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

September 9, 2020
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.)
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.
Narrow corridors in urban areas constrained options, resulting in 100% use of the more costly concrete barrier wall.

Original IPB Scope: Approx. 5 miles

Modified Due to Design Changes:
- Fresno Trench Change Orders (Nos. 51, 141, 235)
  - $8,819,943
- Herndon Change Order No. 260
  - $1,876,744

Added Due to Requirement Changes: Approx. 9 miles

- Change Order No. 320
  - 6/24/20
  - $58,753,462
  - Construction costs of modified design

- Change Order No. 322
  - 6/24/20
  - $198,513,186
  - Construction costs for added IPB

- Change Order No. 305
  - 3/25/20
  - $14,705,593
  - Design costs for all IPB

2.5 miles in negotiation
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

Modified due to Design Changes: Ditch to Berm
1.25 miles

Modified due to Design Changes: Ditch to Berm & Loading Criteria
4.1 miles

Modified due to Design Changes: Wall to Berm
0.5 miles

Change Order No. 39
8/29/19
$5,500,000 – Berm
Construction costs only

Change Order No. 39 R1
12/10/19
$13,977,559 - Berm Construction costs only (2.0 miles)

Change Order No. 39 R2
3/5/20
$15,872,288 - Berm Construction costs (2.1 miles), and pergola design criteria change

Pending Change Order (In negotiation)
BNSF Bulletin Redesign - Optimizes concrete wall for berm

Change Order No. 39 R3 (In Negotiation)
Construction of drainage system required due to modification from ditch to berm

Pending Change Order (In Negotiation)
Credit for original 6 miles base contract IPB scope.
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?