

Environmental Impact of High Speed Rail in California

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The CA High Speed Rail Proposal

- Up to 800 mi of rail lines – 500 mi first phase San Francisco to LA/Anaheim, first segment Fresno Area
- 1000 passenger trains
- Speeds: p to 220 mph
- Up to 24 stations
- Headways as low as 5 min. in peak periods
- Fares: \$100+ SF-LA (competitive with air)
- Ridership estimates: 40-80 M a year by 2030
- Costs – \$43B (2008 est), for phase one only (2009) – could be double?

Source: CHSRA website, independent analyses

California High-Speed Train Map, Statewide Overview



Environmental Impacts of HSR: Problems and Potential

- Lengthy environmental assessment process has identified a number of important environmental impacts:
 - Temporary, construction-related impacts
 - Unavoidable negative impacts on the natural and built environment
 - Potential for HSR to be an environmental asset
- Environmental Review will continue – segment by segment details including mitigation

Anticipated Benefits - CHSRA Vision

Transportation	Employment	Environmental Quality	Urban Vitality
Congestion relief on freeways and at airports	Up to 100,000 construction-related jobs	Improved air quality	Revitalized communities, economic development around stations
Faster travel between major metropolitan areas	Up to 450,000 permanent new jobs over 25 yrs created by HSR economic growth	Improved energy efficiency: 1/3 energy use of planes, 1/5 that of cars	Transit- and pedestrian-oriented infill development
Improved movement of people, goods and services		Reduced dependence on foreign oil: 12.7 million barrels less per year	Enhanced public safety due to separation of tracks and highways
		Reduced greenhouse gas emissions: 12 billion pounds less per year	

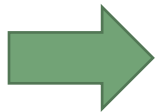
Environmental Impacts of HSR

- Impacts on the natural environment, agriculture
- Impacts on the urban (“built”) environment

- Temporary – during construction
- Primary – direct impacts
- Secondary and tertiary impacts
- Cumulative impacts

Particular Concerns about Environmental Impacts Raised by Stakeholders

- Noise (>90dBA at high speeds) and visual intrusion of elevated structures and/or sound walls, fences in urban areas
- Access restrictions due to protection of ROW
- Impact on farming – severance, access restrictions
- Impact on parks, recreation areas (intrusion)
- Adverse effects of noise on wildlife
- Adverse effects on endangered and threatened species from noise, barriers, road kill
- Public acceptability, costs and timing of compact growth and transit feeders to support ridership and reduce traffic impacts



Air quality, GHG, energy issues are big for researchers & state agencies but do NOT appear to top the list for stakeholders

Temporary Impacts

- Disruption of circulation patterns during construction
 - can interfere with rail and road traffic
- Disruption, relocation of utilities
- Construction noise
- Construction emissions
- Runoff, water table impacts



Following best practices can generally keep impacts to manageable levels

Impacts on the Natural Environment

- Waterways, wetlands and nature preserves or biologically sensitive habitat areas affected
- Parklands lost, trails crossed
- Encroachment into areas of highly erodable or otherwise sensitive soils



Following existing ROW, elevation or undergrounding can avoid or minimize impacts; mitigation and compensation for added impact

Transportation and Utilities Impacts

- Permanent impacts on rail operations due to, e.g., loss or relocation of sidings
- Permanent changes to traffic circulation - increased circuitry and delay due to protection of ROW
- Traffic and parking impacts around stations



Design can mitigate or compensate for these impacts



New multimodal terminals and feeders services – transit improvements for broad catchment area could be induced or added as traffic mitigation

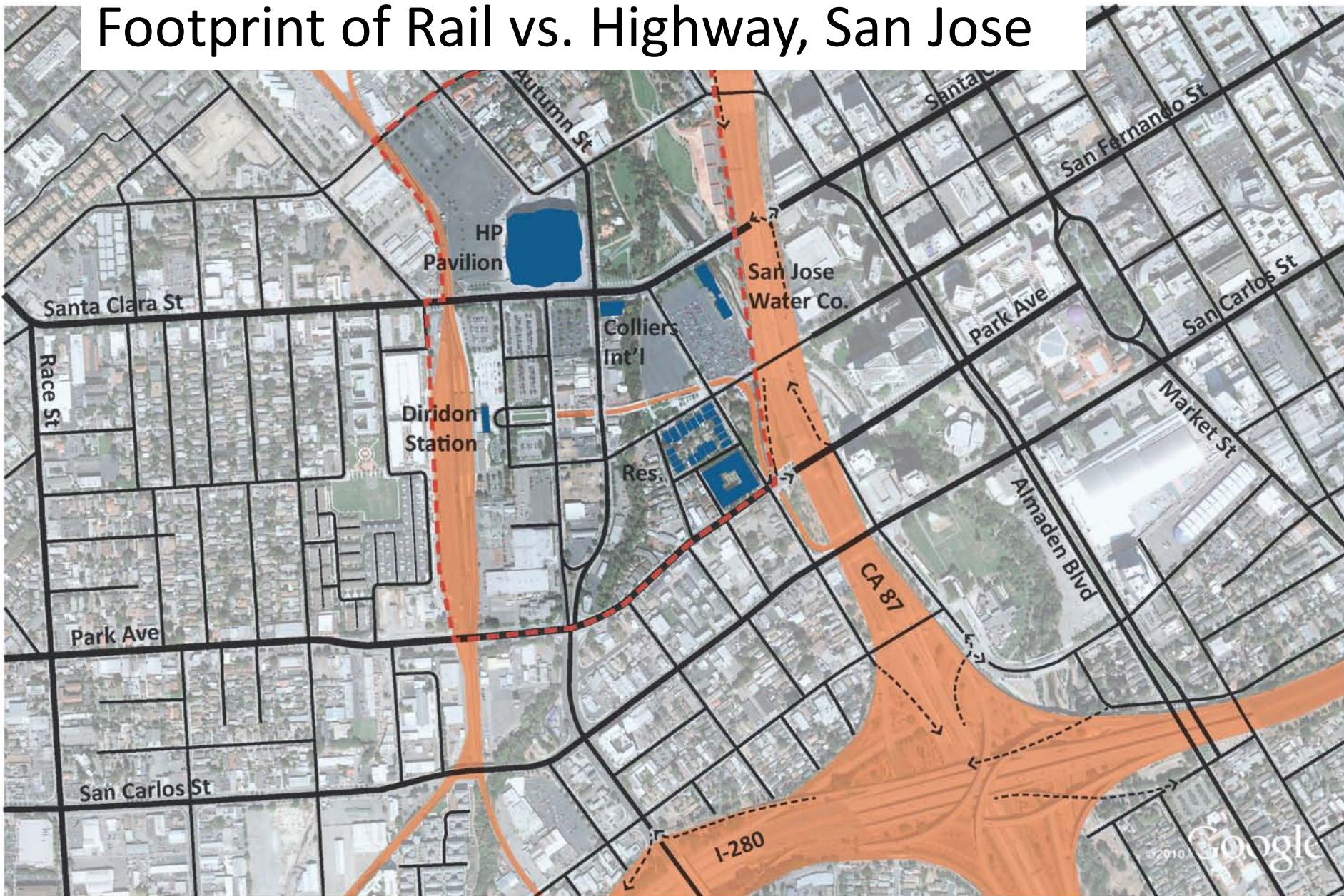


Successful operation could reduce traffic congestion & need for expansion of roads, airports

Comparisons to Other Modes

- Alternatives to HSR – auto, air-- could improve performance over time – reducing benefits - or deteriorate further, increasing HSR's relative attractiveness
 - Depends in part on technology (e.g., how fast vehicle emissions and energy use improve in air, auto modes; improvements in ATC and highway ops as well)
 - Also depends in part on public policy (e.g., willingness to widen highways, add runways – these are NOT very popular in CA – and to subsidize minor airports and their air services)
- Overall impact on transport is small because travel in the 50-500 mi length is small (note: highest ridership est. for 2030 is less than BART alone carries now)

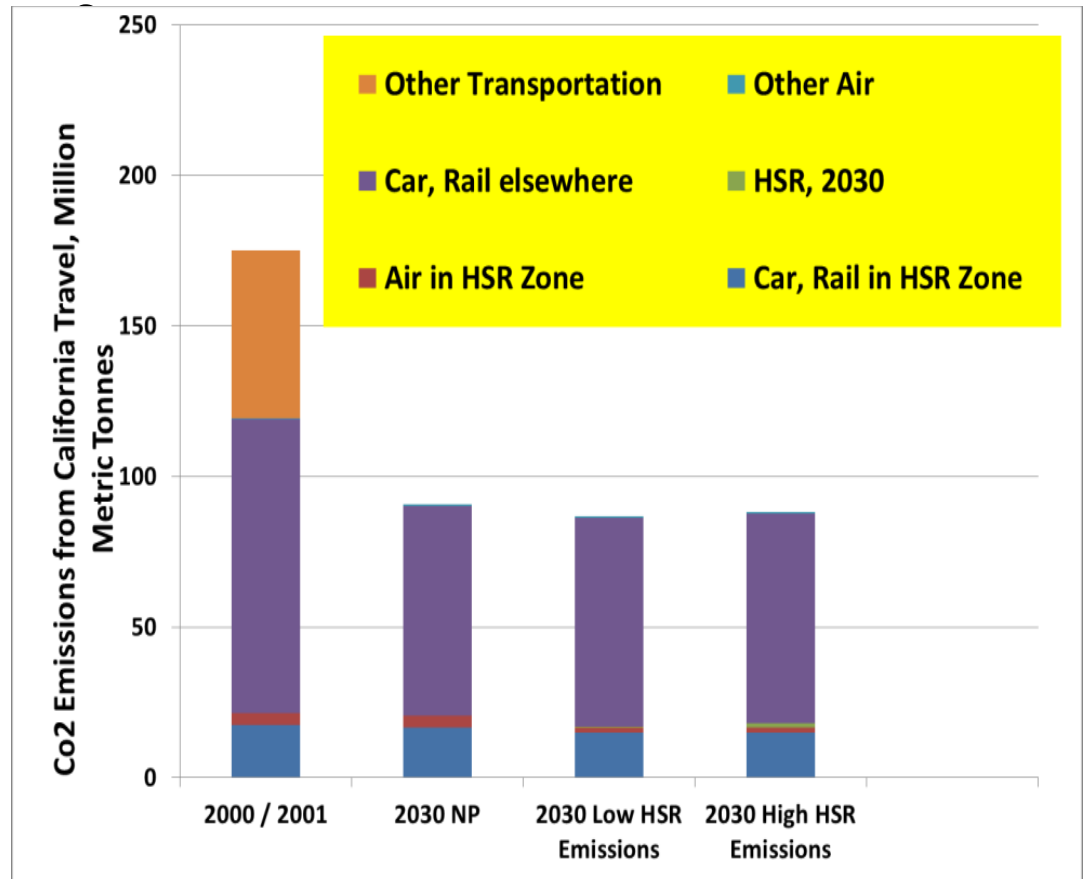
Footprint of Rail vs. Highway, San Jose



Credit: John Doyle, UC Berkeley

Air Pollution, GHG Emissions Impacts

- Depends in part on how electricity is generated
- Life cycle analysis – amount of concrete can make a difference!
- Other modes will be getting cleaner, more energy efficient
- Given small share of travel in HSR “range”, overall contribution is modest



Credit: Schipper, Kosinski and Deakin, 2011

Land Use Impacts

- Takings of homes and businesses – full and partial
- Loss of access to urban and rural parcels; severance
- Impacts on prime and unique farmland and farmland of statewide or local importance



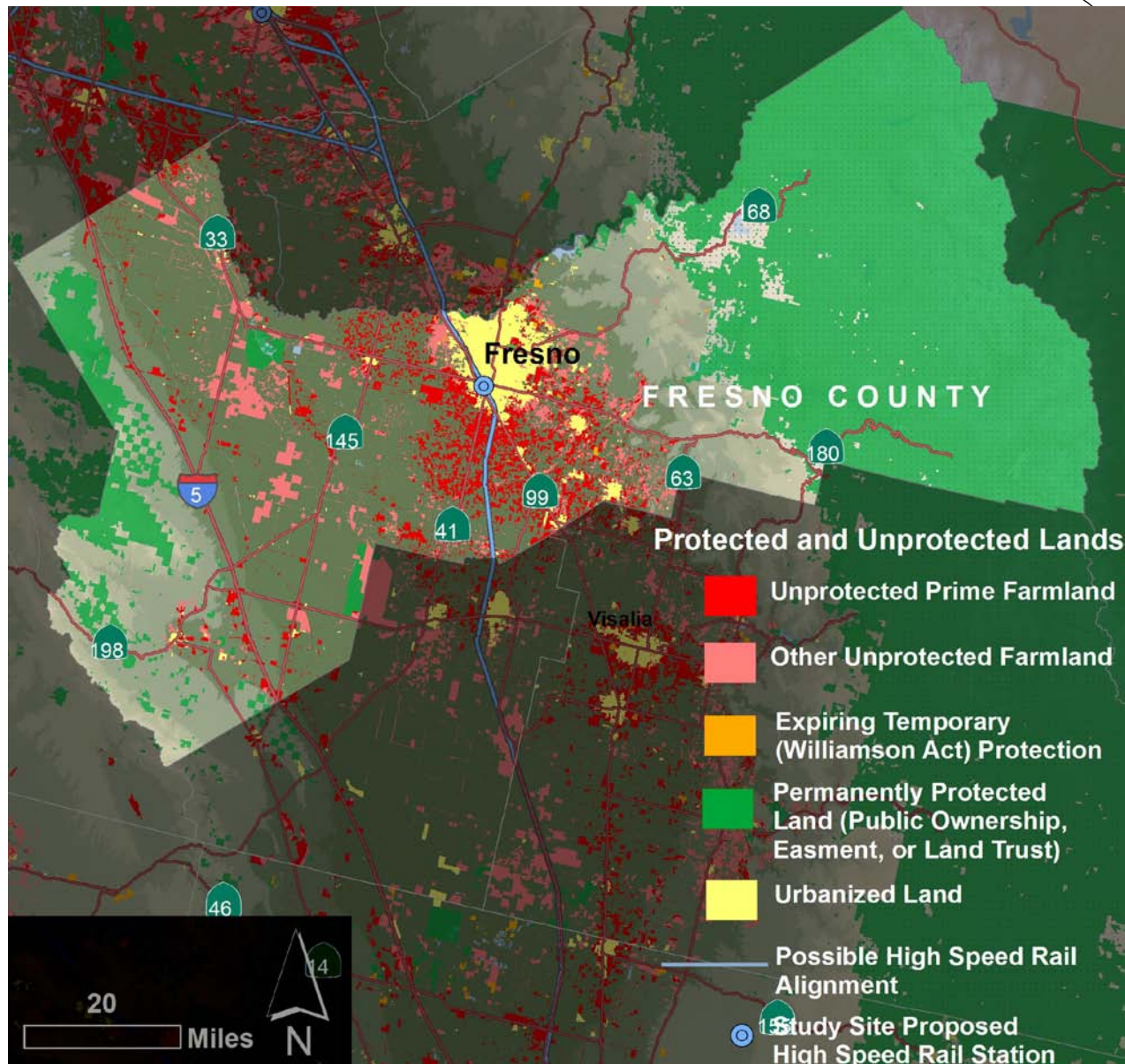
As with transportation impacts, direct land use impacts can be avoided or minimized by choice of ROW, mitigated, compensated



Secondary impacts can be important – induced growth and change

Example: Protected and Unprotected Farmlands in Fresno County

- Much of the farmland in the County is not under agricultural protection agreements
- Will HSR spur further development into farmlands, or help create plans and impetus for more compact growth?



Urban Impacts

- Visual impacts of elevated structures, sound walls, other elements – can affect property values, enjoyment of open space
- Noise and vibration affects on built environment

BUT

- New opportunities for infill, higher densities around HSR stations
- New businesses, economic development to serve travelers
- Avoided, much larger negative impacts if highways must be widened or airports expanded



Example: The impact of a 60' structure in an urban context.



Example: how a 60 ft. structure could be integrated into urban fabric

- mixed-use office buildings along the HSR corridor, acting as a visual and sound buffer
- space under the structure for parking
- pedestrian-oriented street design

Infill Development Potential – Fresno

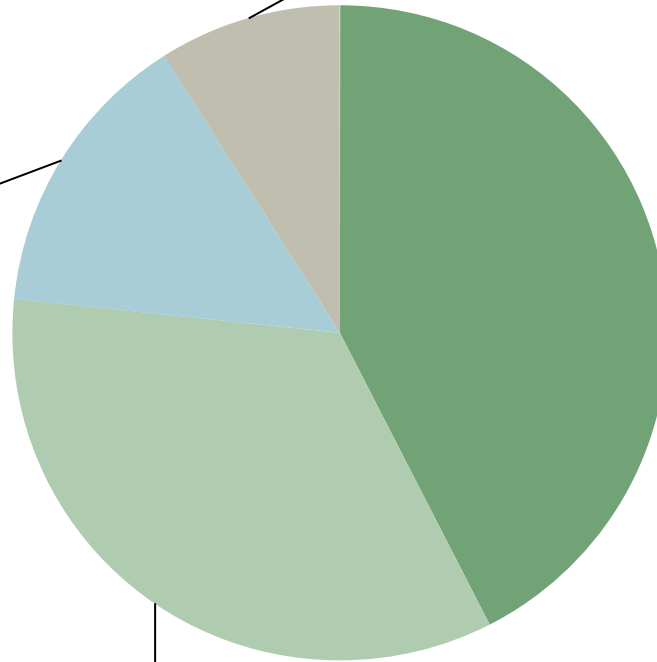


footprint area
(existing
buildings), 14%

parking lot
area, 9%



Un(der)develop
ed block area
(not including
parking and
buildings), 43%



right of way
area, 34%



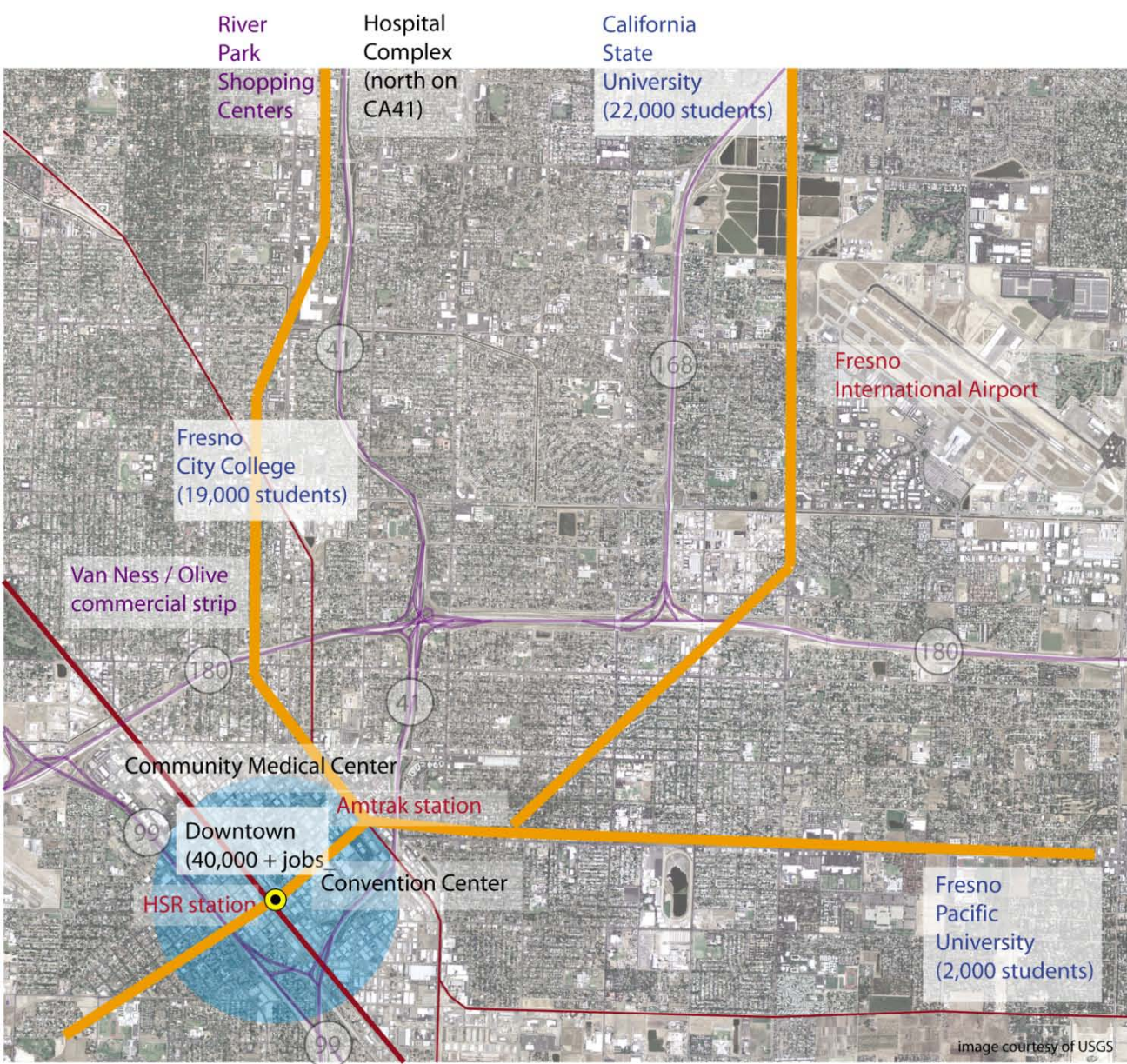
Infill Examples

San Joaquin Light and Power Corporation Building

Infill development

Alexander Pantages Theater





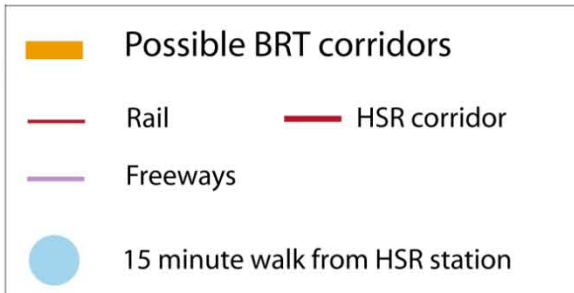
Possible future BRT corridors connecting major employment and activity centers

BRT corridors should connect the major regional destinations (California State University, Fresno City College, Fresno International Airport, the River Park Shopping Centers, and the Fresno Pacific University) to the downtown.

Within the downtown, it is important that these bus routes connect the HSR station, the Amtrak station, the Community Medical Center and other important destinations.



0 1 mile



Will Environmental Costs and Benefits Materialize?

- Many environmental costs are the result of construction of the rail lines – land takings, severance, access disruption, visual impacts -
- Some are the result of operating trains, whether or not they attract passengers – noise, a good part of the energy and emissions
- Still others depend on whether ridership materializes and extent to which it is diverted from other modes: air quality, energy, CO2 emissions avoidance, urban revitalization due to station area activity
- Public policy and technological advances both play important roles

Additional Questions with Environmental Consequences

- How use of rail ROW would affect ability to move more freight by rail
- How mitigation, segment by segment, will affect costs and impacts – e.g., if have to tunnel on Peninsula
- Longer term effects of global warming – e.g., flooding, storms affecting CA airports (could change cost functions)
- Longer term effects of technological change – smart highways, better air traffic control,...

Summing Up

- Some environmental impacts are negative and unavoidable results of construction
- Some depend on attracting riders to HSR from air and auto
- Relative impact in part depends on how other modes - air, auto – develop over next several decades – technology and public policy
- Relative impact also depends on whether cities and counties coordinate land use strategies with HSR investment – public policy and markets