

William W. Hay Railroad Engineering Seminar

“7 Disciplines of Engineering at Union Pacific Railroad”



Eric Gehringer

Assistant Vice President of Track Programs,
Union Pacific Railroad



Date: Friday, April 28, 2017
12:15pm

Time: Seminar Begins

Location: Newmark Lab, Yeh Center, Room 2311
University of Illinois at Urbana-Champaign

Students welcome and
encouraged to attend!

Sponsored by





BUILDING AMERICA®

**The Ties
That Bind
a Nation:
Union Pacific**



2016 Fast Facts

\$19.9 B Revenue

8.5 mil Carloads of Freight

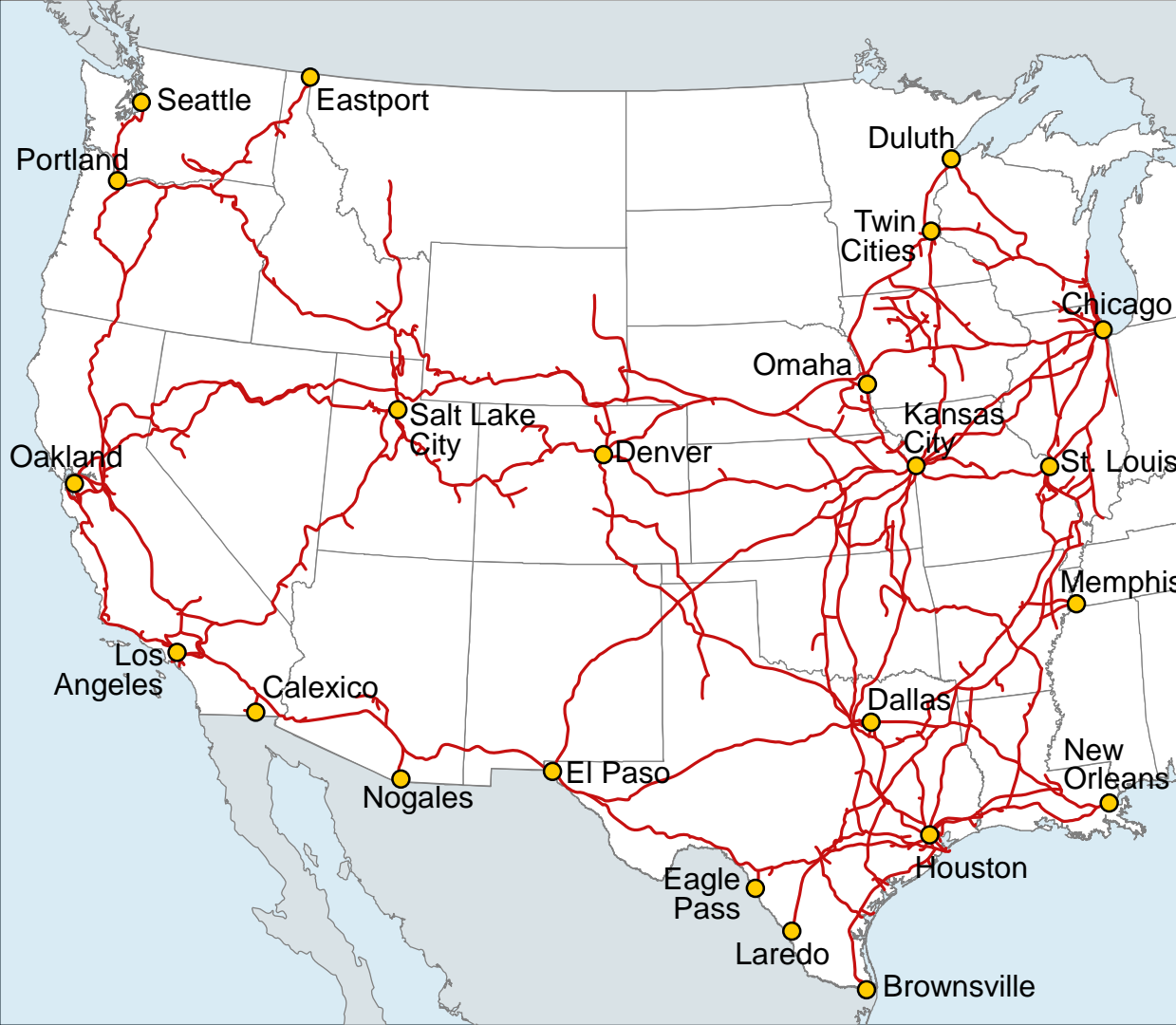
10,000 Customers

**32,100 Route Miles in
23 States**

42,900 Employees

\$4.1 B Annual Payroll

8,000 Locomotives

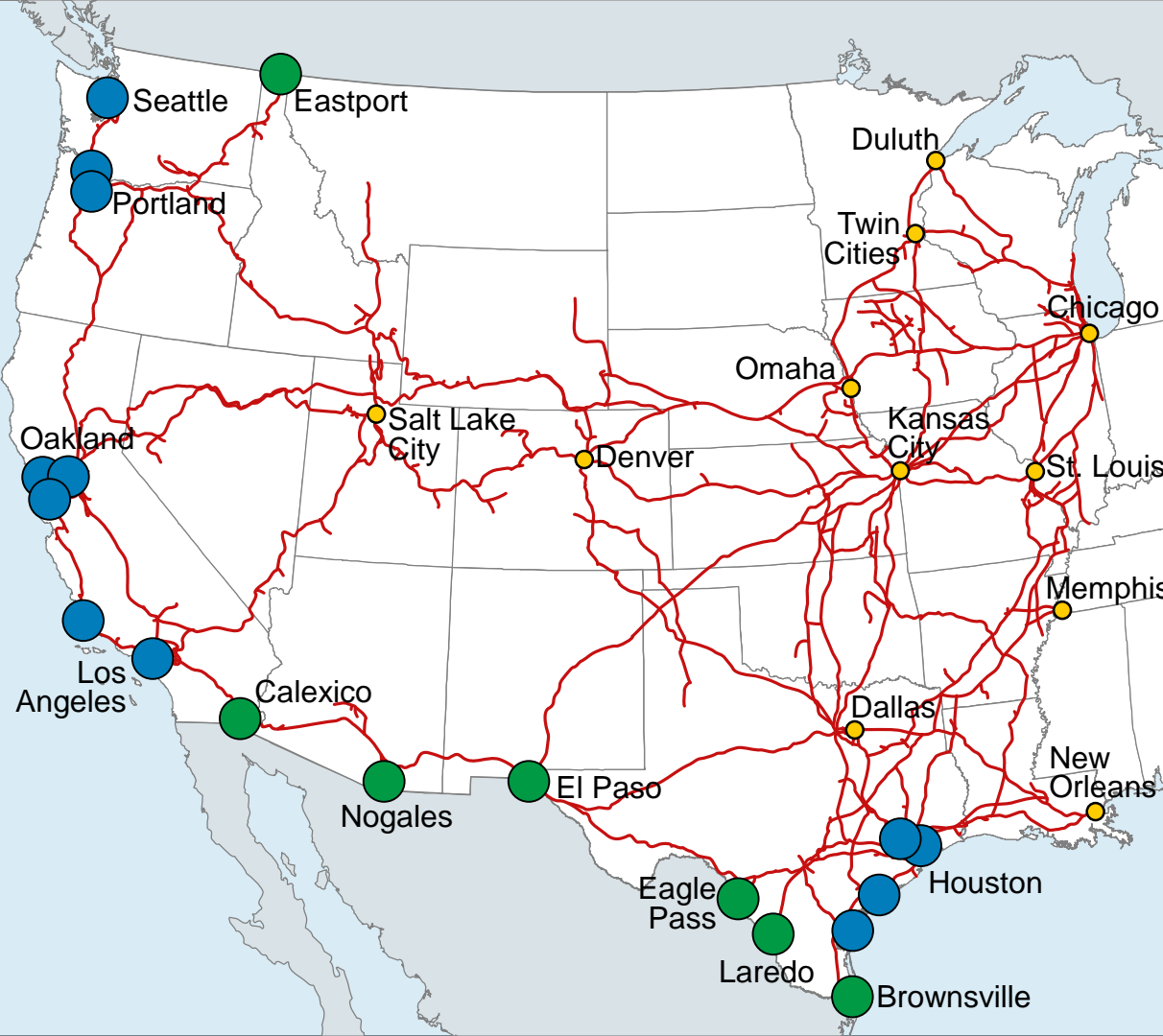




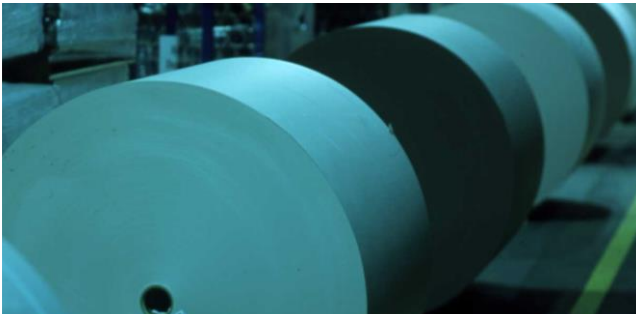
Strength of a Unique Franchise

● Port Access

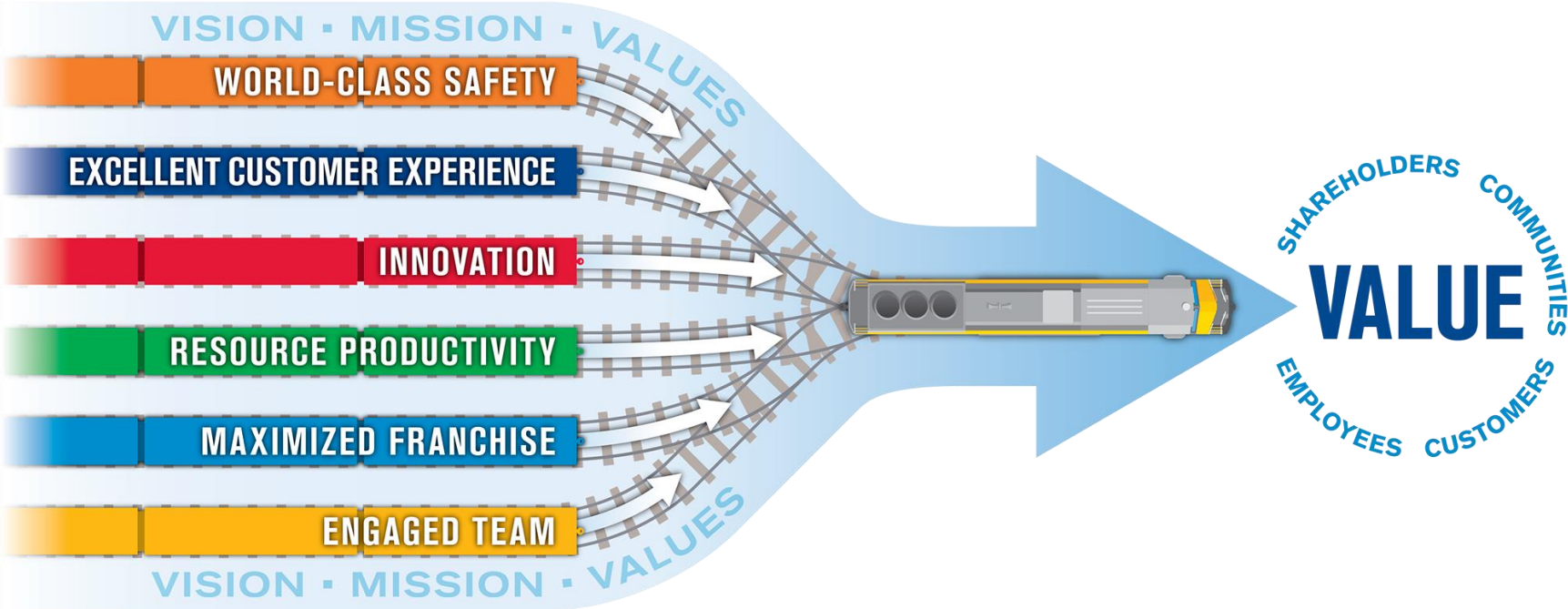
● Border Crossings



Union Pacific Hauls . . .

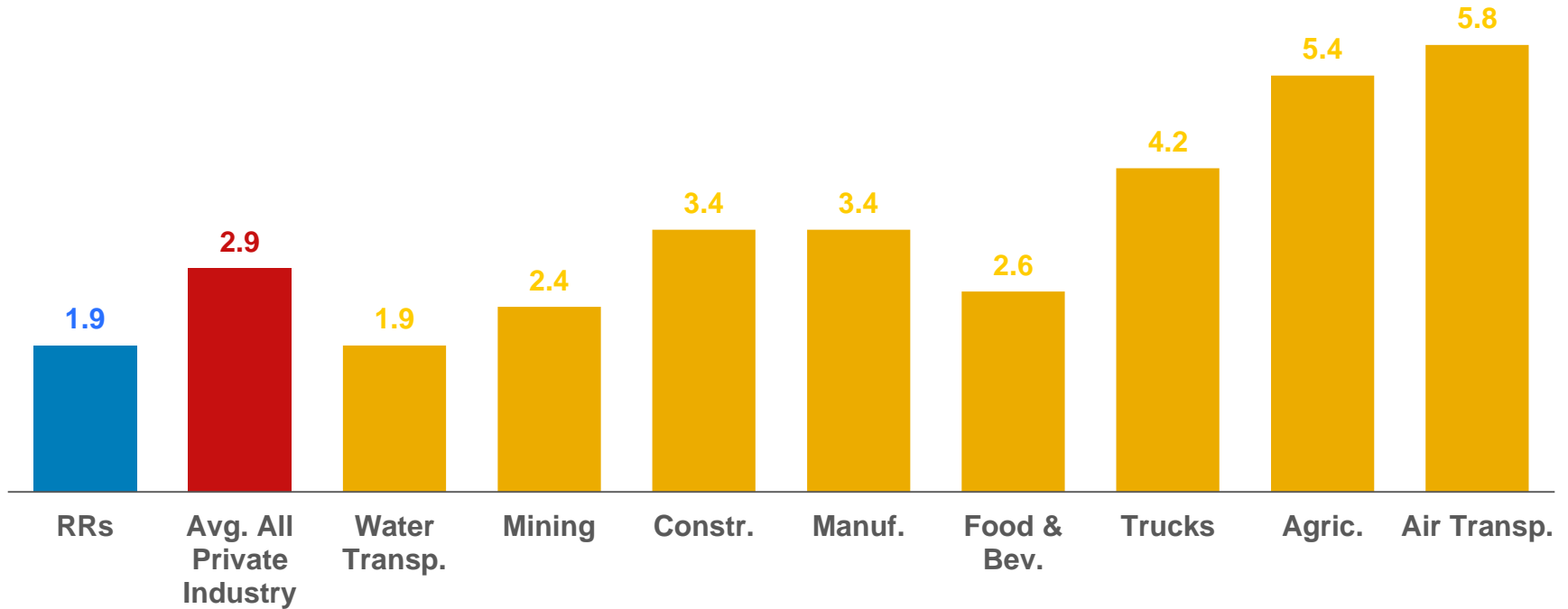


Creating Value the UP Way



Rails Are One of America's Safest Industries

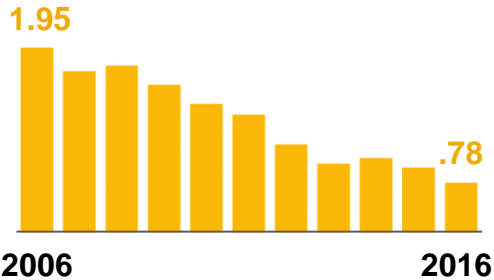
Injuries and illnesses per 100 Full-time Employees, 2015



Safety is Top Priority

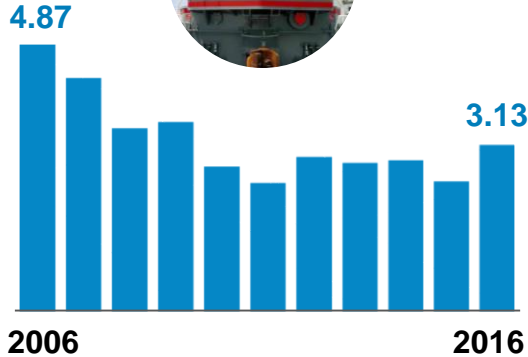


↓60%
EMPLOYEE



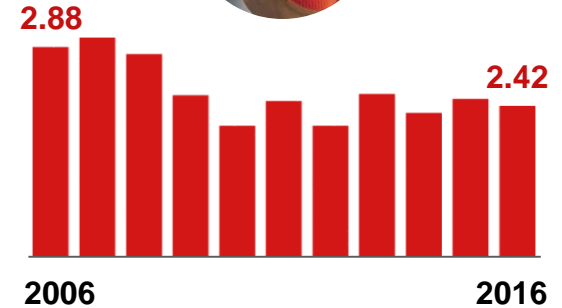
Reportable Injuries
Per 200,000 Employee Hours

↓29%
RAIL EQUIPMENT



Reportable Rail Equipment Incidents
Per Million Train Miles

↓16%
CROSSING



Crossing Accidents
Per Million Train Miles

Armour Yellow Outside Green Inside



- One train takes several hundred trucks off congested highways
- Rail is almost four times more fuel efficient than trucks
- UP can haul one ton of freight 452 miles on one gallon of diesel fuel



Strengthening the Franchise



*In millions. Includes cash capital, leases and other non-cash capital.



OUR MISSION

The men and women of Union Pacific are dedicated to serve.

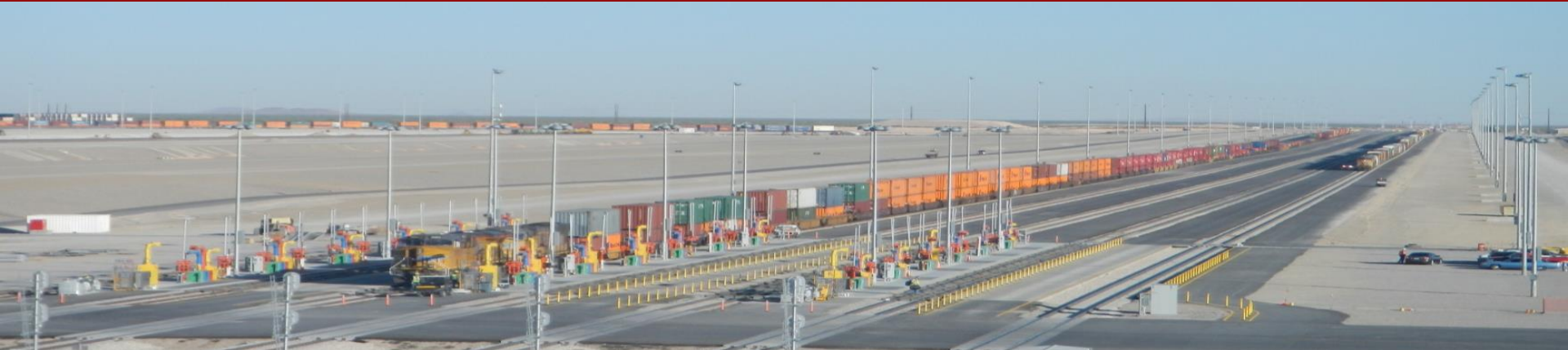
OUR VALUES

Passion for performance
High ethical standards
Work as a team

7 DISCIPLINES OF ENGINEERING UNION PACIFIC RAILROAD



Eric Gehringer – Assistant Vice President



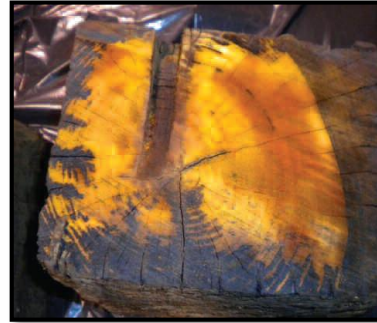
Engineering

Material Management/Design



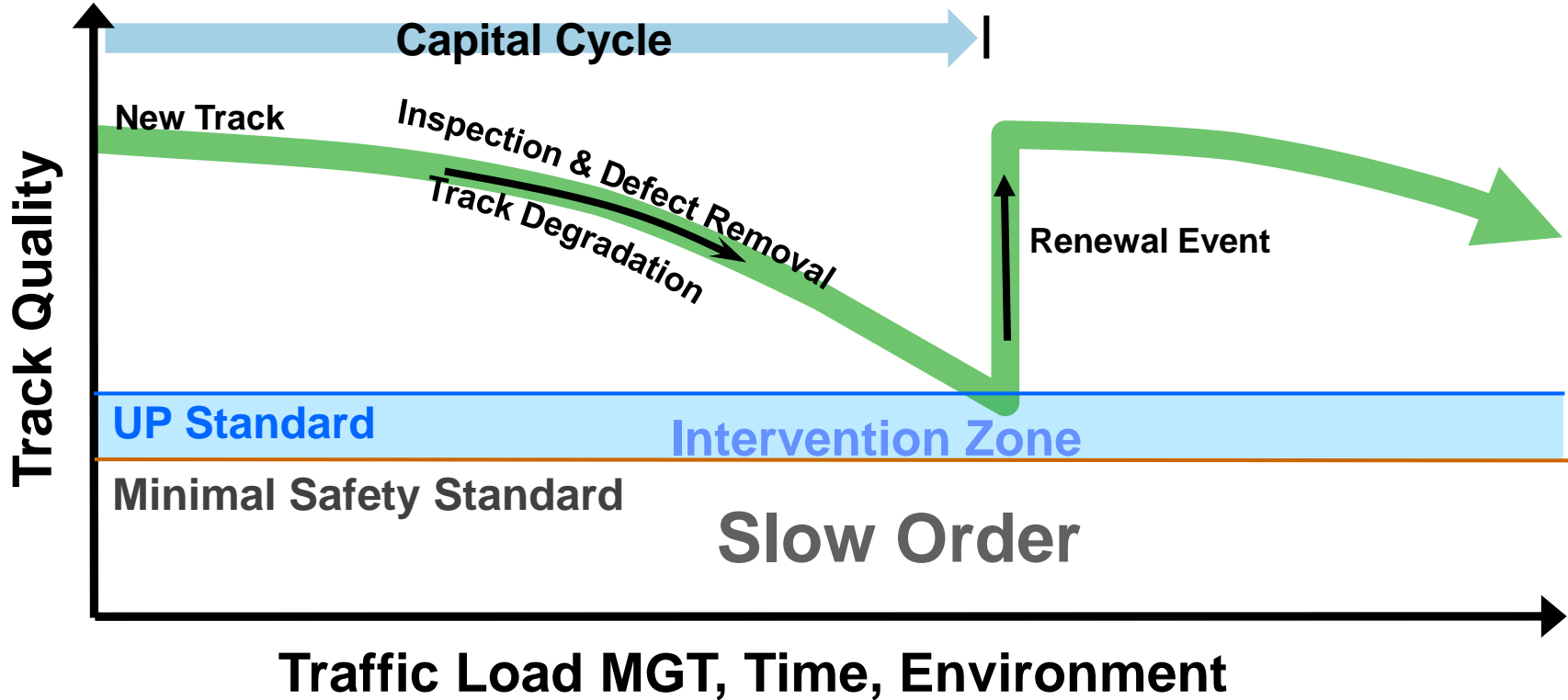
Strategic Focus Areas

- Tie treatments
- Composite ties
- Concrete ties
- Concrete OTM (pads & insulators)
- Elastic fasteners
- Tie spacing
- In-track condition monitoring
- Asset life cycle modeling



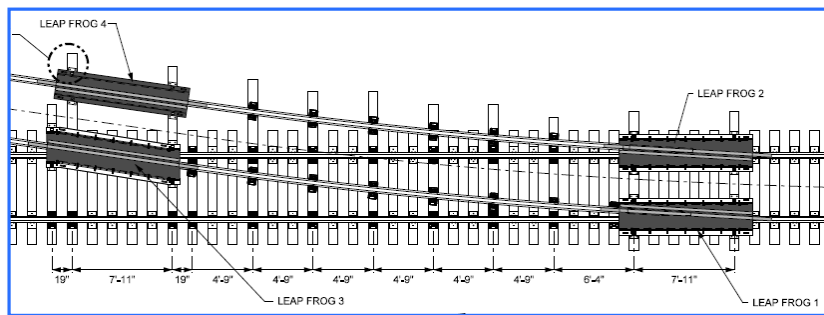
Engineering

Transportation – Consistent System Performance

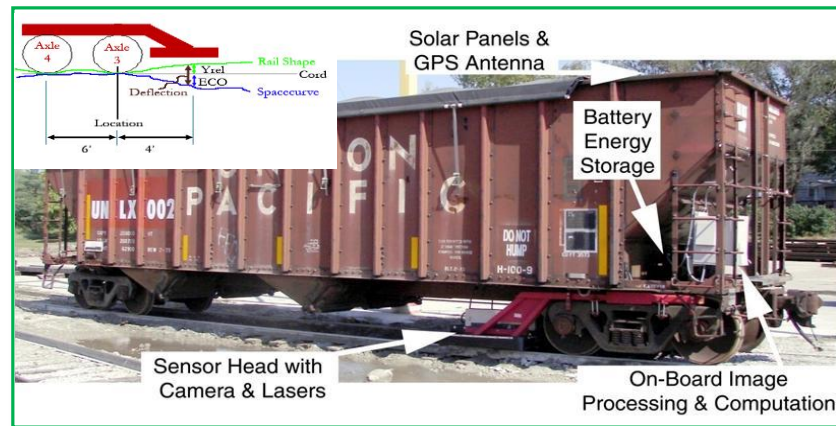


Engineering Transportation

Minimize Footprint



Risk Identification

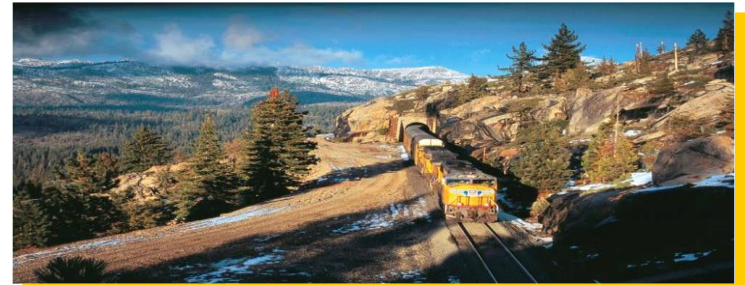


Engineering Structures



Strategic Focus Areas

- Condition monitoring sensors
- Critical event monitoring sensors
- Drone technology
- Fire detection
- Fire prevention
- Laminated wood products
- Predictive life cycle asset modeling



Engineering Environmental



Union Pacific Environmental Policy

Union Pacific Railroad is committed to protecting the environment now and for future generations by continuously improving our management systems and operating efficiency while developing and investing in technology to reduce the company's environmental footprint.

Our employees understand that protecting the environment is part of every job. Union Pacific employees, customers, shareholders and the more than 7,000 communities we serve and call home can expect our full compliance with all laws and regulations and the pursuit of continuous improvement in our environmental performance.

We are dedicated to maintaining our leadership role in providing safe, reliable, fuel-efficient and environmentally responsible freight transportation of the goods American families and business need.

A handwritten signature in black ink, likely belonging to a Union Pacific executive.



Strategic Focus Areas

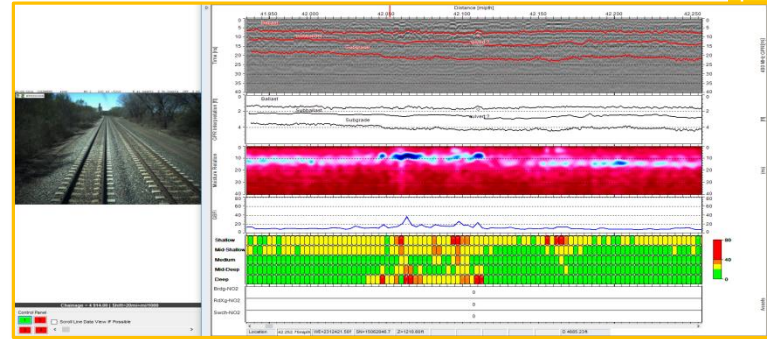
- Define environmental aspects, requirements, & required training
- Prevent, prepare for & respond to incidents that can harm human health & the environment
- Monitor environmental performance
- Evaluate compliance & risk

Engineering Geotechnical



Strategic Focus Areas

- Application of GPR data sources
- Expansive clays
- Effectiveness of shoulder cleaning
- Underlayments (geo-web, HMA)
- Effectiveness of shear key strategies
- Effectiveness of soil nails



Engineering

Construction Management



- Adding track capacity
 - 2nd Main tracks
 - Sidings
 - Siding extensions
- Promoting commercial development
 - Intermodal yards
 - Automotive yards
 - Industrial parks
 - Industrial lead tracks
 - Switch installation
- Yards
 - Classification
 - Storage in Transit (SIT)
 - Local customer support
- Facilities
 - Yard offices
 - Crew change locations
 - Border security
 - Fueling
 - Gatehouse admin buildings
 - Waste water treatment
 - Automatic Gate Systems



ILLINOIS HIGH SPEED RAIL

Multimodal Improvement Project



IL High Speed Rail

Project Scope

- Passenger and Freight joint–use corridor
- Primarily single track with 13+ sidings
- Upgrades for passenger speeds of up to 110mph
- Reduced travel time
- Improvements for reliable service



IL High Speed Rail Infrastructure Investment

- 262 miles of track rehabilitation
- 57 miles 2nd Main Line construction
- 15 new or improved sidings
- 234 improved grade crossings
- 38 major structures
- Advanced signaling system (PTC)



*Civil
Engineering*



*Track &
Structural
Engineering*



*Final
Product*



SANTA TERESA

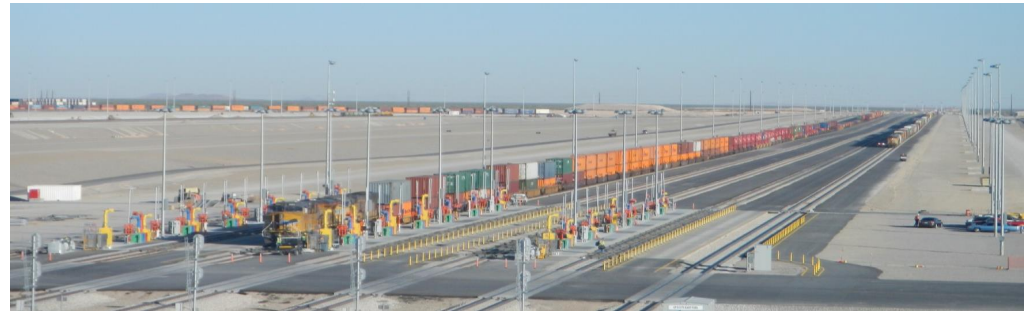
Run Through, Intermodal Yard & Fueling Facility Project



Santa Teresa

Project Scope

- 45 trains per day capacity
- 30 mph speed through fueling facility
- Track design to utilize wood, steel and concrete ties
- 2 tracks must be in service at all times during construction



Santa Teresa

Cross Functional Facility w/ Extensive Foot Print



West Fueling Facility

East Fueling Facility

Intermodal Yard

Block Swap Yard



TOWER 55 – FT. WORTH, TX

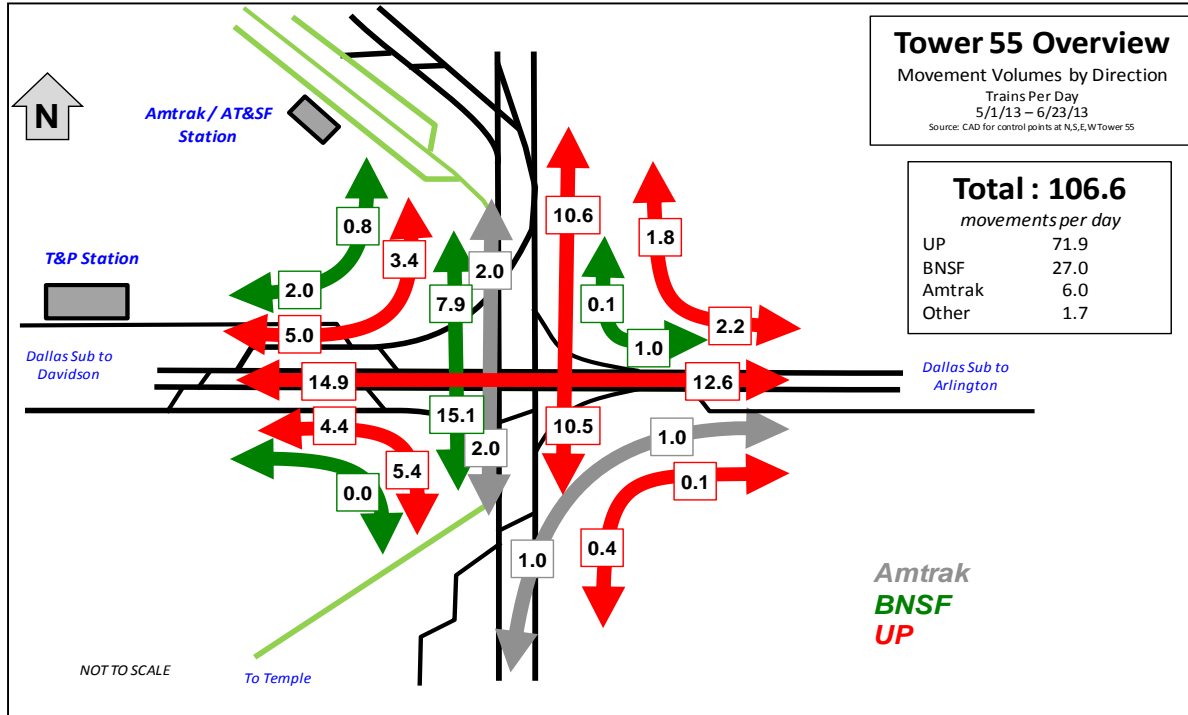
Multimodal Improvement

System Velocity



Tower 55 – Ft. Worth, TX

Flow Pattern Drives Project Demand



Project Challenges:

- Confined work area
- Overhead and pier obstructions
- Coordination with stakeholders
- Subgrade condition
- Working under traffic
- Neighborhood relationships

Tower 55 – Ft. Worth, TX

Project Scope

- 3rd north/south mainline
- Four slots north of tower
- Reduced curvature
- Switch Improvements
- Widened bridges
- Signal Improvements
- Increased mainline speed



17 Months of Construction Drove 25% Increase in Train Speed

Construction Management Responsibilities

- Manage all aspects of construction including
 - Grading
 - Building
 - Track work
 - Electrical systems
 - Bridges
 - Drainage systems
 - Culverts
 - Utilities
 - Pavement
- Professional management of various contractors including invoice payment
- Insure compliance with federal, state and local laws
- Insure compliance with environmental permitting requirements



Construction Management

Responsibilities (cont.)

- Provide onsite engineering expertise to both internal and external customers
- Manage the work in progress inventory for all track material by ensuring arrival and installation
- Assure construction is delivered at the lowest cost and results in the highest quality product
- Minimize local customer service disruptions and through-freight train delays.

