



olsson®

Engineering Possibilities.

**Diagnostic Team
Best Practices**

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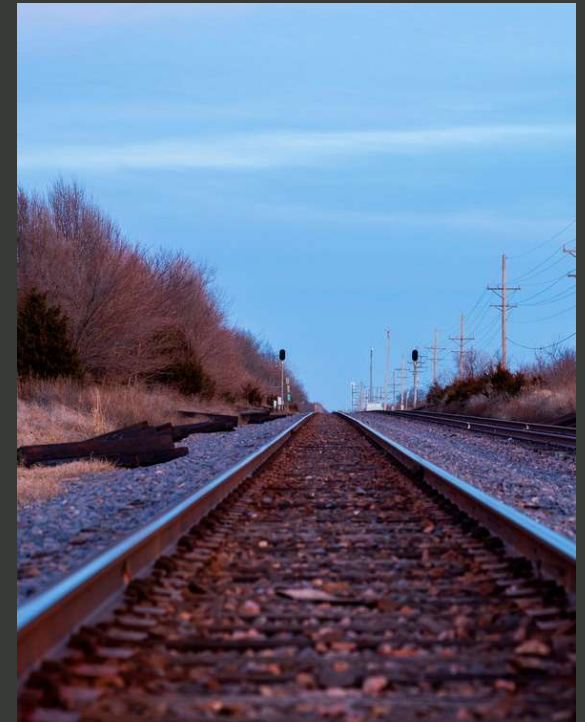
What is a Diagnostic Team?

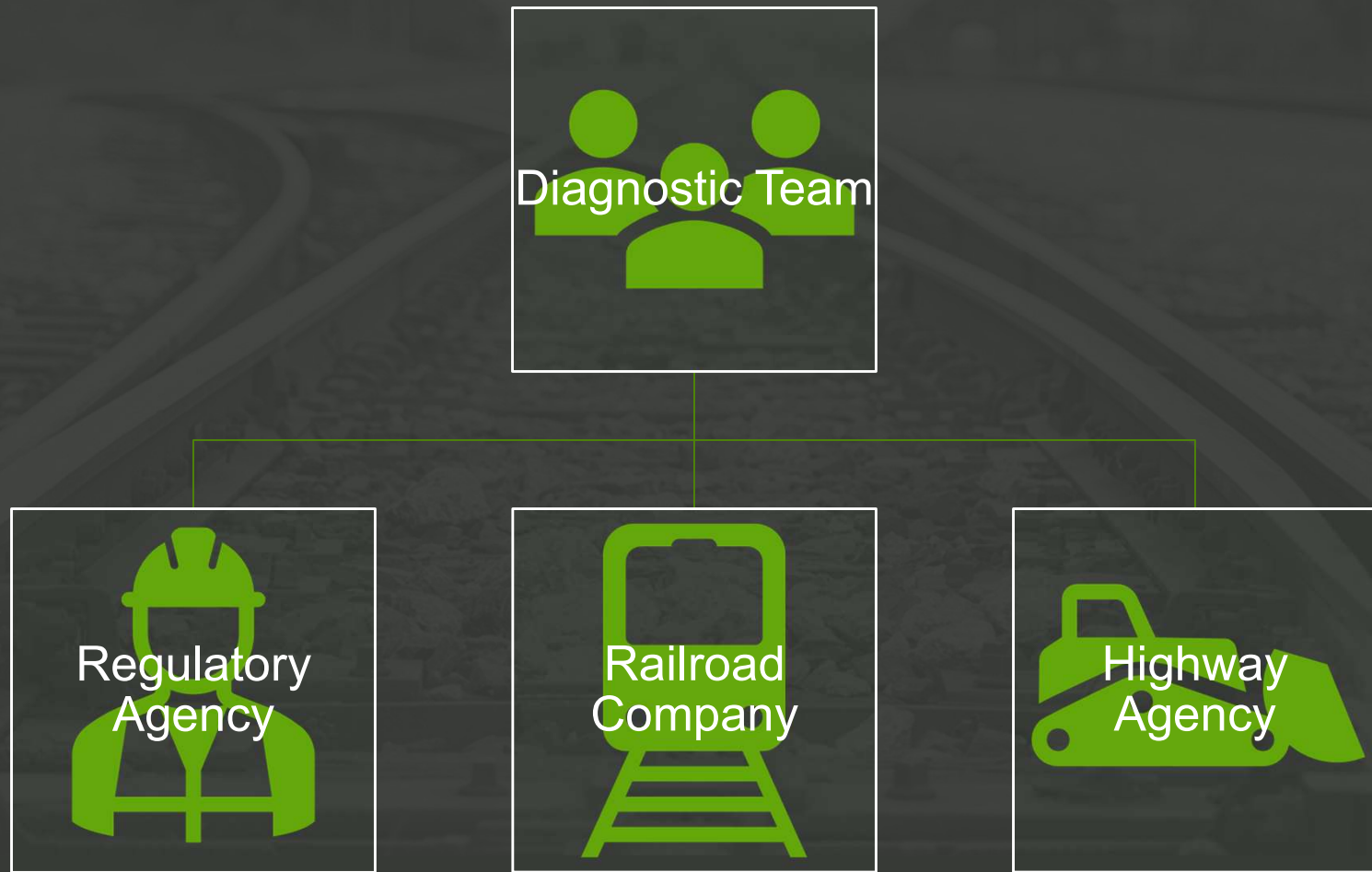
A group of knowledgeable representatives of the parties of interest in a grade crossing or group of grade crossings (see 23 CFR Part 646.204).

- MUTCD Section 1C.02 (2023)

Definition of a Diagnostic Team

- The Diagnostic Team is usually composed of the following team members:
 - Highway agency with jurisdiction
 - Regulatory agency with statutory authority
 - Railroad company and/or transit agency Representative from the Railroad
- Diagnostic Team meetings are protected under 23 USC 407
- What other parties may be included in a Diagnostic Team meeting?





Purpose of a Diagnostic Team

“This approach is intended to **ensure that site-specific features** are considered in adapting guidance and standards for treatments to address the issues at a crossing. The diagnostic study method can also provide **an interdisciplinary approach** which reflects all the technical considerations in selection of a treatment alternative. As such, the diagnostic study method, **supported by additional engineering analyses conducted offsite**, provides a structured approach which might satisfy the various requirements for “Engineering Study” as defined in the MUTCD (Part 1A.13).”

- FHWA Highway –Rail Grade Crossing Handbook (2019)

Purpose of a Diagnostic Team

- The role of the Diagnostic Team is to:
 - **Develop engineering judgment or perform an engineering study for the grade crossing**
 - Review the findings of an engineering study
 - Make recommendations, documented in an engineering study (see Section 8A.05), on new grade crossing traffic control systems and on proposed changes to an existing grade crossing traffic control system
 - Determine the appropriate measures to clear highway traffic from the grade crossing prior to the arrival of rail traffic
 - Make recommendations as part of the Quiet Zone establishment process
 - Determine the appropriate steps that need to be taken to accomplish elimination of a grade crossing
 - The Diagnostic Team recommendation shall be made based on the Diagnostic Team's site visits, meetings, conference calls, or a combination of some or all of these methods.



Diagnostic Best Practices

Factors for Consideration

MUTCD Section 8A.05

Highway Agency Responsibility

- Road Geometrics
- Stopping Sight Distance
- Clearing Sight Distance
- The Proximity of Nearby Roadway Intersections
- Adjacent Driveways
- Traffic Volume Across The Grade Crossing
- Extent of Queuing Upstream or Downstream From The Grade Crossing
- Pedestrian And Bicycle Volumes
- Number of School Buses or Hazardous Material Haul Vehicles
- Crash History At or Near The Location

Railroad Responsibility

- Operation of Passenger Trains
- Train Volume
- Presence of Nearby Passenger Station Stops
- Maximum Allowable Train Speeds
- Variable Train Speeds
- Accelerating And Decelerating Trains
- Multiple Tracks
- High-speed Train Operation

Diagnostic Best Practices: Railroad Data

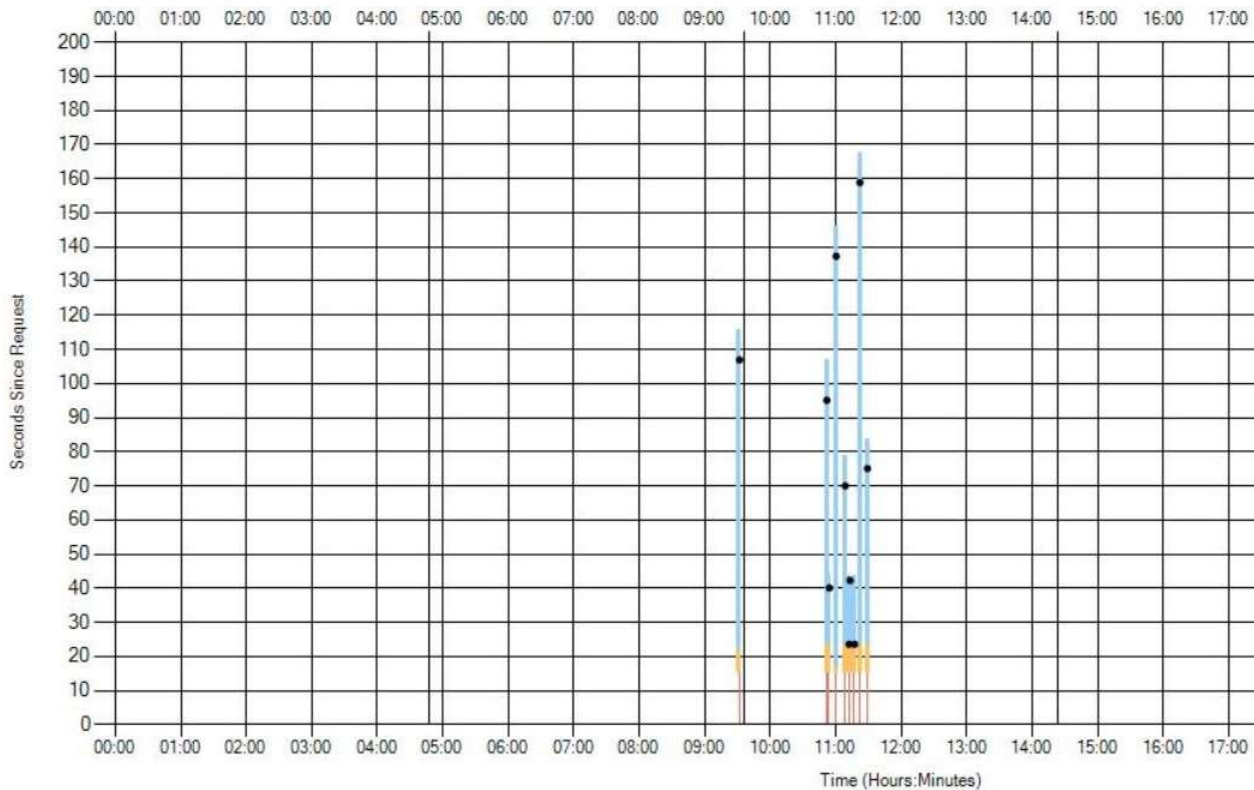
- Current train traffic
- FRA Inventory Report
- FRA Accident Reports
- Near miss data (broken gates, vehicle on track, unsafe motorist/pedestrian and blocked crossing reports, etc.), if available
- Railroad signal design information (for crossings with flashing-lights, gates and/or cantilevers)

3. Name of Railroad or Other Entity Responsible for Track Maintenance (single entry) Union Pacific Railroad Company [UP]		3a. Alphabetic Code UP		3b. Railroad Accident/Incident No. 0515UT008	
4. U.S. DOT Grade Crossing ID No. 805689K		5. Date of Accident/Incident month 0 day 5 year 2015		6. Time of Accident/Incident 4:00 AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	
7. Nearest Railroad Station SALT LAKE CITY		8. Subdivision SALT LAKE SUB		9. County SALT LAKE	
11. City (if in a city) SALT LAKE CITY		12. Highway Name or No. 300 NORTH		10. State Abbr. UT Code 49	
Highway User Involved			Rail Equipment Involved		
13. Type C. Truck-trailer F. Bus J. Other Motor Vehicle A. Auto D. Pick-up truck G. School Bus K. Pedestrian B. Truck E. Van H. Motorcycle M. Other (specify) Code K		17. Equipment 1. Train (units pulling) 4. Car(s) (moving) A. Train pulling- RCL 2. Train (units pushing) 5. Car(s) (standing) B. Train pushing- RCL 3. Train (standing) 6. Light loco(s) (moving) C. Train standing- RCL 7. Light loco(s) (standing) D. EMU Locomotive(s) Code 1 8. Other (specify) E. DMU Locomotive(s)			
14. Vehicle Speed (est. mph at impact) Code 3		15. Direction (geographical) 1. North 2. South 3. East 4. West Code 3		18. Position of Car Unit in Train 6	
16. Position 1. Stalled or stuck on crossing 4. Trapped on crossing by traffic 2. Stopped on Crossing 5. Blocked on crossing by gates Code 3 3. Moving over crossing		19. Circumstance 1. Rail equipment struck highway user 2. Rail equipment struck by highway user Code 2			
20a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? 1. Highway User 2. Rail Equipment 3. Both 4. Neither Code 4		20b. Was there a hazardous materials release by 1. Highway User 2. Rail Equipment 3. Both 4. Neither Code 4			
20c. State here the name and quantity of the hazardous material released, if any					
21. Temperature (specify if minus) 56 °F		22. Visibility (single entry) Code 4 1. Dawn 2. Day 3. Dusk 4. Dark		23. Weather (single entry) Code 2 1. Clear 2. Cloudy 3. Rain 4. Fog 5. Sleet 6. Snow	
24. Type of Equipment Consist (single entry) 1. Freight Train 5. Single Car 9. Maint./inspect. car D. EMU 2. Passenger Train-Pulling 6. Cut of cars A. Spec. MoW Equip. E. DMU 3. Commuter Train-Pulling 7. Yard/Switching B. Passenger Train-Pushing 4. Work Train 8. Light loco(s) C. Commuter Train-Pushing Code 1		25. Track Type Used by Rail Equipment Involved Code 1. Main 2. Yard 3. Siding 4. Industry 1 MAIN TRACK ONE		26. Track Number or Name 1. North 3. East 2. South 4. West Code 4	
27. FRA Track Class (1-9,X) 4		28. Number of Locomotive Units 3		29. Number of Cars 99	
30. Consist Speed (Recorded speed if available) Code R. Recorded E. Estimated 3 mph R		31. Time Table Direction 1. North 3. East 2. South 4. West Code 4			
32. Type of Crossing Warning 1. Gates 4. Wig wags 7. Crossbucks 10. Flagged by crew 2. Cantilever FLS 5. Hwy. traffic signals 8. Stop signs 11. Other (specify) 3. Standard FLS 6. Audible 9. Watchman 12. None Code(s) 01 03 05 06 07		33. Signaled Crossing Warning (See reverse side for instructions and codes) Code 1		34. Roadway Conditions A. Dry B. Wet C. Snow/Slush D. Ice E. Sand/Mud/Dirt/Oil/Gravel F. Water (Standing, Moving) Code A	
35. Location of Warning 1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach Code 1		36. Crossing Warning Interconnected with Highway Signals 1. Yes 2. No 3. Unknown Code		37. Crossing Illuminated by Street Lights or Special Lights 1. Yes 2. No 3. Unknown Code 1	
38. Highway User's Age 1. Male 2. Female Code 1		39. Highway User's Gender 1. Yes 2. No 3. Unknown Code 2		40. Highway User Went Behind or in Front of Train and Struck or was Struck by Second Train 1. Permanent Structure 3. Passing Train 5. Vegetation 7. Other (specify) 2. Standing railroad equipment 4. Topography 6. Highway Vehicles 8. Not Obstructed Code 8	
41. Highway User 1. Went around the gate 2. Stopped and then proceeded 3. Did not stop 4. Stopped on crossing (primary obstruction) Code 2		42. Driver Passed Standing Highway Vehicle 1. Yes 2. No 3. Unknown Code		43. View of Track Obscured by 1. Killed 2. Injured 3. Uninjured 44. Driver was (est. dollar damage) Code 0	
45. Highway-Rail Crossing Users Killed Injured 1 0		46. Highway Vehicle Property Damage (est. dollar damage) Code 0		47. Total Number of Vehicle Occupants (including driver) Code 0	
48. Railroad Employees 0 0		49. Passengers on Train 0 0		50. Total Number of People on Train (include passengers and train crew) Code 2	
51. Is a Rail Equipment Accident / Incident Report Being Filed 1. Yes 2. No Code 2		52. Special Study Block Video Taken? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Video Used? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		53b. Special Study Block	
54. Narrative Description (Be specific, and continue on separate sheet if necessary) HIGHWAY USER'S ACTIONS: PEDESTRIAN WENT AROUND GATES AND WENT UNDER THE MOVING TRAIN.					

Preemption Details

Geneva Rd. @ 200 S (Lindon) - SIG#6057
Wednesday, September 20, 2023 12:00 AM - Thursday, September 21, 2023 12:00 AM

Preempt Number: 1



Diagnostic Best Practices: Highway Data

- Crossing concept exhibit
- Roadway incident data
- Traffic/queuing analysis for crossings within 200 feet of intersections or where potential for queuing exists
- Traffic signal operations information (ATSPM data for nearby traffic signals)

Diagnostic Best Practices: Pre-Diagnostic Call



Share project scope



Share project background data



Share railroad data



Share highway data



Identify additional data needs for on-site diagnostic meeting



Discuss safety requirements

Diagnostic Best Practices: Pre-Diagnostic Site Visit

01

Observe the
crossing in a safe
location

02

Drive all crossing
approaches

03

Report any
deficiencies
immediately



Map data: Google Earth

Diagnostic Best Practices: Get the right people there

Complex crossings may require specialized expertise

Diagnostic teams for crossings with traffic signal preemption should include:

- Traffic Signal Engineer
- Traffic Signal Operations Representative

Diagnostic Team Best Practices: Know the Standards and Best Practices

AREMA Communications and Signals Manual (2024)

MUTCD (2023)

Union Pacific Public Projects Manual (2021)

ITE Preemption of Traffic Signals Near Railroad Grade Crossings Recommended Practice (2021)

FHWA Highway-Rail Grade Crossing Handbook (2019)

BNSF Public Projects Manual (2018)





Case Studies

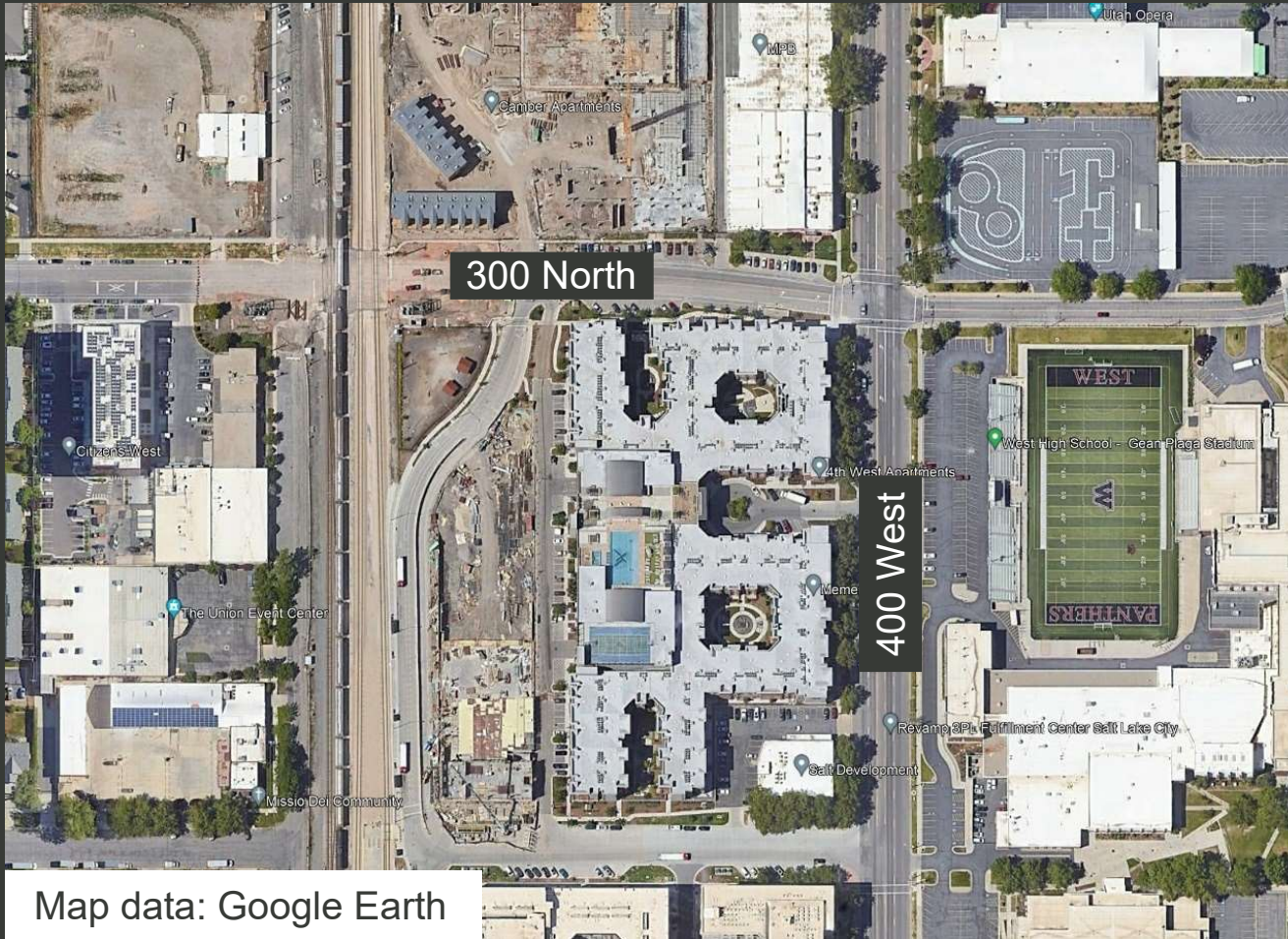
300 North Salt Lake City

Highway Data

- Frequent reports of kids climbing between stopped train cars
- AADT: 2,025

Railroad Data - 5 Years

- Daily Trains: 145
- Max Train Speed: 79 mph
- Unsafe Pedestrian Reports: 12
- Pedestrian fatality in 2015





What would the diagnostic team recommend at this location?

- A. No changes
- B. At-grade pedestrian safety treatments
- C. Pedestrian overpass
- D. Highway overpass



Crossing Relocation

2600 W to 2400 W Brigham City



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Crossing Relocation

2600 W to 2400 W
Brigham City



Crossing Data

Highway Data

- AADT (Existing): 400
- AADT (New): Based on development, zoned industrial
- Large Trucks Anticipated
- <75 ft of storage downstream of the crossing

Railroad Data – 5 Years

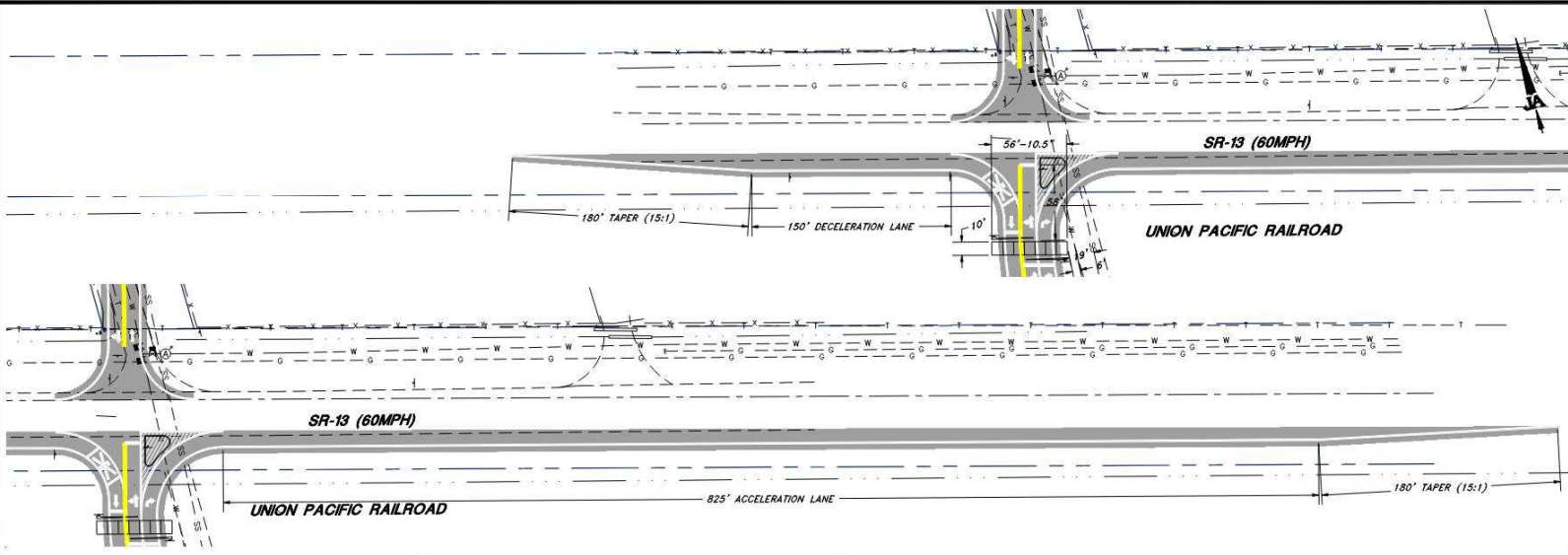
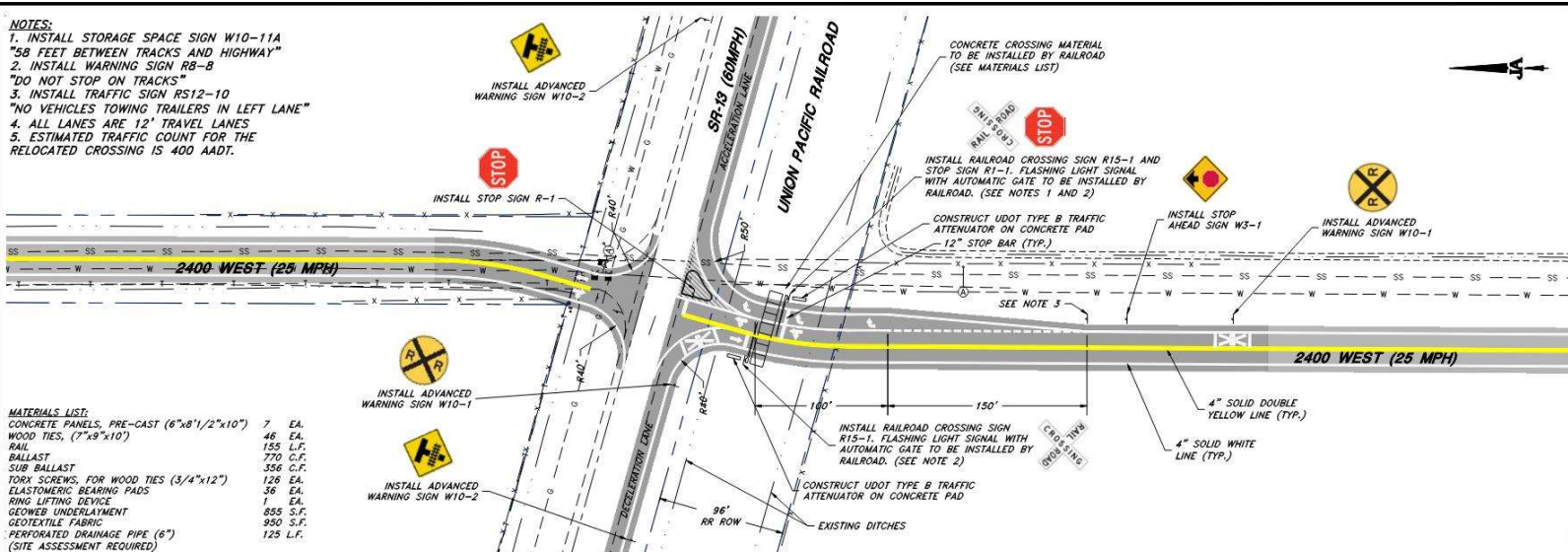
- Daily Trains: 4
- Max Train Speed: 10 mph
- Unsafe Motorist Reports: 0
- FRA Reportable Incidents: None in last 10 years

- NOTES:**
1. INSTALL STORAGE SPACE SIGN W10-11A "58 FEET BETWEEN TRACKS AND HIGHWAY"
 2. INSTALL WARNING SIGN R8-8 "DO NOT STOP ON TRACKS"
 3. INSTALL TRAFFIC SIGN RS12-10 "NO VEHICLES TOWING TRAILERS IN LEFT LANE"
 4. ALL LANES ARE 12' TRAVEL LANES
 5. ESTIMATED TRAFFIC COUNT FOR THE RELOCATED CROSSING IS 400 AADT.

MATERIALS LIST:

CONCRETE PANELS, PRE-CAST (6"x8 1/2"x10")	7	EA.
WOOD TIES, (7"x9"x10")	46	EA.
RAIL	155	L.F.
BALLAST	770	C.F.
SUB BALLAST	356	C.F.
TORX SCREWS, FOR WOOD TIES (3/4"x12")	126	EA.
ELASTOMERIC BEARING PADS	56	EA.
RING LIFTING DEVICE	1	EA.
GEOWEB UNDERLAYMENT	855	S.F.
GEOTEXTILE FABRIC	950	S.F.
PERFORATED DRAINAGE PIPE (6")	125	L.F.

(SITE ASSESSMENT REQUIRED)



BRIGHAM CITY CORPORATION

2400 WEST AND SR-13 INTERSECTION PROJECT

INTERCONNECTED RAILROAD CROSSING

SITE PLAN

J&A CONSULTING ENGINEERS

JONES & ASSOCIATES

6080 Fashion Park Drive
South Ogden, Utah 84403
(801) 476-3707 www.jaassoc.com

REV	DATE	BY	CHKD	APPD

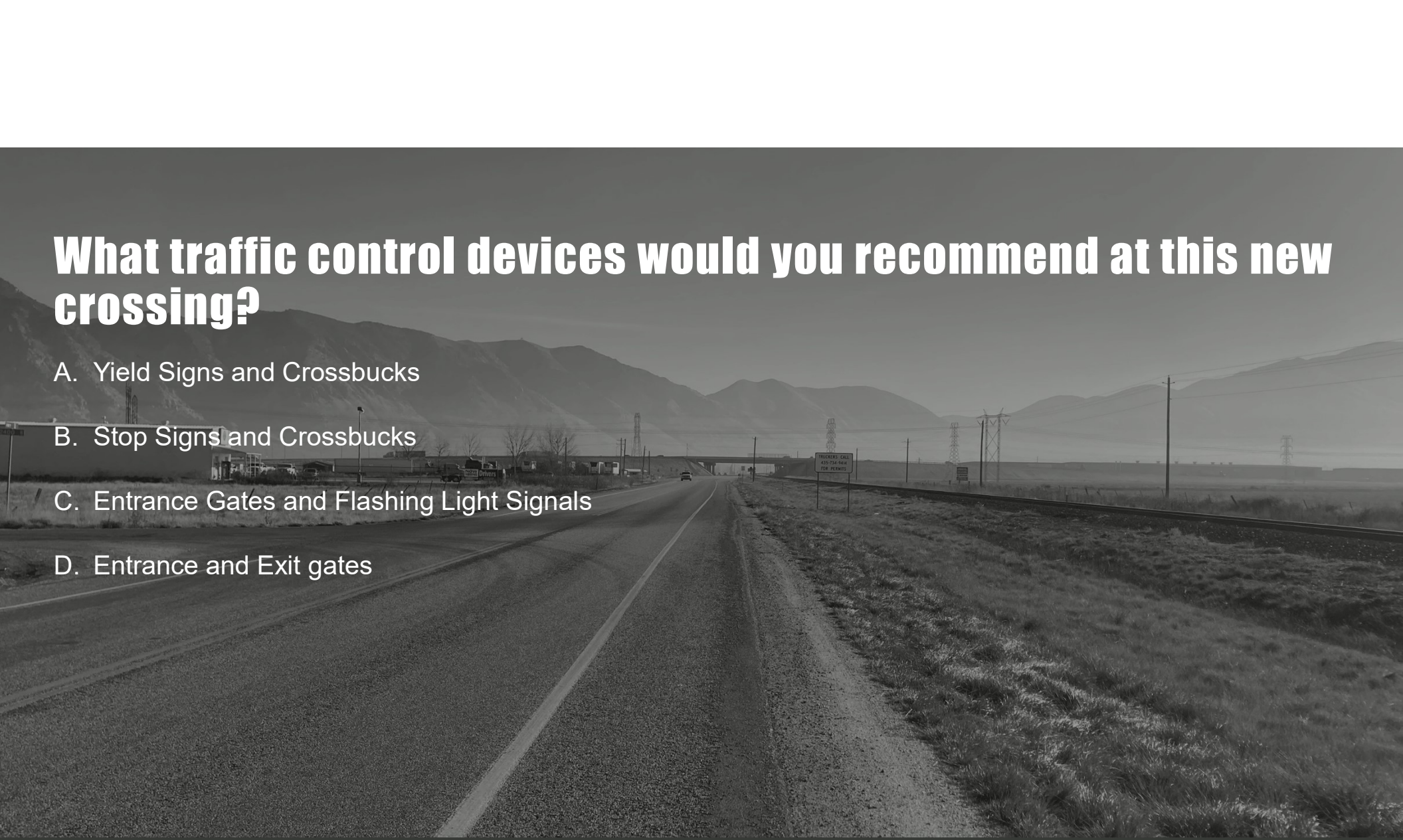
SCALE: 24"x36" (1")=40'

11"x17" (1")=20'

SHEET:

C2

OF 1 SHEETS



What traffic control devices would you recommend at this new crossing?

- A. Yield Signs and Crossbucks
- B. Stop Signs and Crossbucks
- C. Entrance Gates and Flashing Light Signals
- D. Entrance and Exit gates

What traffic control device would you recommend at the adjacent intersection?

- A. Traffic signal
- B. Stop control
- C. Yield control
- D. All-way stop

How would you address the short storage distance?

- A. Install a Do Not Stop on Tracks (R8-8) Sign
- B. Install Storage Distance (W10-11, W10-11a) Signs
- C. Install a traffic signal with preemption
- D. Install a free right-turn and an acceleration lane



Crossing Upgrades

19th Ave/ McDowell Rd
Phoenix, AZ



Crossing Data

Highway Data

- AADT (Existing): 29,120
- 13% trucks
- Major bus transfer northeast of crossing
- Near state fair grounds
- Major intersection <200 ft downstream

Railroad Data – 5 Years

- Daily Trains: 4
- Max Train Speed: 40 mph
- Regular train switching in area
- Blocked Crossings: 32
- FRA Reportable Incidents: 2



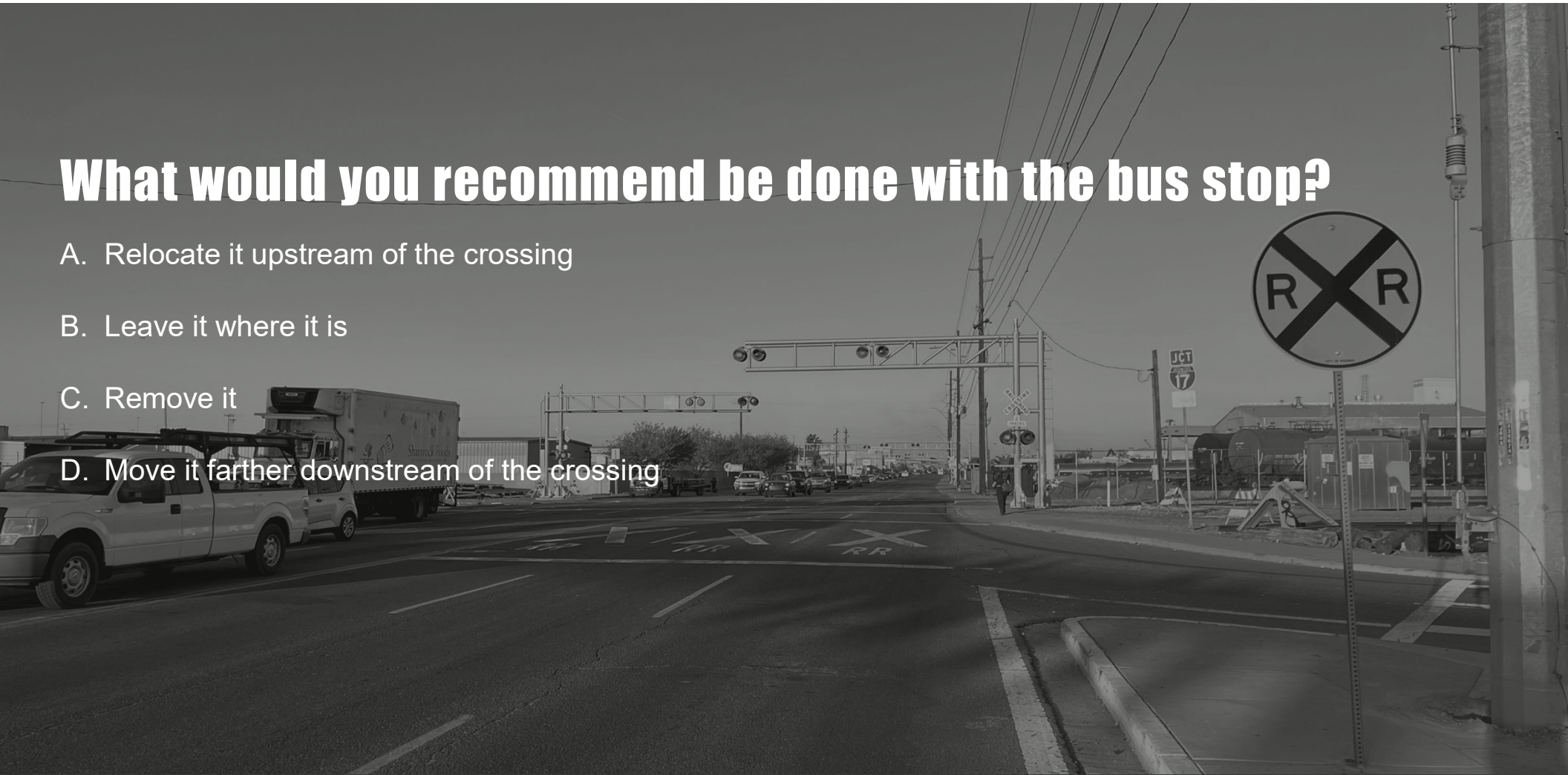
Map data: Google Earth

How would you address queuing over the tracks?

- A. Install a Do Not Stop On Tracks (R8-8) Sign
- B. Interconnect Downstream Traffic Signal
- C. Install a Queue Cutter Traffic Signal
- D. Install Cross Hatching

What would you recommend be done with the bus stop?

- A. Relocate it upstream of the crossing
- B. Leave it where it is
- C. Remove it
- D. Move it farther downstream of the crossing



How would you address the blocked crossings?

- A. Modify the tracks
- B. Minimize preemption time
- C. Change train operations to stop-and-proceed
- D. Install advance notifications signs for when trains are occupying the crossing

CONTACT US



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