

INTRUSION PROTECTION BARRIERS (IPB)

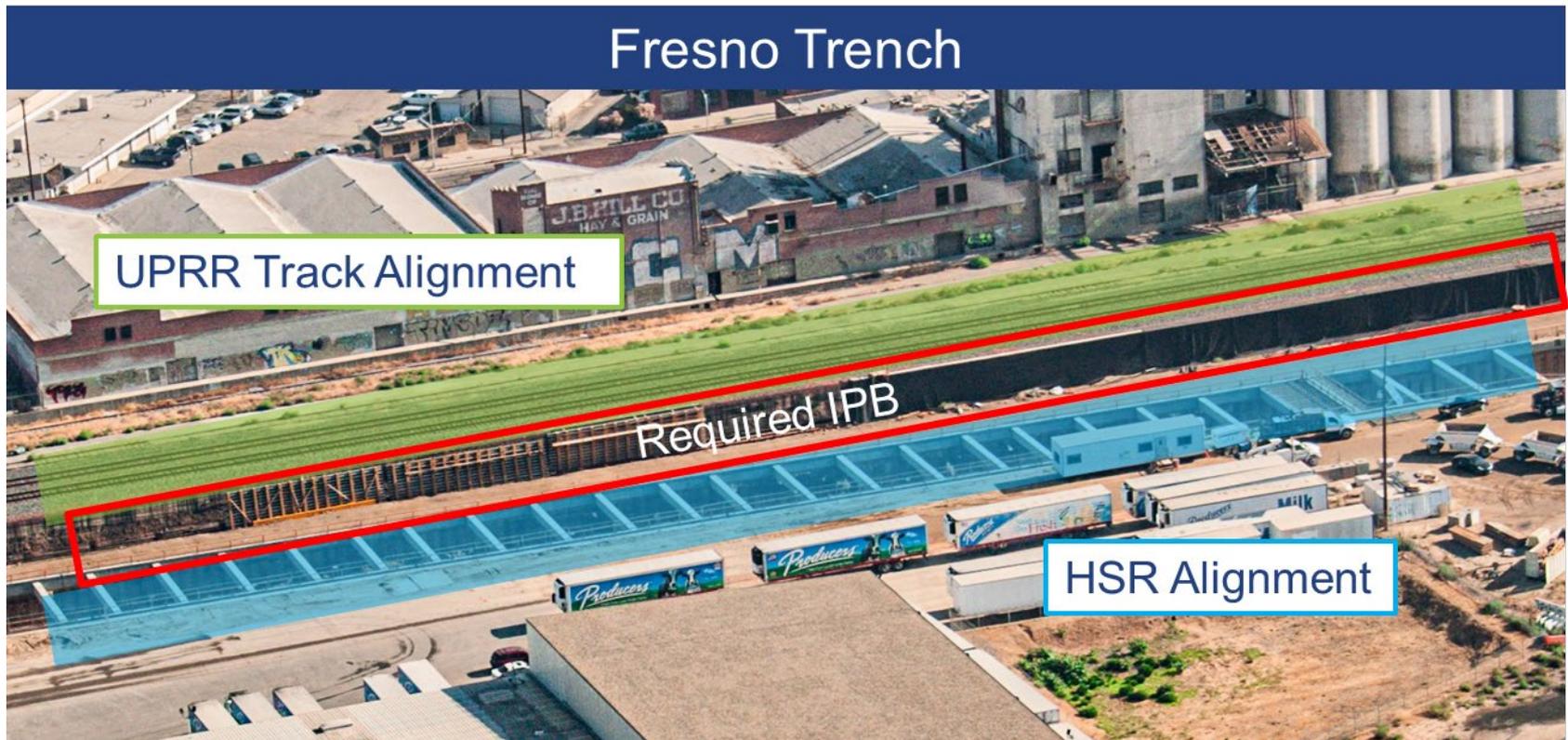
Frank Vacca, Chief of Rail Delivery & Operations
Garth Fernandez, Contract Manager CP 1
Ben Ruiz, Contract Manager CP 2/3
Steve Milton, Contract Manager CP 4

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INTRUSION PROTECTION BARRIER (IPB)

- Allows for use of an **adjacent corridor** with freight rail.
- A **critical safety measure** to avoid possible train derailment onto another party's tracks.



IPB EXAMPLE



IPB TIMELINE

2008 – 2016

Design Criteria Development & Railroad Negotiations

To meet ARRA funding objectives, contracts were issued between 2013 and 2016, before all right of way was secured and some technical requirements were determined.

Dec 2016

Final Railroad Agreements* & IPB Study

Requirement established

2016 – 2020

Collaborate for Cost Mitigations

HSR collaborated with Railroads and Design Builders to identify and implement alternative IPB options to mitigate changes necessary due to final requirement.

June 2020

Mitigations Concluded

Final HSR Engineering Bulletin issued

* CP 1 Final Agreement with UPRR, December 2014



DEVELOPING UNPRECEDENTED REQUIREMENTS

- The Federal Railroad Administration (FRA), CHSRA, BNSF and UPRR concerned with freight train derailments adjacent to HSR mainline tracks.
- No IPB precedence in the world for systems of our speed and weight.
- Studies, Monte Carlo analyses, and negotiations over **seven** years identified mitigation requirements for freight train derailment impacts.

Resulting Requirement

If the distance from the freight property line to the HSR centerline is less than 102 ft, then a barrier is required to prevent derailed freight trains from crossing the HSR operations area.

Requirement impacts about 38 of 119 miles of HSR alignment.



IPB STUDY IMPACTS

- Fewer mitigation options at greater cost
- Increased requirements necessitated design modifications
- Each Construction Package (CP) involves different alignment issues requiring different IPB applications with varying costs.

IPB Types Allowed at Time of Bid

HSR Embankment



10ft Deep Ditch



Stand-Alone Berm



Concrete Barrier Wall



Critical IPB Study Impacts

Eliminated

Eliminated

Increased Footprint

Increased Height & Loading Requirements*

* Strength increased from 400 KIPs to 650 KIPs (1 KIP = 1,000 lbs.)



IPB SUMMARY

CP 1: 14 miles of IPB at a cost of \$282,668,928.

Additional 2.5 miles still to complete design and cost review.

CP 2/3: 16 miles of IPB; cost is still under review.

Disputed item under commercial review and negotiation with the contractor.

CP 4: 5.5 miles of IPB at a cost of \$35,349,847.

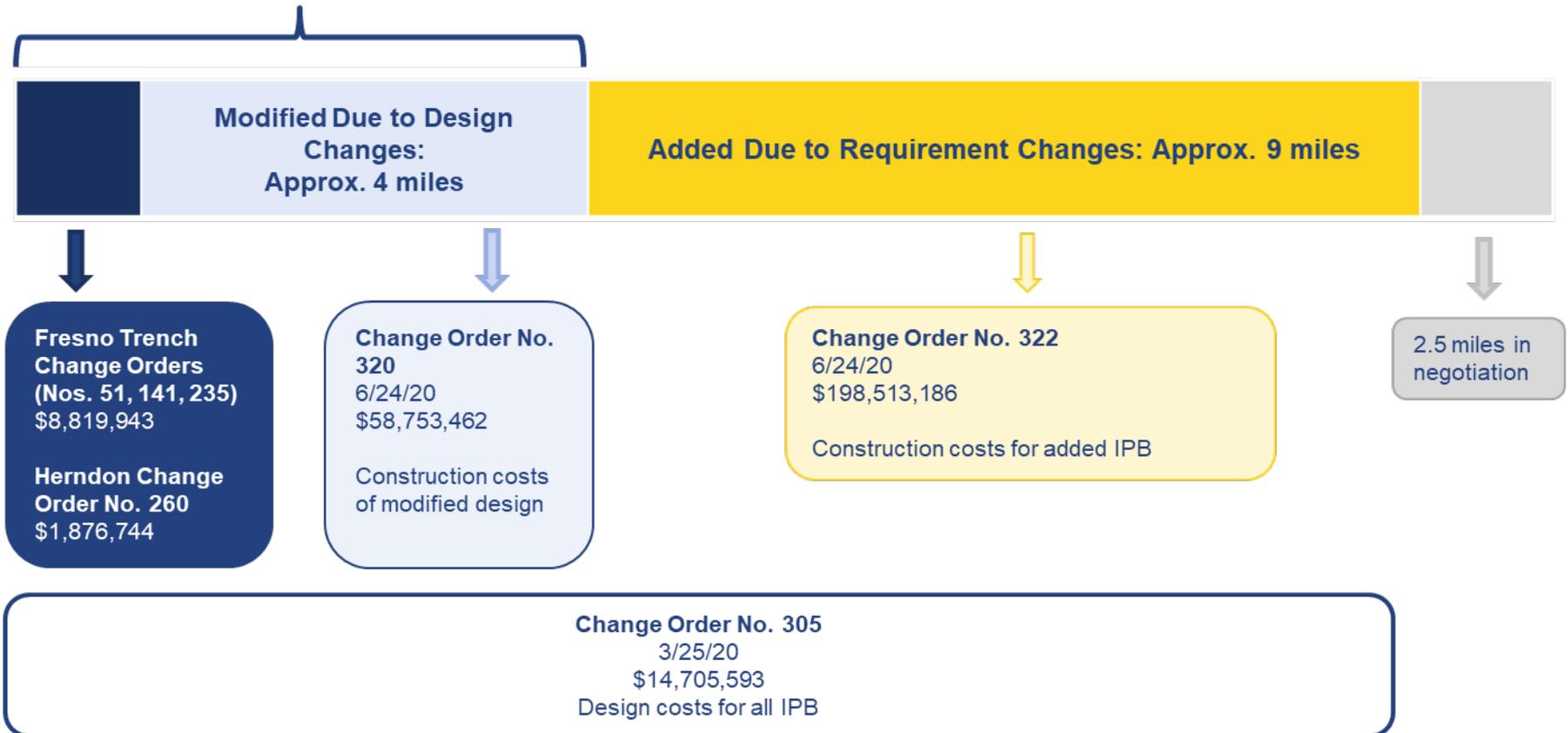
Three change orders pending final negotiations for drainage, previous scope credit, and .5 miles of wall to berm pending redesign.



MITIGATION – CONSTRUCTION PACKAGE 1

Narrow corridors in urban areas constrained options, resulting in 100% use of the more costly concrete barrier wall.

Original IPB Scope: Approx. 5 miles



MITIGATION – CONSTRUCTION PACKAGE 2/3

HSR Embankment / Ditch / Concrete Wall (under review/negotiation)
18.7 miles

Design Criteria Changes



Concrete Wall
16.2 miles

Earth Berm
3 miles

HSR Mitigation (Hormel Shift)



Concrete Wall
13 miles

Earth Berm
3 miles

BNSF / DB / HSR Design Collaboration



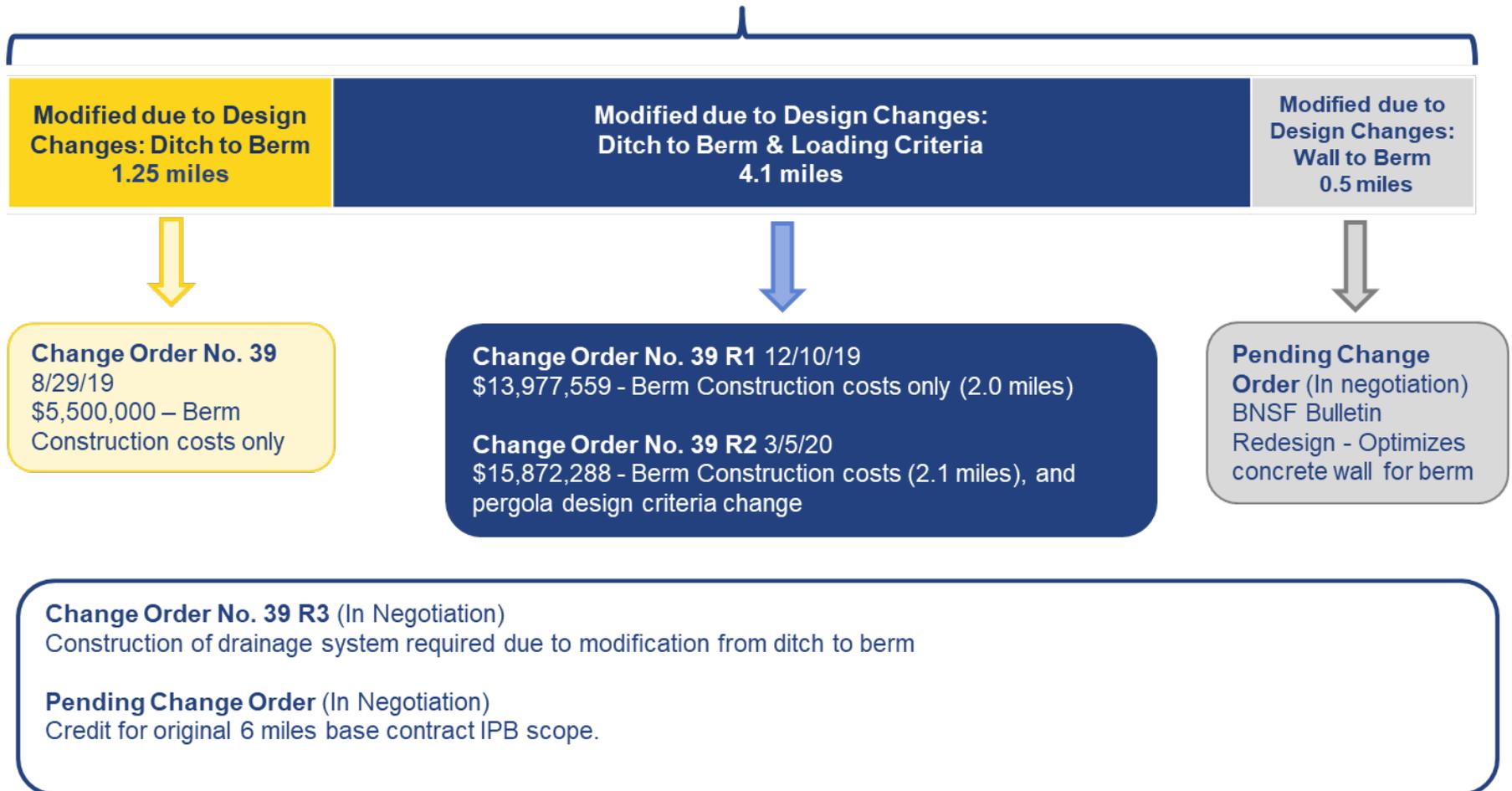
Concrete Wall
2 miles

Earth Berm
14 miles



MITIGATION – CONSTRUCTION PACKAGE 4

Total IPB Approx. 6 miles



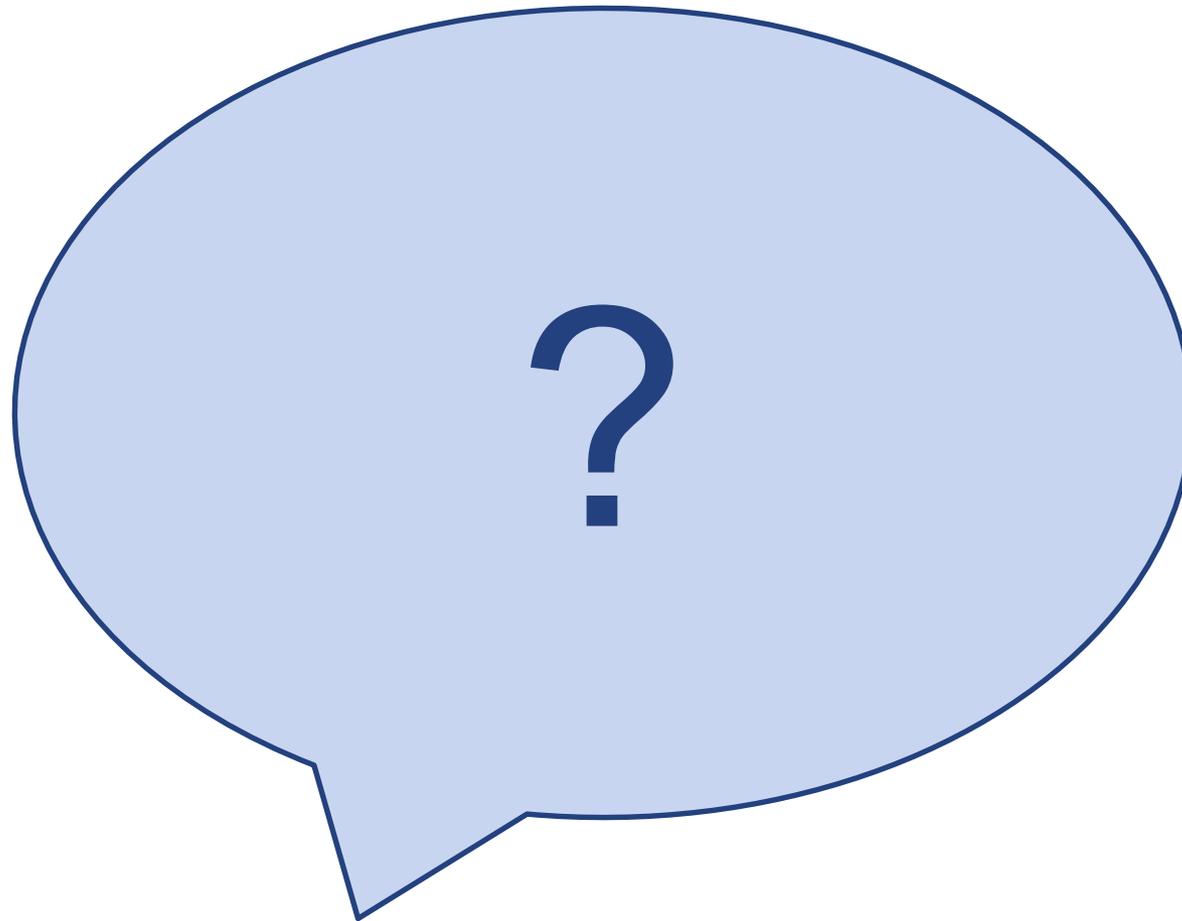
ENSURING SAFETY

- Resolved legacy issue
- Defined adjacent corridor safety requirements
- Lessons Learned Applied for the Future:
 - » Authority Design Criteria Manual now requires 110 feet of separation to adjacent freight property to avoid future contracts needing mitigation.
 - » In urban areas, design variances will be approved based on cost-benefit analysis of mitigation options to avoid acquisition of businesses or excessive land.

The Authority has set the standard for safety for adjacent rail corridors based on the approach developed during the collaboration with railroads and the FRA.



QUESTIONS?



INTRUSION PROTECTION BARRIERS

CALIFORNIA HIGH-SPEED RAIL



Headquarters

California High-Speed Rail Authority

770 L Street, Suite 800

Sacramento, CA 95814

www.hsr.ca.gov

