onto Center Ave and they will enter along the Halsted exit back onto the highway.



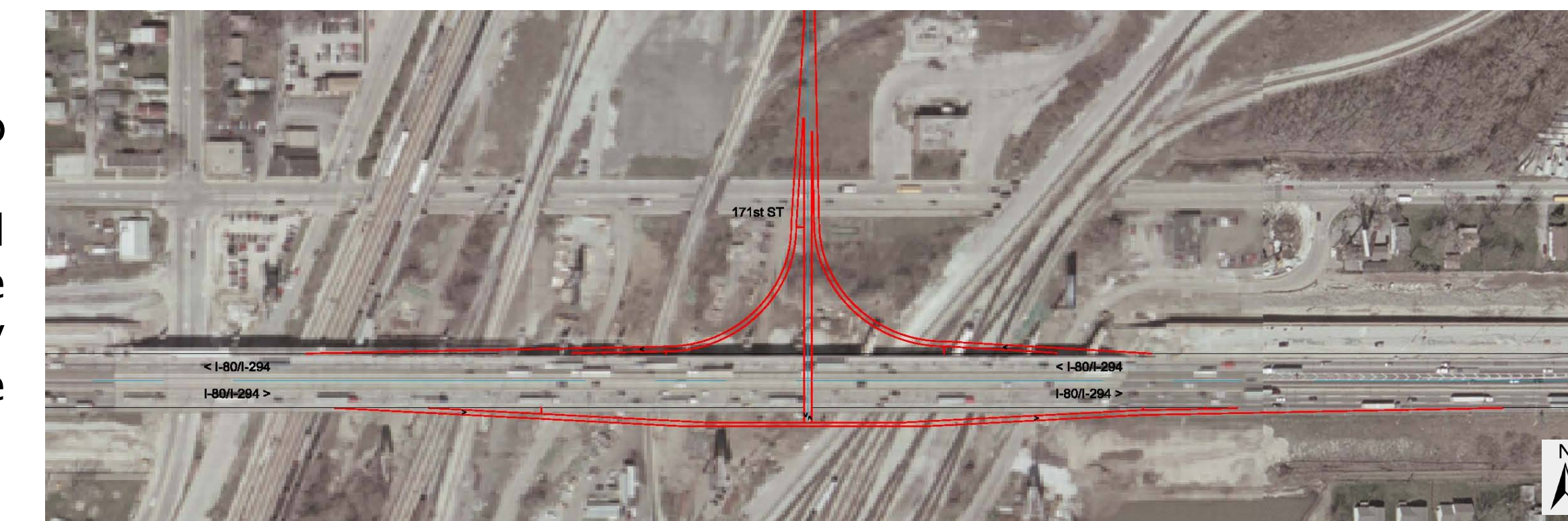
Option 3- Convert 171st Into a Two Way Frontage Road

This option requires converting 171st into a two way frontage road. The problems this presents is that the road may need to be expanded. Also, this road passes under tunnels that would need to be expanded as well. Another issue is that of on/off ramps.



Option 4- Ramp Directly Into Yard

This option is similar to option 1 but has no frontage roads. Unlike option 1 this option only requires space for the on/off ramps and the piers that go along with it. Because there is limited space in the area, this option may be the best fit for a ramp directly into the yard.



Research

Frontage Roads

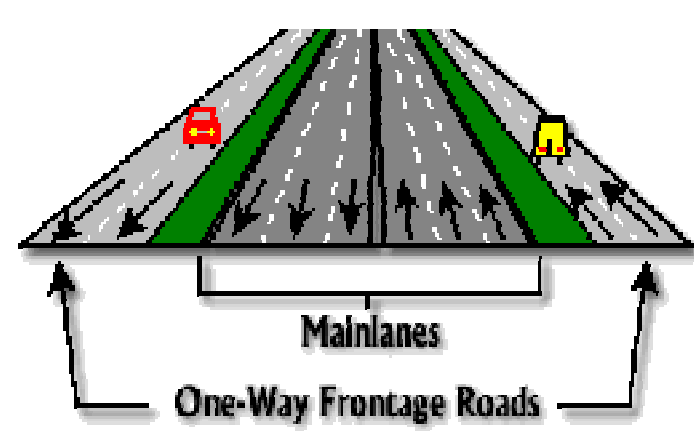
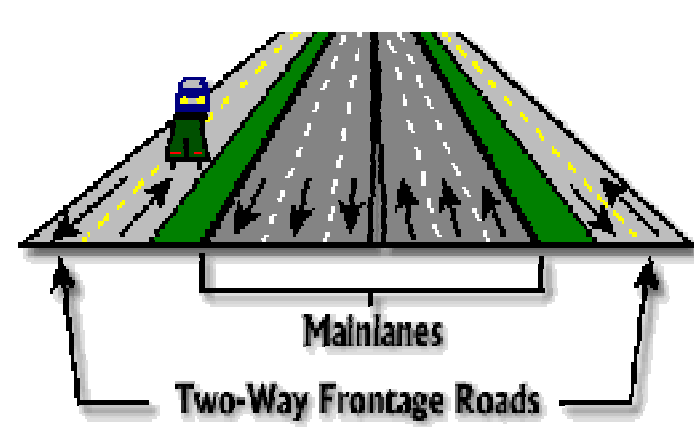
Definition: Frontage roads are access roads running parallel to a freeway, which feed into it at given interchanges.

- In urban areas already existing roads are often used as frontage roads; they are frequently one way roads on both sides of the highway.

Importance: Frontage roads provide access to residential and commercial areas from the highway which would be cut off from access otherwise.

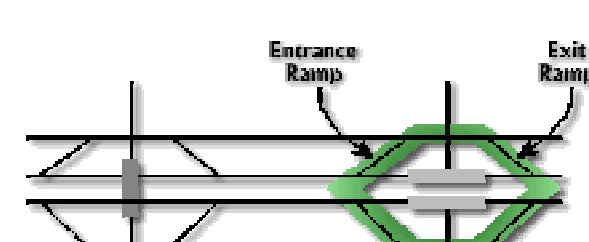
Common Names: "Feeder roads" (Houston), "service roads" (Dallas), "access roads" (San Antonio), "gateways" (El Paso), "frontage roads" (Austin, and officially).

Background: Frontage roads are often built as part of a multi-phase plan to construct new limited access highways. Initially they serve as a highway with access to local business before the freeway is constructed. After completion of the new freeway, frontage roads serve as a major thoroughfare for local activity. Speed limits on frontage roads generally range from 60 mph in rural areas to 40-50 mph in urban areas. They can be found both on interstates, and state and federal highways.

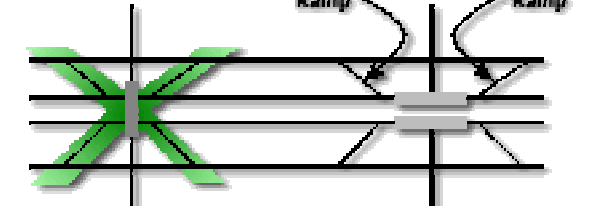


Ramp Configurations:

There are multiple ramp configurations used with frontage roads. The "diamond" interchange is standard and is shown below. The on- and off-ramps connect to the frontage roads in the general shape of a diamond, relative to the cross streets.

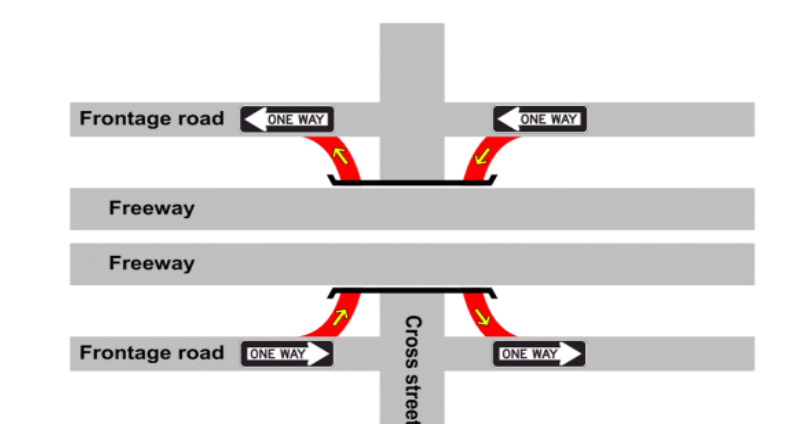


Often in urban areas, the ramps are reversed in an "X" interchange with the exit ramp for the next cross street preceding the entrance ramp from the previous cross street. The traffic is able to weave on the frontage road rather than the freeway. The "X" interchange is shown below.



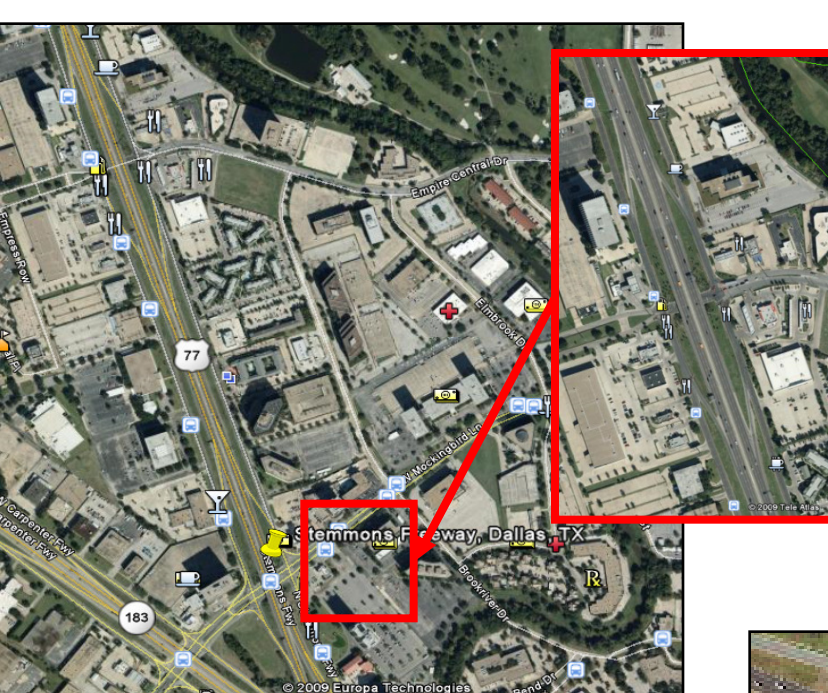
Turnarounds

Occasionally used with frontage roads are "turnarounds", separate U-turn ramps that allow traffic heading in one direction on a one-way frontage road to "turnaround" and head the other way on the opposite frontage road without having to travel through a road/cross street intersection. A turnaround design is shown below.

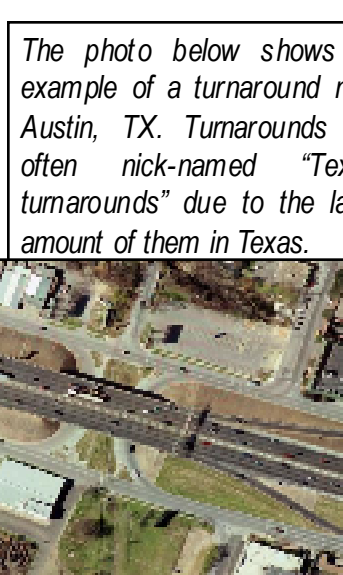


TEXAS

Texas has more highway miles than any other state, with 6,800 miles of frontage roads. Most of the freeways designed with frontage roads are found in urban and suburban areas of Texas, with one-way frontage roads. Over eighty percent of Houston's freeways have frontage roads, typically referred to as feeders. The Stemmons Freeway in Dallas illustrates the practicability of the frontage road. The real estate developer John Stemmons offered free land to the Texas Highway commission to build a freeway on the condition that the state builds the freeway with frontage roads that would give access to undeveloped property. The state was able to reduce its costs of building the freeway and the developer profited handsomely from lucrative development along the freeway.



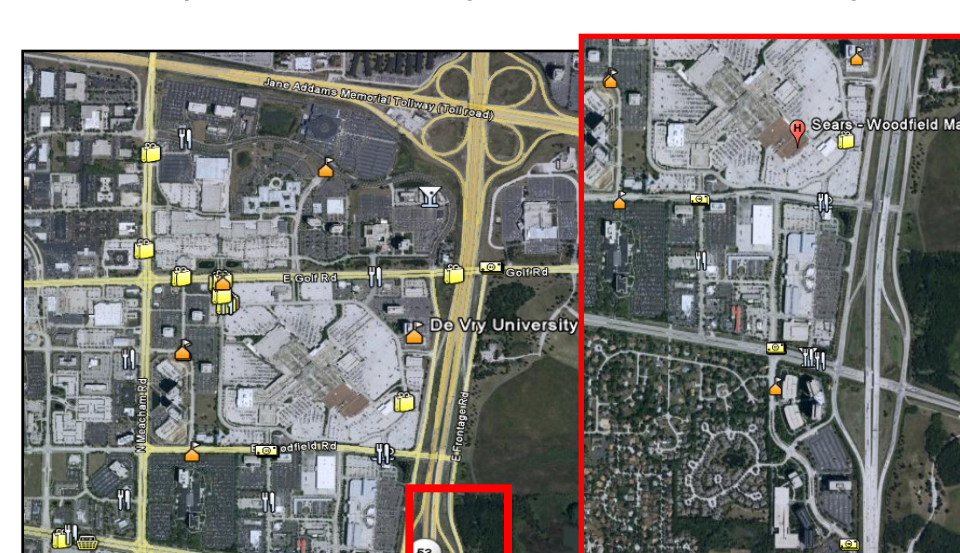
Shown above is the Stemmons Freeway in Dallas, TX. The photo in upper right shows the "diamond" interchange design was utilized to connect the Stemmons Freeway to the one-way frontage roads running alongside of it. Note the access to the multiple commercial attractions and residential area.



The photo below shows an example of a turnaround near Austin, TX. Turnarounds are often nick-named "Texas-turnarounds" due to the large amount of them in Texas.

ILLINOIS

Frontage roads in Illinois are sparse compared to Texas, however, they are of great advantage to the areas that do utilize them. For example frontage roads are utilized in Schaumburg, IL near the Woodfield mall shopping area to ease the flow of traffic since it is a high traffic density area. At the Harvey, IL Intermodal Yard project site both design options include a frontage road design.



The above photo shows the frontage road system near Woodfield mall shopping area, in Schaumburg, IL. The picture in the upper right shows a close up of the "diamond" interchange.

The photo to the right shows the frontage road system that runs alongside the Dan Ryan highway in Chicago, IL, specifically the frontage roads Wells and Wentworth alongside the Dan Ryan near the 4th Intermodal Yard, one of the busiest in the Chicago area.

Category	Max noise level	Description
B	67 dBA	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 dBA	Developed lands, properties, or activities not included in Categories A or B above.

Maximum noise levels in residential (Category B) and commercial (Category A) areas. Values are from Federal Highway Administration Noise Abatement Criteria

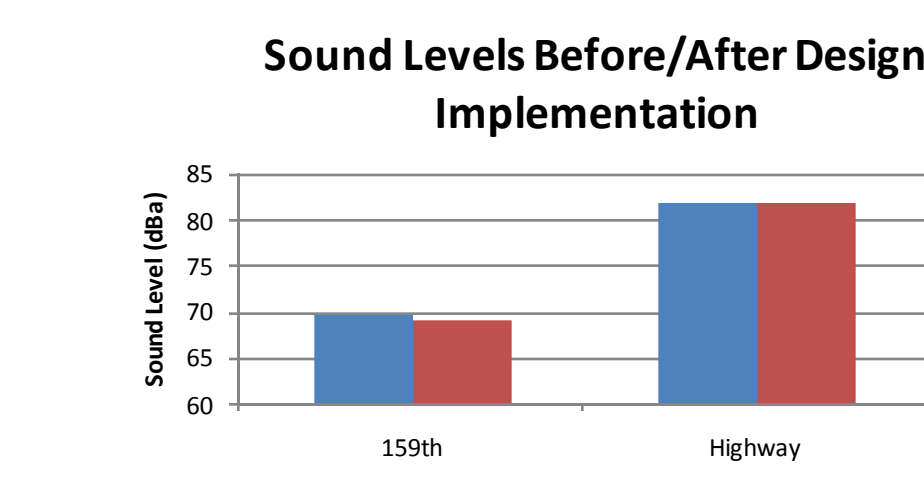


Image showing dBA range with the highway as a source. Red area is dBA>72. Blue area is less than 72 dBA and greater than 67 dBA

Graph comparing sound levels before and after implementation of option. (Highway sound levels calculated with no sound barrier)

Currently, noise laws prevent any commercial areas to be in areas that have a dBA level greater than 72. Additionally, no residential areas can be in areas that have a dBA level greater than 67. In the image above, the red area is where no buildings can exist, the blue areas are where commercial buildings can be and areas outside of the colored regions is where residential buildings can exist.

In order to make sure that any of the options would not violate noise laws, noise levels were estimated using a simulation from the Federal Highway Administration. 159th St. and I-80 highway were evaluated as they would be the areas that would be most affected by the designs. Projected traffic values were used as raw data in the simulation. Using the information from the simulation, it was found that that our options would not violate noise laws as the noise levels would decrease on 159th St. and stay the same on the highway.



Why Frontage Roads?

Frontage Roads...

- ...allow for an increased highway capacity and reduced delay in traffic.
- ...help reduce travel time due to improved traffic flow.
- ...tend to equalize the effect of the freeway on adjacent property.
- ...minimize difficulties in right-of-way acquisition.
- ...construction usually reduces the right-of-way cost, resulting in immediate savings in overall cost of freeway development.
- ...provide a means of handling traffic flow, especially special traffic situations such as maintenance, accidents and the movement of oversized loads.
- ...eliminate the barrier effect of a freeway on surface street system.
- ...are more economical, the greater the possibility of development in the area.