High Speed Rail
&
Existing Rail Corridors

NWTC

February 11, 2010

HDR

Presentation Outline

1. Characteristics of High Speed Passenger Rail (HSR) Service
2. Expectations
3. HSR Design Factors – Standalone Corridor
4. HSR Pursuits
5. Open Discussion

Catalyst: Stimulus Investments with Objective Goals

- ARRA/PIIA AID to States ($8B)
  - HS Rail Corridors
  - Intercity Capital Assistance
  - Congestion Relief
- Other Stimulus Funding
  - TIGER ($1.5B)
  - Amtrak ($1.3B)
  - On-going $1.0B annually
  - Potential for an additional $2.5B

Catalyst: Stimulus Investments

- Latest News:
  - Announcement of $8B of ARRA Stimulus Funding
  - Florida & California = High Speed
  - Others = Intercity Capital & Congestion Relief
  - Based on, in part, the contribution each state has made over the years
-

Characteristics of Passenger Rail Service

Conventional Intercity Passenger Rail Service

Amtrak/Cascades

- Distinguishing features: Conventional passenger trains over tracks owned by the freight railroads
- Intermixed (trackage shared) with freight trains
- Typical passenger train speeds up to 79 mph
- Typical freight train speed = 60 mph
- At-grade highway/rail crossings – an issue

HDR

Amtrak/Cascades Market

- Intercity service for personal, business and recreational travel
- Complements air, intercity bus, and automobile
- In the Northwest Corridor, the largest markets are Portland and Seattle, with stations every 20 to 50 miles
- Average trip lengths of 150-200 miles

Higher Speed Intercity Passenger Rail Service

Amtrak

- Distinguishing features: In Northeast Corridor speeds reach 125-150 mph over dedicated tracks
- Electric locomotive powered by overhead catenary with minor diesel/electric locomotive operation
- All at-grade crossings eliminated
- Difficult (although not impossible) to accommodate limited freight train service

HDR

High Speed Rail

- True high speed rail has speeds over 125 mph.
- Examples are the Japanese bullet trains, French TGV, German ICE.
- Dedicated right-of-way with catenary overhead system (OCS).
- No at-grade (level) highway/rail crossings.
- Virtually impossible to share tracks with freight rail due to vast differences in operating speed, clearance issues & maintenance requirements.

HDR

High Speed Rail Markets

- High Speed Rail provides intercity service to large metropolitan markets
- Typically complements airlines, intercity buses, and automobiles
- Typical trip length over 150 miles

HDR

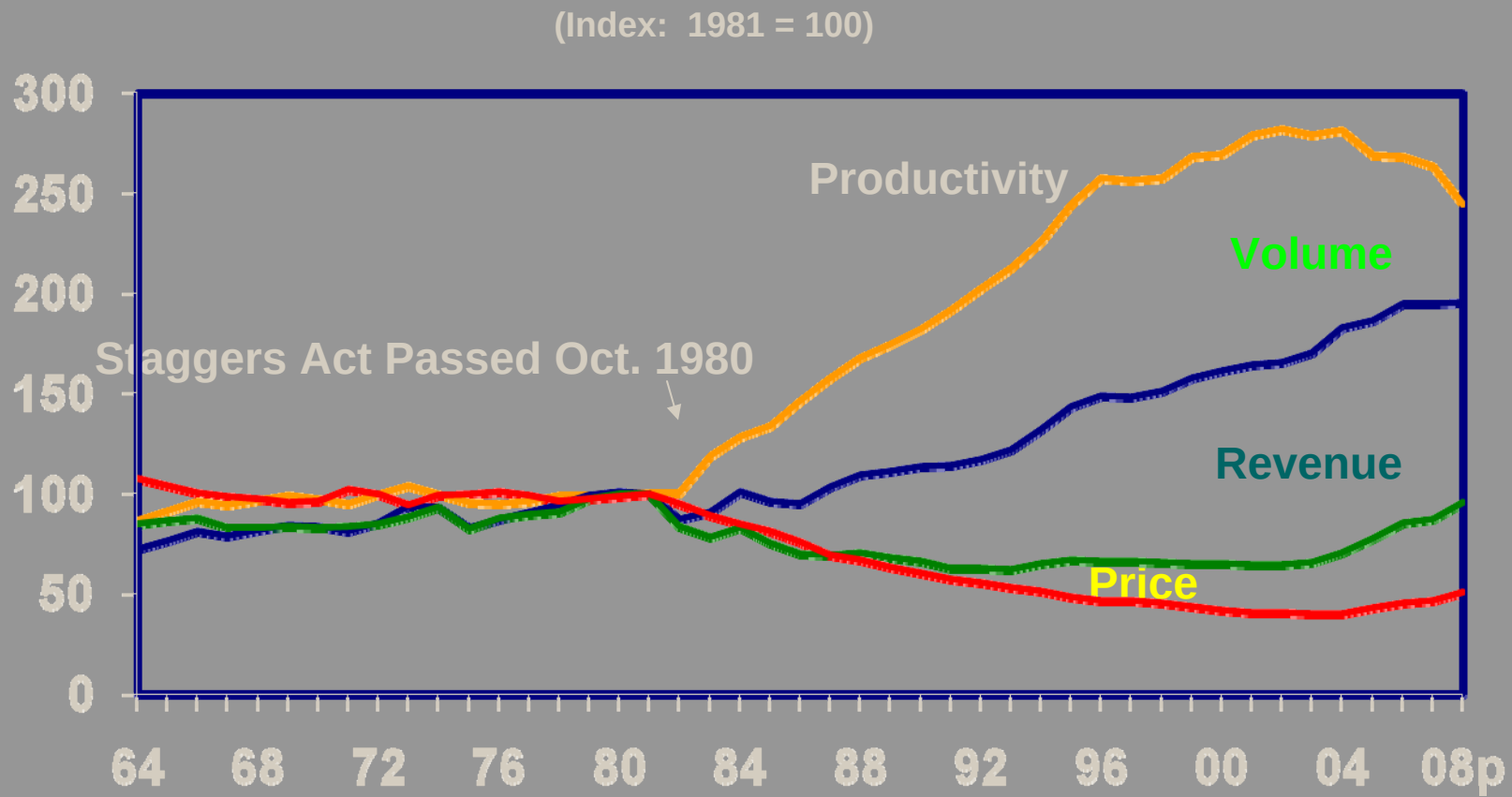
2. HSR Design Factors

HDR

Things to Think About…
Capacity (in terms of Passenger Trains)

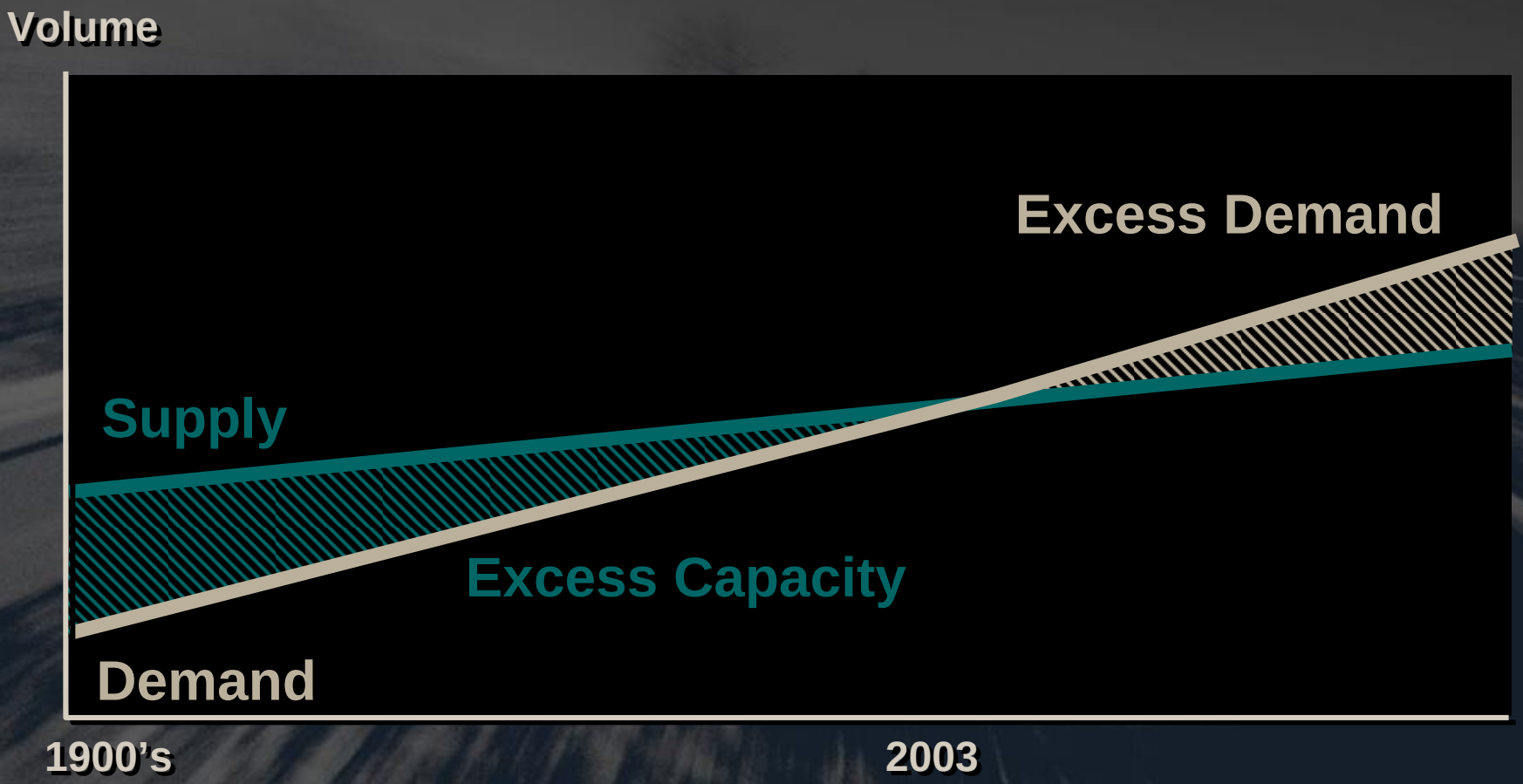
Rail Volumes	Low Passenger	High Passenger
Low Freight	X	X
High Freight	X	?

US Railroad Performance: 1964-08



Source: AAR

Transportation Supply and Demand



3500 Locomotives
450,000 rail cars stored
25-30% downturn since October 2008 with Autos down 50%

April 1, 2009 Testimony from Matt Rose before the House Committee on Appropriations Subcommittee on Transportation, Housing and Urban Development for a hearing on "The Future of High Speed Rail, Intercity Passenger Rail and Amtrak."

"…The Commission clearly called for the kind of investment needed to support passenger trains operating at the highest speeds in sealed, passenger-only separated right-of way…At sustained speeds in excess of 90 MPH, passenger train operations will need to be segregated from freight operations on separate tracks." - Matt Rose (BNSF's CEO & President)

HDR

Maintenance/Track Access Fees

- FRA Track Classification

Track Class	Max Speed Freight MPH	Max Speed Passenger MPH
4	60	80
5	80	90
6	-	110
7	-	125
8	-	160
9	-	200

Implications:
(1)Freight RR's maintain to FRA Class 4 (BNSF = 60 MPH)
(2)To Maintain 110 MPH, Passenger Operator will be required to maintain track at higher (Class 6) standards.
(3)More maintenance requires more track time for MW workers & less time for freight trains.

110 MPH is highest velocity allowed by FRA in a non-sealed corridor

High Speed Rail – Design Factors

Factor	Freight	High Speed Passenger
Vertical Alignment	Maximum 1.0% grade	TGV: up to 5%
Horizontal Alignment	Can negotiate 16 degrees but prefer 7.5 degrees or less	Maximum 2.0 degrees
Superelevation	4.5 inches	5 to 6 inches
Spirals	Nominal	Function of Speed
Tangent between Curves	150 – 500 feet	500 feet or more
Vertical Clearance	23.5 feet	Height of pantograph/OCS
Overtakes	48 miles double track required to accommodate 45 MPH freight operating between two opposing 90 MPH passenger trains	

What Speed?

- 79 MPH (FRA Class 4)
- 110 MPH (FRA Class 6)
  - Diesel/Electric
- 150 MPH (FRA Class 8)
  - Electric/OCS

Two Approaches

- Introduce Tilt-Body Equipment
  - Europe's experience
  - Talgo between Portland & Vancouver, BC
- Develop New Alignment

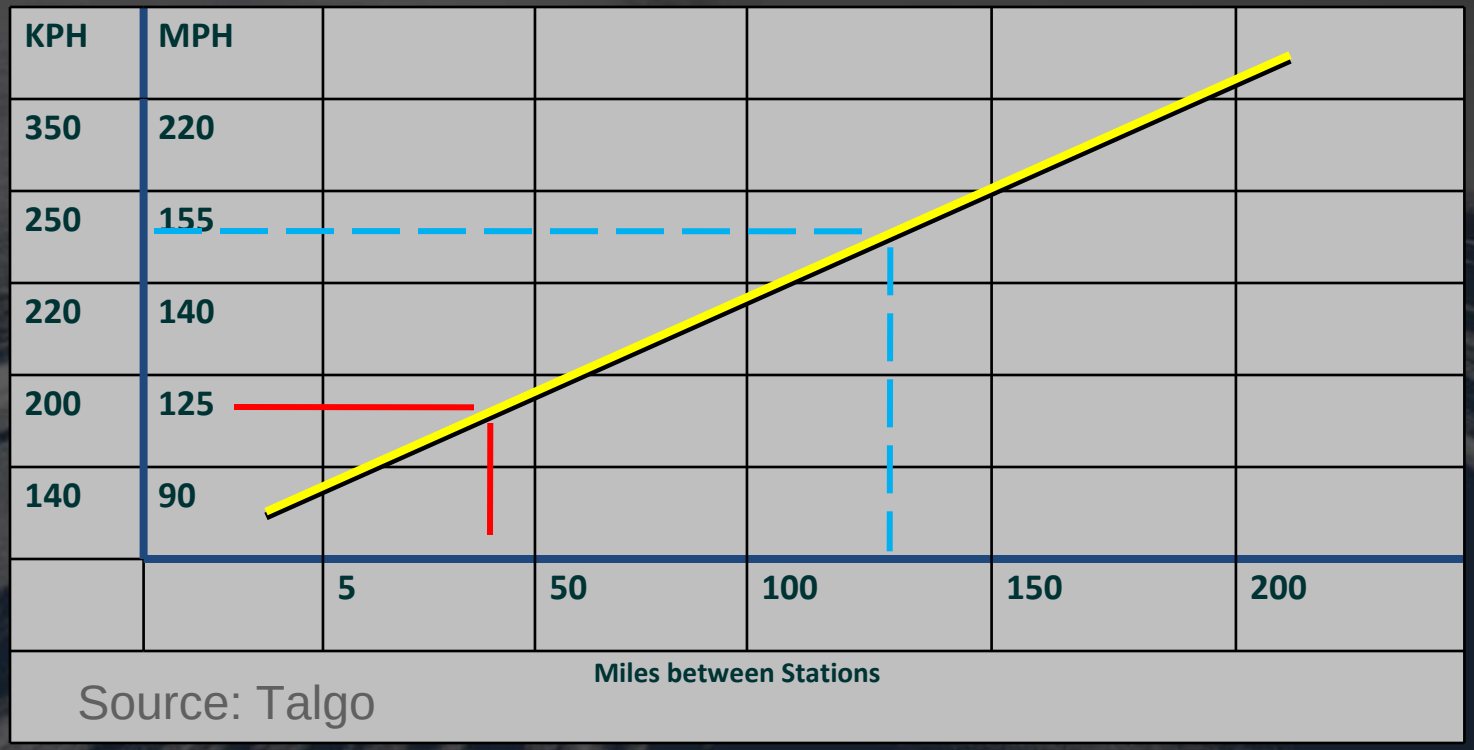
Why 110 MPH?

- Limits of GCP's (Grade Crossing Predictors)
- Need look out to 4800 feet for a train operating at 110 MPH with no overlapping crossings
- At- Grade Highway/Rail Crossings?
  - Sealed Corridor
  - Eliminate Crossing

Station Spacing – Portland/Seattle

From	To	Miles
Portland Union Station	Vancouver	9.9
Vancouver	Kelso	39.0
Kelso	Centralia	43.2
Centralia	Lacey	21.8
Lacey	Nisqually	-
Nisqually	Lakewood (74th St)	21.5
Lakewood	Tacoma	5.7
Tacoma	Tukwila	28.4
Tukwila	King Street Station	10.8
	Total:	180.3

Practical Maximum Speed as a function of Station Spacing



Source: Talgo

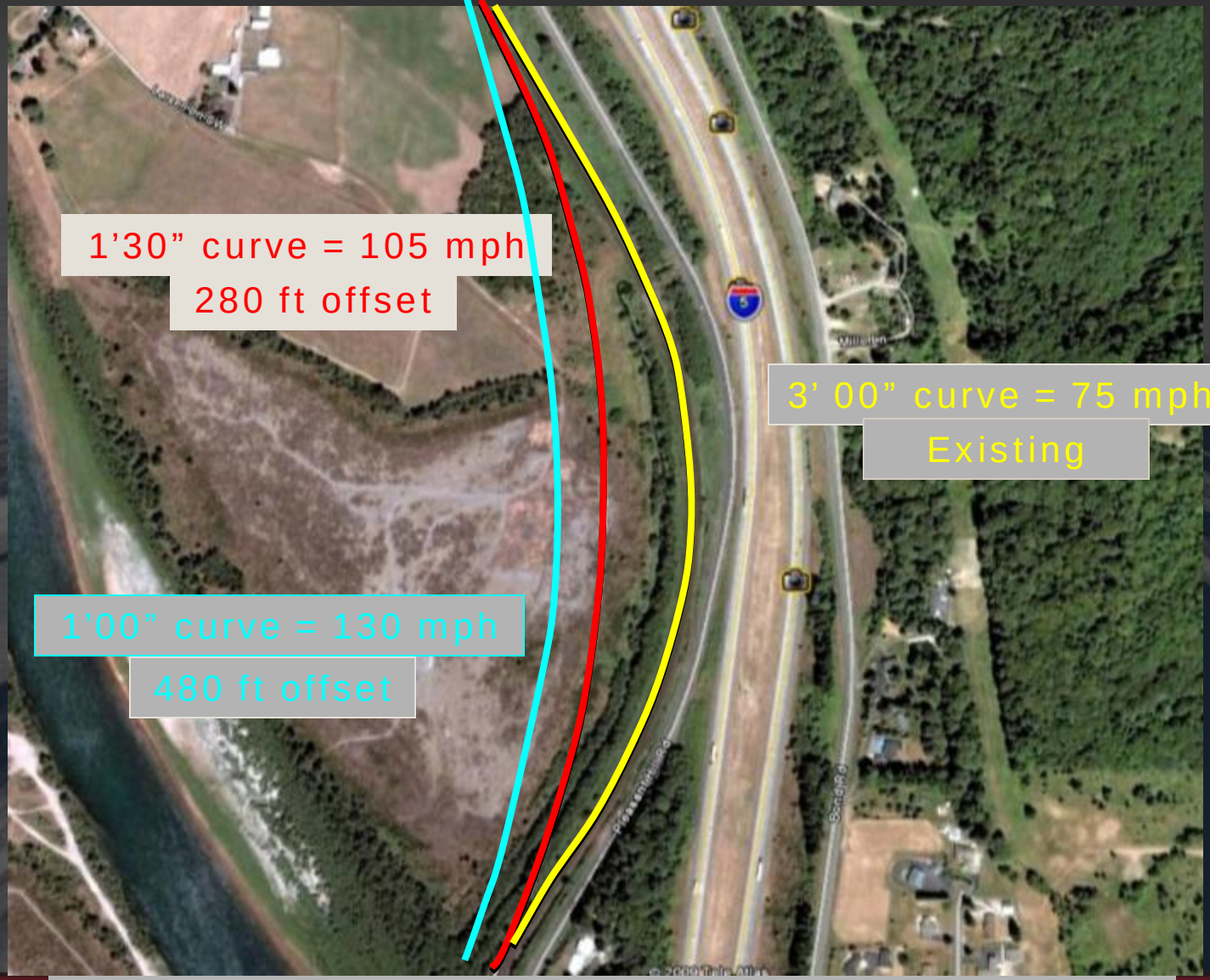
Curvature

115 curves between North Vancouver and Nisqually with a maximum of 3 degrees, 28 minutes

Degree	Radius Ft	Maximum Speed (MPH) – 7 inches	Maximum Speed (MPH) – 9 inches
0.5	11520	185	200
1.0	5760	130	140
1.5	3840	105	115
2.0	2880	90	100
2.5	2304	80	85
3.0	1920	75	80
3.5	1646	70	75

Assumes 5 inches super-elevation

Near Castle Rock

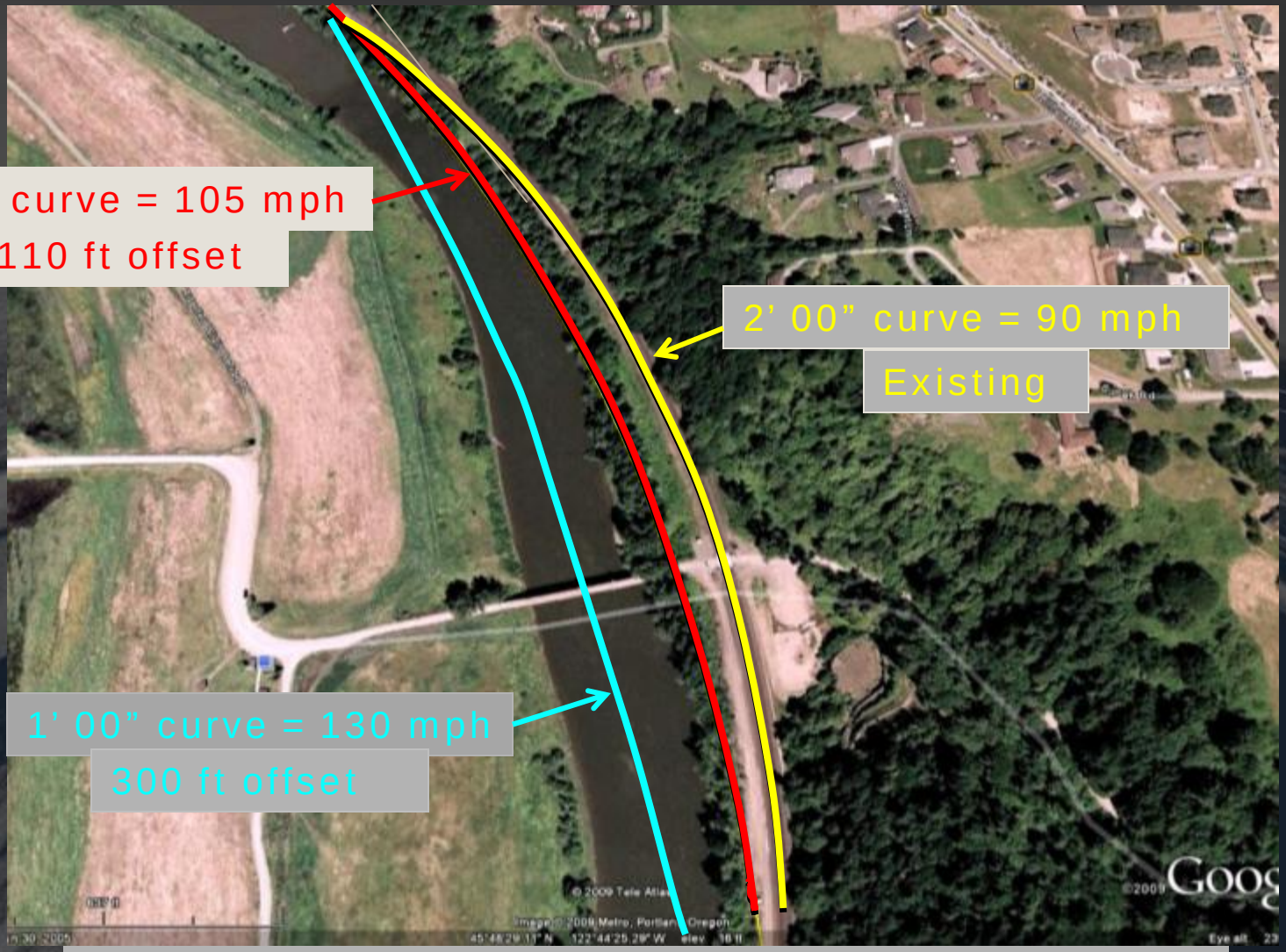


Assumes 5 inches super-elevation and 7 inches unbalance

Near Ridgefield

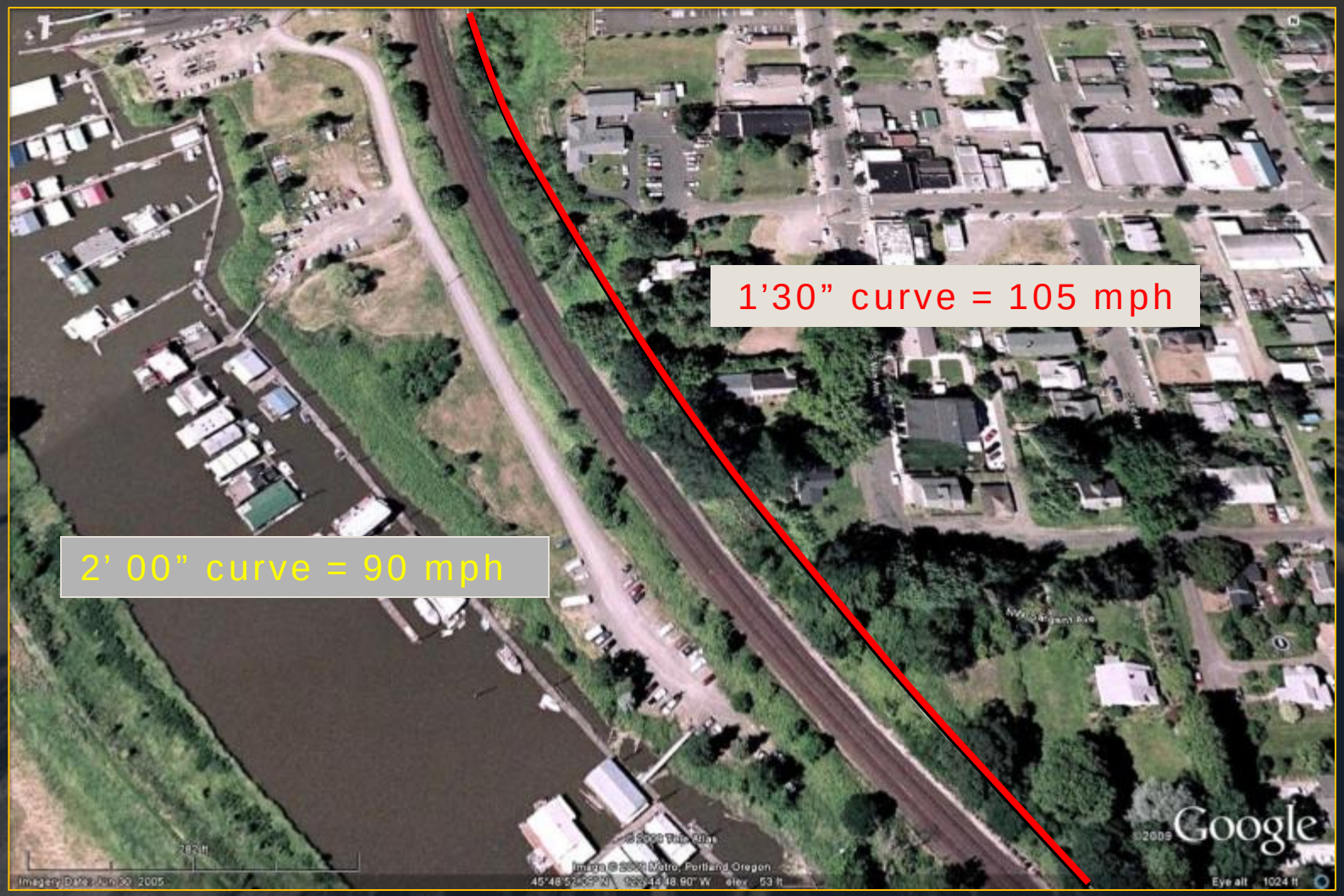
Assumes 5 inches super-elevation and 7 inches unbalance

Near Ridgefield



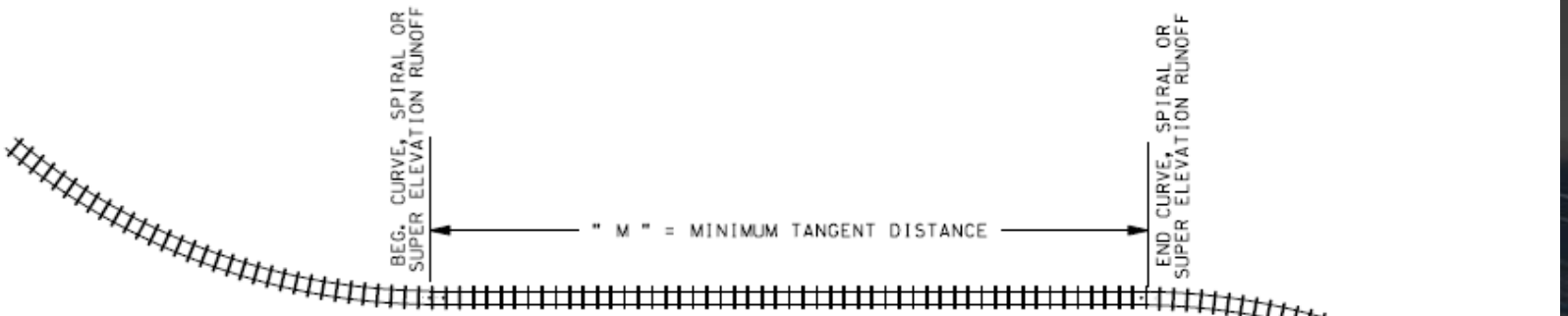
Assumes 5 inches super-elevation and 7 inches unbalance

Ridgefield



Assumes 5 inches super-elevation and 7 inches unbalance

Tangent between Curves



Track Speed – Type	Distance
60 MPH & above	500 feet
40- 59 MPH	300 feet
39 MPH & below	150 feet

Technical Issues:

Positive Train Control (PTC):
FRA Mandate 2015

Level Boarding – Gauntlet Track
Current FTA & FRA Mandate

Stimulus Funding vs PTC Implementation

1. Timing Issue
2. FRA will likely not provide funding for systems control unless it is PTC
3. Required wherever passenger trains and certain hazardous materials (TIH) are handled.
4. Mandate for Installation: 2015
5. **Interoperability Requirement**
6. Currently at the Rule-Making Level (UPRR, BNSF, NS & CSX)

HDR

Federal Railroad Administration (FRA) Compliancy Issues

- Crashworthiness Standards 49CFR 238.203
  - Heavy (difficult to accelerate & decelerate)
- The Issue: Crash Survivability vs Crash Avoidance
- Relevancy to PTC Mandate?
- Goal: Operate FRA Non-Compliant Vehicles that have been equipped with Crash Management Technology in a rail corridor where PTC has been implemented.

High Speed Rail - Key Issues

- Ownership – Who will own & operate system?
- Governance/Operation/Revenue Source
  - (over 32 IGAs needed to implement Washington County Oregon Commuter Rail)
- Track and Right-of-Way Ownership
- NEPA
- Freight Coordination/Industry Tracks
- Choice of Vehicles – Compliant? Non-Compliant?
- Power Supply: Diesel-Electric Locomotives or Overhead Catenary System (OCS) supplied Electrical Power?
- Stations/Lay-down Location(s)
- Last Mile Issues

Passenger Rail Governance:

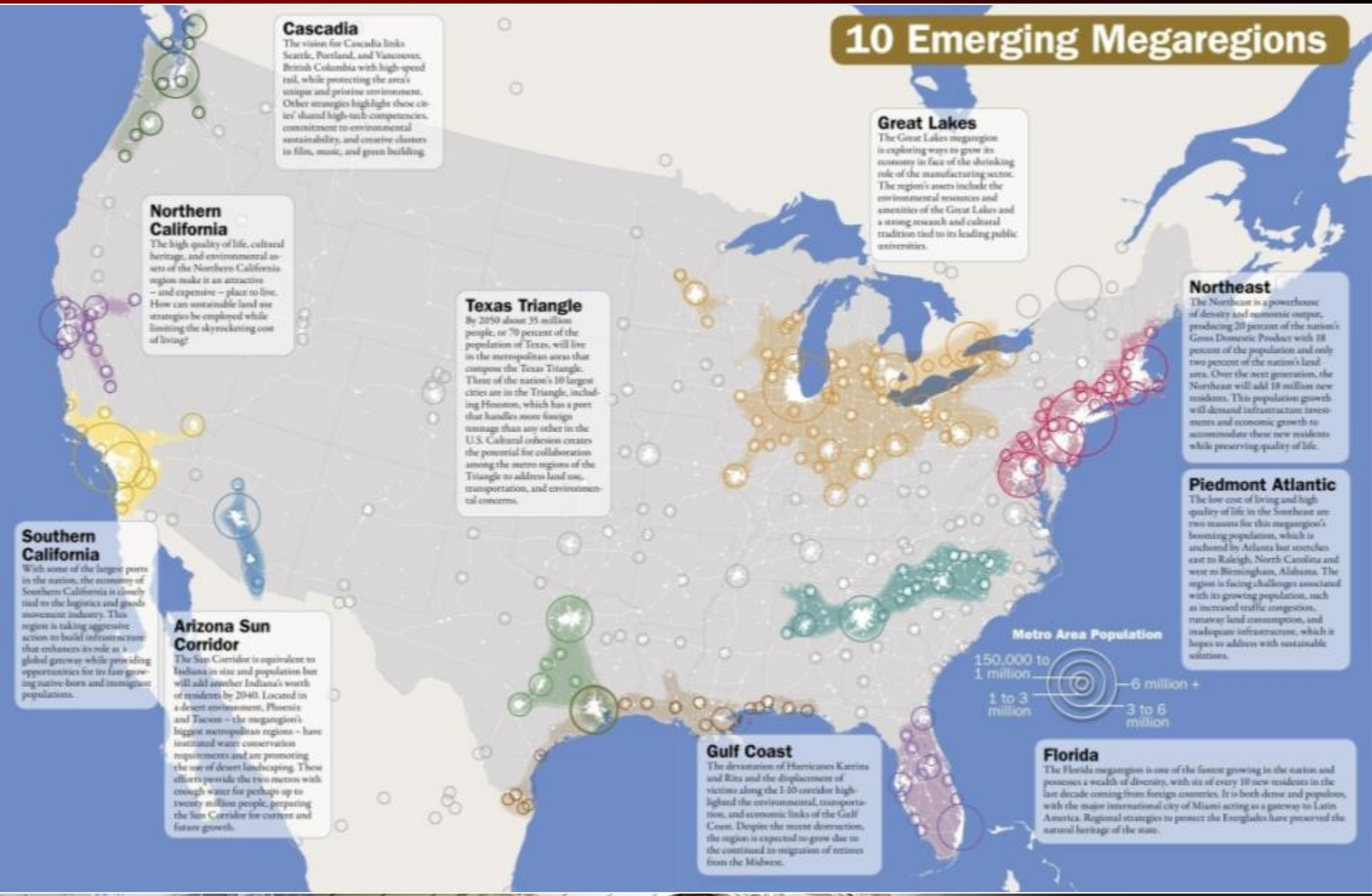
- Suggest new governance structure such as a Joint Powers Authority.
- Authority would have ability to acquire and spend funds, create taxing district, develop methodology for prorating revenues and costs, and provide security.
- This governance may require legislative mandate.
- Operating arrangement could assume Amtrak or any other entity that has safe operating experience as Operator.

HDR

Benefits of Passenger Rail

- No down-time while traveling. Each train equipped with WiFi.
- Save fuel using passenger rail.
- Reduction of Green House Gases (GHG).
- Jobs created during construction and permanent jobs created providing passenger rail service.
- Reduction of Vehicle Miles Traveled (VMT).
- Movement of freight via rail benefited by infrastructure improvements to railroad or if all passenger trains moved to stand-alone corridor.

3. Other HSR Pursuits


10 Emerging Megaregions
Cascadia
The vision for Cascadia links Seattle, Portland, and Vancouver, British Columbia with high-speed rail, while protecting the area's unique and pristine environment. Other strategies highlight these cities' shared high-tech competencies, commitment to environmental sustainability, and creative clusters in film, music, and green building.
Northern California
The high quality of life, cultural heritage, and environmental assets of the Northern California region make it an attractive – and expensive – place to live. How can sustainable land use strategies be employed while limiting the skyrocketing cost of living?
Great Lakes
The Great Lakes megaregion is exploring ways to grow its economy in face of the shrinking role of the manufacturing sector. The region's assets include the environmental resources and amenities of the Great Lakes and a strong research and cultural tradition tied to its leading public universities.
Texas Triangle
By 2050 about 35 million people, or 70 percent of the population of Texas, will live in the metropolitan areas that compose the Texas Triangle. Three of the nation's 10 largest cities are in the Triangle, including Houston, which has a port that handles more foreign tonnage than any other in the U.S. Cultural cohesion creates the potential for collaboration among the metro regions of the Triangle to address land use, transportation, and environmental concerns.
Northeast
The Northeast is a powerhouse of density and economic output, producing 20 percent of the nation's Gross Domestic Product with 18 percent of the population and only two percent of the nation's land area. Over the next generation, the Northeast will add 18 million new residents. This population growth will demand infrastructure investments and economic growth to accommodate these new residents while preserving quality of life.
Piedmont Atlantic
The low cost of living and high quality of life in the Southeast are two reasons for this megaregion's booming population, which is anchored by Atlanta but stretches east to Raleigh, North Carolina and west to Birmingham, Alabama. The region is facing challenges associated with its growing population, such as increased traffic congestion, runaway land consumption, and inadequate infrastructure, which it hopes to address with sustainable solutions.
Southern California
With some of the largest ports in the nation, the economy of Southern California is closely tied to the logistics and goods movement industry. This region is taking aggressive action to build infrastructure that enhances its role as a global gateway while providing opportunities for its fast growing native-born and immigrant populations.
Arizona Sun Corridor
The Sun Corridor is equivalent to Indiana in size and population but will add another Indiana's worth of residents by 2040. Located in a desert environment, Phoenix and Tucson – the megaregion's biggest metropolitan regions – have instituted water conservation requirements and are promoting the use of desert landscaping. These efforts provide the two metros with enough water for perhaps up to twenty million people, preparing the Sun Corridor for current and future growth.
Metro Area Population
150,000 to 1 million
1 to 3 million
3 to 6 million
6 million +
Gulf Coast
The devastation of Hurricanes Katrina and Rita and the displacement of victims along the I-10 corridor highlighted the environmental, transportation, and economic links of the Gulf Coast. Despite the recent destruction, the region is expected to grow due to the continued in-migration of retirees from the Midwest.
Florida
The Florida megaregion is one of the fastest growing in the nation and possesses a wealth of diversity, with six of every 10 new residents in the last decade coming from foreign countries. It is both dense and populous, with the major international city of Miami acting as a gateway to Latin America. Regional strategies to protect the Everglades have preserved the natural heritage of the state.


HDR


HIGH-SPEED RAIL
CORRIDOR DESIGNATIONS
CANADA
MEXICO
Vancouver, BC
Seattle
PACIFIC NORTHWEST
Portland
Eugene
Sacramento
Bay Area
CALIFORNIA
Los Angeles
San Diego
Minneapolis/St. Paul
Milwaukee
Chicago
CHICAGO HUB NETWORK
Kansas City
St. Louis
Indianapolis
Louisville
Cincinnati
Detroit
Cleveland
Toledo
Buffalo
Montreal
Portland/Auburn
NORTHERN NEW ENGLAND
Boston
Springfield
EMPIRE
Albany
New Haven
New York City
KEYSTONE
Philadelphia
Pittsburgh
Columbus
Harrisburg
Washington, D.C.
Baltimore
Richmond
Hampton Roads
SOUTHEAST
Raleigh
Charlotte
Greenville
Atlanta
Columbia
Savannah
Jacksonville
Orlando
Tampa
FLORIDA
Miami
Tulsa
Oklahoma City
Little Rock
SOUTH CENTRAL
Texarkana
Dallas/Ft. Worth
Austin
San Antonio
Houston
GULF COAST
Meridian
Birmingham
Macon
Mobile
New Orleans
Northeast Corridor Main Line (Not a "Designated Corridor")
Designated Corridors
U.S. Department of Transportation
Federal Railroad Administration
10/19/2005

National HSR Pursuits
Current Status

Region	Location	Status	Max Speed Considered
Boston - Montreal	also via New Haven & Springfield	Study Initiated	110 MPH
NY State	Empire Corridor	Just getting started	110 MPH
Virginia & North Carolina	I-95 Corridor	Study Initiated	110 MPH
Florida – FOX	Orlando – Tampa Bay & Orlando to Miami	Consultant Selected	185-220 MPH
Gulf States	LA, MS, AL	Just getting started	110 MPH


National HSR Pursuits
Current Status

Region	Location	Status	Max Speed Considered
Midwest Rail	With Chicago as a Hub, reaching out to MSP, Madison, Detroit, Toledo, among other cities.	Study Initiated – Incremental HSR within Active Freight RR Corridors	110 MPH
Illinois	Chicago-Springfield-St. Louis	Underway after meeting with UPRR	110 MPH
Texas	Texas T-Bone connecting Houston with Austin and DFW area	Meeting with DBOM Consortiums	185-220 MPH
California	Multiple Corridors	Study well underway; $9.95B bonding passed by CA voters	220 MPH


4. HSR in Washington & Oregon

HDR

WSDOT Mid Range Plan & ARRA Request

$1.3 Billion Request:

- Increase Service Frequency to 8 RTP Seattle to Portland
- On Time Performance increases 62% to 95%
- Increases Ridership to 890K
- Travel Time Reduction 5 Min. for Pt Defiance
- Selected segments have been designed for 110 mph operation

HSR 110 mph Initial Segment

- Lakewood to N. Vancouver 120 Miles, Conventional (79MPH PDX to North Vancouver & between Lakewood and King Street Station) with 5 station stops.
- Single Main Track w/ Passing Tracks
- Compliant Equipment?
- Propulsion: Diesel/Electric Locomotives
- Dedicated ROW within BNSF corridor
- Positive Train Control
- Implement Program to Grade Separate All At-Grade Crossings within 20 yrs
- BNSF Corridor Hardening
- RESULT: 2 hours 30 minutes run-time PDX to King Street Station

HSR 110 mph Initial Segment

1. Concept Agreement w/BNSF
2. Insitutional Issues Resolved
3. BNSF/WSDOT MOU
4. Programmatic EIS
5. PH 1 Projects EIS
6. Preliminary Engineering
7. R/W Acquisition
8. D/B Procurement
9. D/B Construction

Oregon HSR

Current:

1. Two Cascade Service Trains
2. One Intercity Los Angeles to Seattle Train
3. UPRR – Portland to Eugene: Single Track with Sidings with approximately 20-25 TPD
4. 82 miles of tangent track
5. OE Alignment: ODOT Rail focusing on implementing passenger service on OE alignment with 57 Miles of tangent track

5. Discussion

HDR

Contact Information:

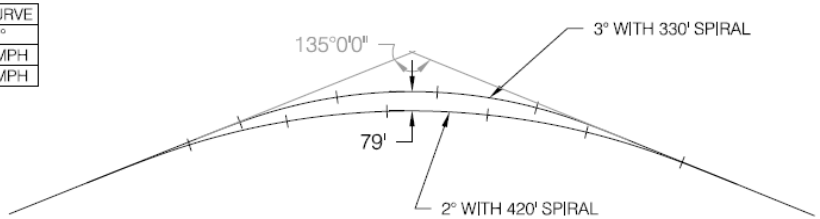
Kurt Reichelt
Vice President
HDR, Inc.
1001 SW 5th, Suite 1800
Portland, OR 97204
503 423 3836
Kurt.Reichelt@hdrinc.com

Additional slides

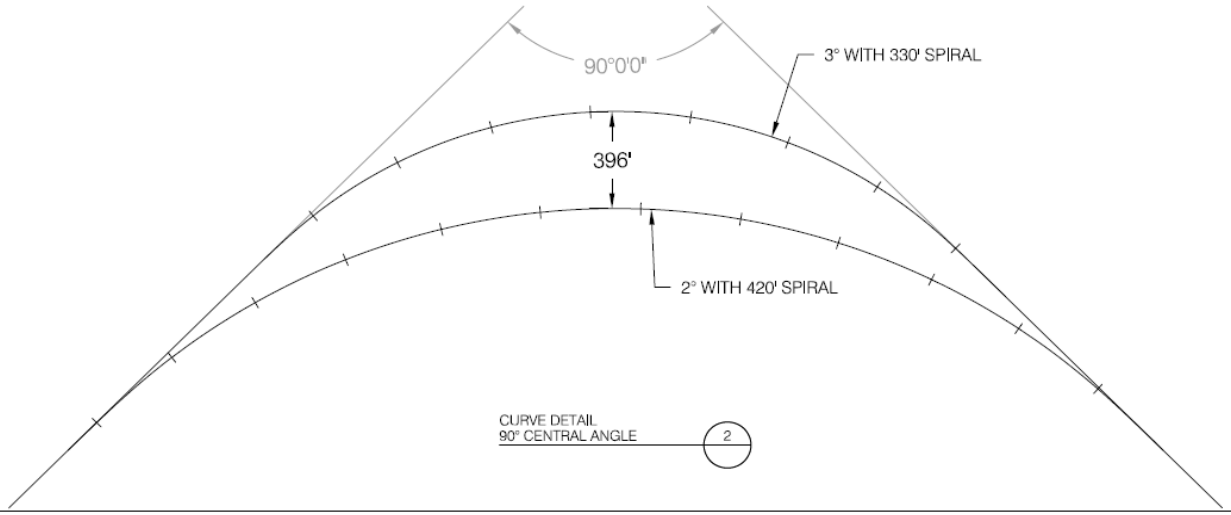
Curve Reduction

MAXIMUM AUTHORIZED SPEED
(5-INCH SUPER)

UNBALANCED	DEGREE OF CURVE	
	2°	3°
3-INCHES	75 MPH	61 MPH
7-INCHES	92 MPH	75 MPH



CURVE DETAIL
135° CENTRAL ANGLE (1)



CURVE DETAIL
90° CENTRAL ANGLE (2)