

# Falls Bridge Advisory Committee Meeting #12 Replacement of Existing Bridge



February 28<sup>th</sup>, 2018

# Meeting Agenda

- Bridge Replacement
  - Recap of Replacement Options
  - Construction Approach & Schedule
  - Construction Cost
- Update on Temporary Bridge
- Update on Alternate Route
- Discussion



# Recap of Replacement Options

## Approach to Evaluating Replacement

- **Steps 1 & 2: Identify, assess & short list initial options** ✓ Presented Last Meeting
  - **Abutments & Retaining Walls**
    - Widen approach to accommodate typical section.
    - Remove eroded fill within approaches, replace with concrete fill
  - **Superstructure**
    - Assess conventional girder alternatives
    - Assess tied arch alternatives
- Step 3: Assess constructability, schedule, impacts, longevity & cost
- Step 4: Identify most suitable replacement strategy

# Recap of Replacement Options

## Purpose & Need Statement

**Project:** Blue Hill, Falls Bridge #5038 (WIN 17712.00)

### Purpose:

The purpose of the project is to address the structural deficiency of the Falls Bridge and improve public safety within the project limits in a cost effective manner. A successful project will provide a bridge capable of carrying all legal loads, will not require additional capital improvements for at least 25 years, will achieve a minimum remaining service life of at least 50 years, and improve site safety.

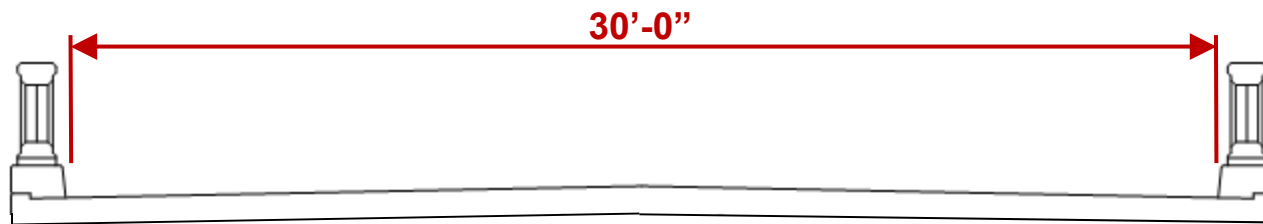
### Need:

The rating condition of the bridge elements are: 5 (fair) for the concrete superstructure, 4 (poor) for the stacked stone substructure, and 4 (poor) for the concrete deck. Further deterioration of the bridge elements may require a load posting. The bridge spans over a reversing falls that is a popular recreation area; however; the bridge and roadway do not meet geometric design standards which create safety concerns.

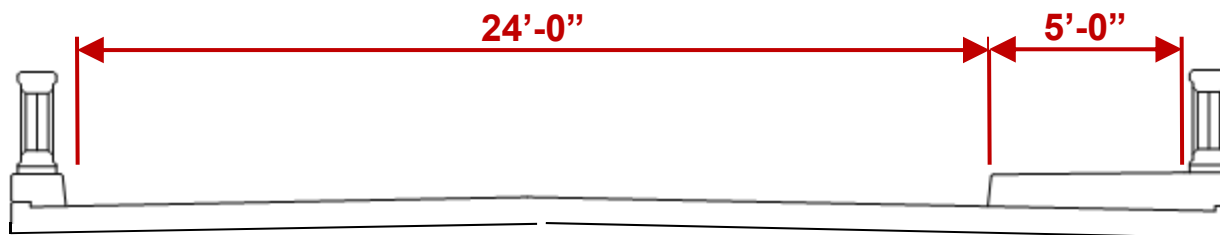
# Recap of Replacement Options

## Design Criteria

- 100 Year Service Life, Designed to Carry Modern Design Loads
- Modern Typical Section



**TYPICAL SECTION WITH WIDE SHOULDERS**



**TYPICAL SECTION WITH SIDEWALK**

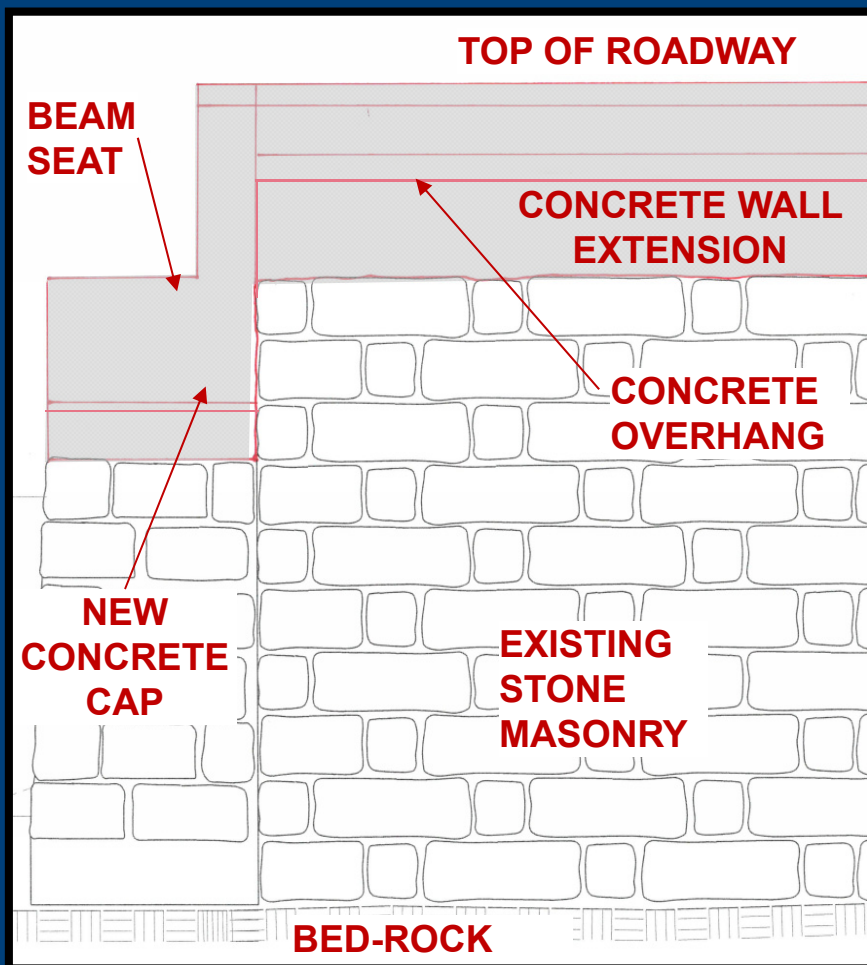
# Recap of Replacement Options - Substructure

## Abutments

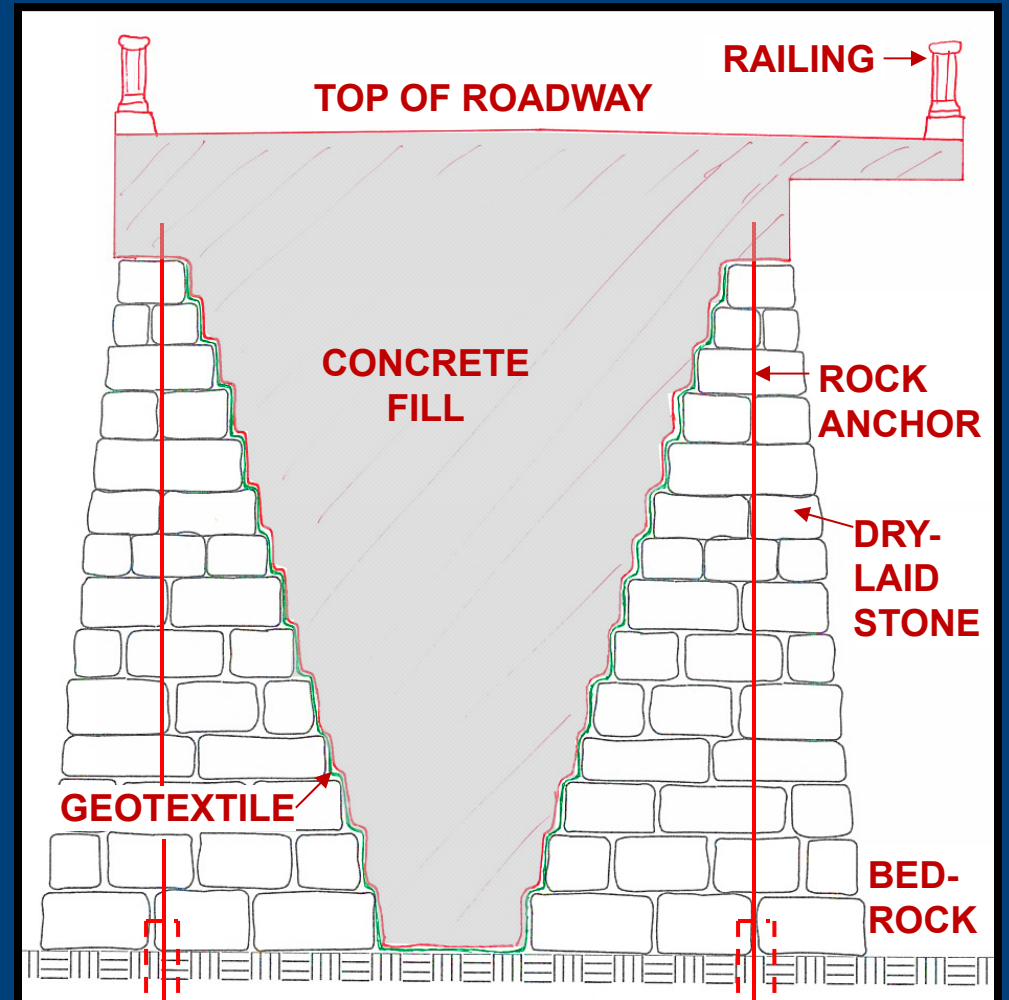


# Recap of Replacement Options - Substructure

## Elevation



## Section



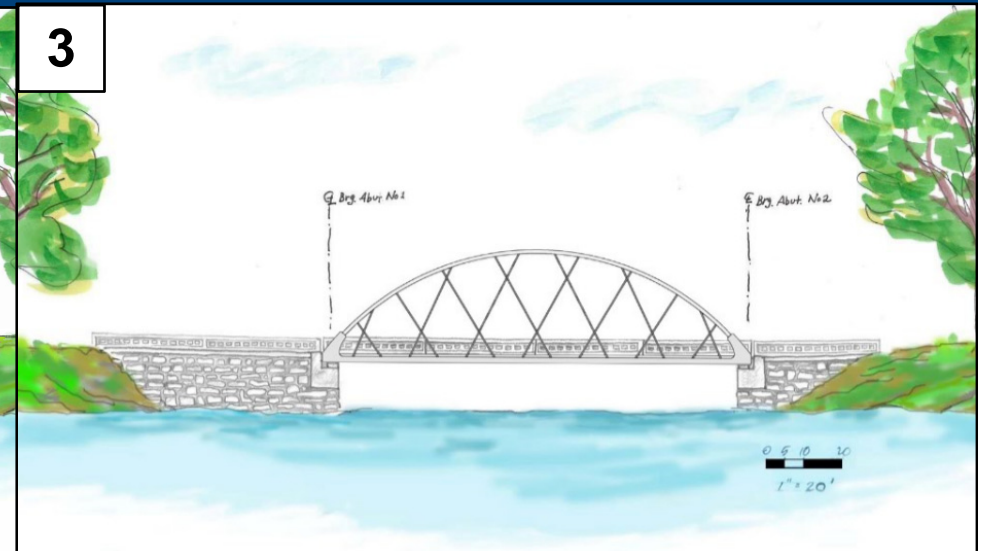
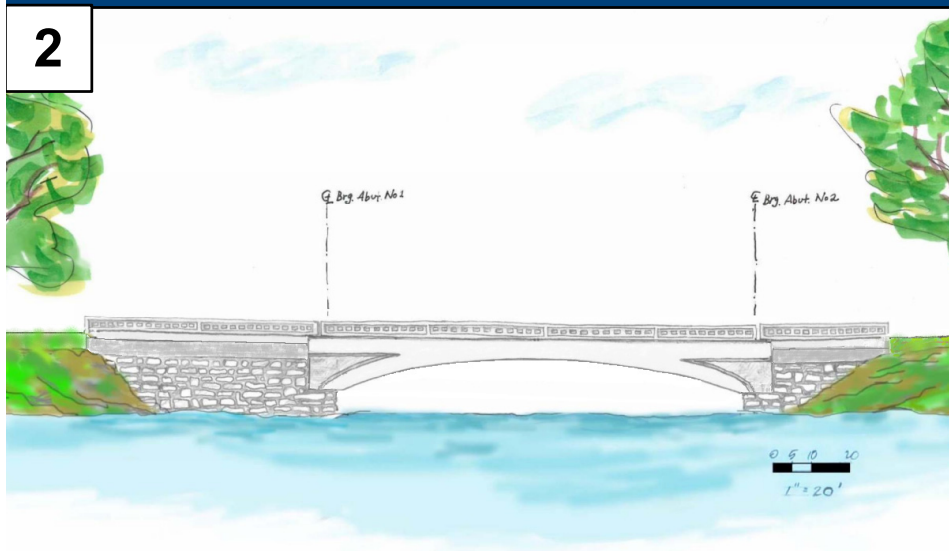
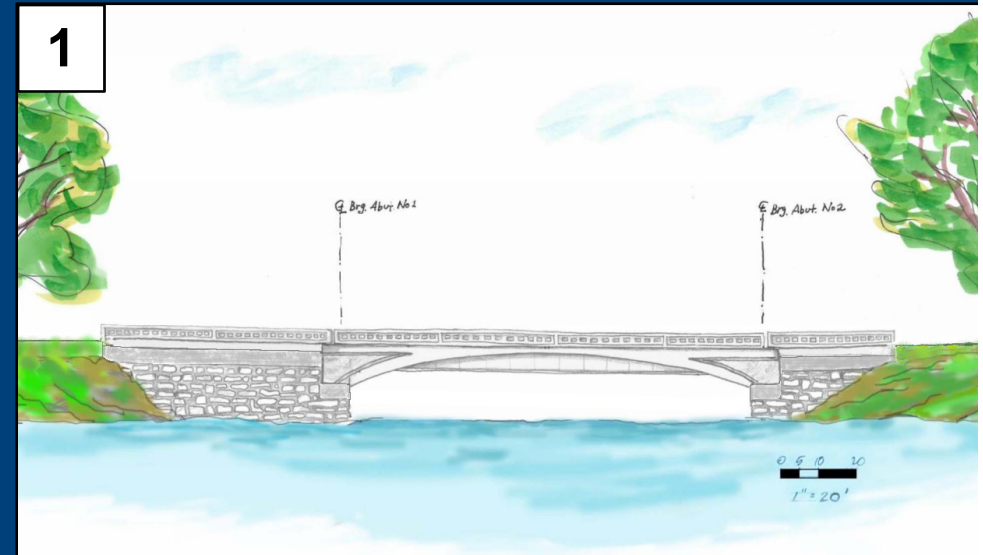
# Recap of Replacement Options - Superstructure

## Precast Concrete Girders

1. Prefabricated standard girder shape with aesthetic fascia panel
2. Prefabricated arched girder

## Tied Arch

3. Tied arch with steel arch rib and concrete tie-girder





# Construction Approach & Schedule

## Approach to Evaluating Replacement

- Steps 1 & 2: Identify, assess & short list initial options
  - Abutments & Retaining Walls
    - Widen approach to accommodate typical section.
    - Remove eroded fill within approaches, replace with concrete fill
  - Superstructure
    - Assess conventional girder alternatives
    - Assess tied arch alternatives
- **Step 3: Assess constructability, schedule, impacts, longevity & cost**
- **Step 4: Identify most suitable replacement strategy**

# Construction Approach & Schedule

## Multiple Construction Methods Evaluated

- Conventional Construction
  - Typical construction approach
  - Cast-in-place concrete
  - More work completed on-site, slower
- Accelerated Bridge Construction
  - Allows more work to be completed off-site, or without traffic impact
  - Evaluated multiple approaches to ABC
    - Prefabricated Bridge Elements
    - Bridge Movement Systems – Lateral Slide

# Construction Approach & Schedule

## Conventional Construction

- Formwork is constructed on-site, typically with timber.
- Required for all concrete placed on-site.
- Formwork construction will occur after traffic is rerouted and the existing bridge has been removed.



# Construction Approach & Schedule

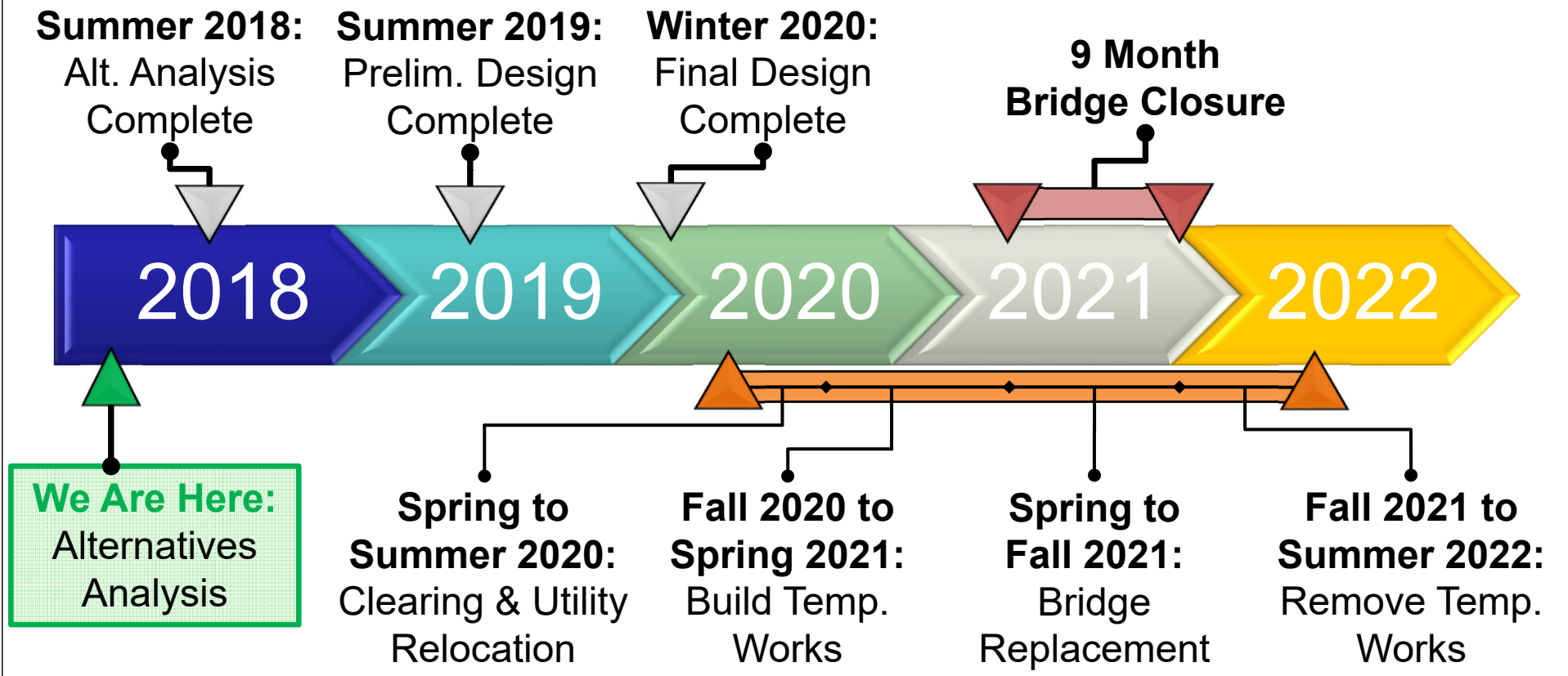
## Conventional Construction Sequence

- Phase 1 – Clear Trees & Relocate Overhead Utilities
  - Clearing is ideally performed during winter months to minimize bat environmental impacts and will be performed in its entirety at the onset of project construction.
- Phase 2 – Construct Temp. Embankments, Temp. Bridge, & Temp. Trestles
  - ***Close Bridge to Traffic***
- Phase 3 – Demolish Existing Bridge
- Phase 4 – Substructure Stabilization & Rehabilitation
- Phase 5 – Superstructure Replacement
  - ***Open Bridge to Traffic***
- Phase 6 – Final Cleanup & Site Restoration (includes temporary bridge removal)

# Construction Approach & Schedule

## Estimated Conventional Construction Schedule

- Approximately 18-24 months of construction, bridge closure of 9 months
  - Assumes November to March in-water work windows with no winter shutdown
  - Schedule does not account for archeological remediation which may be required
  - All durations and dates are conceptual and are subject to change



# Construction Approach & Schedule

## ABC – Prefabricated Bridge Elements

- Elements prefabricated off-site prior to on-site construction.
- Crews will work night and day shifts, possibly working around the clock.
- Would not include construction of a temporary bridge.
- A short duration road closure will be required.



# Construction Approach & Schedule

## ABC – Prefabricated Bridge Elements Sequence

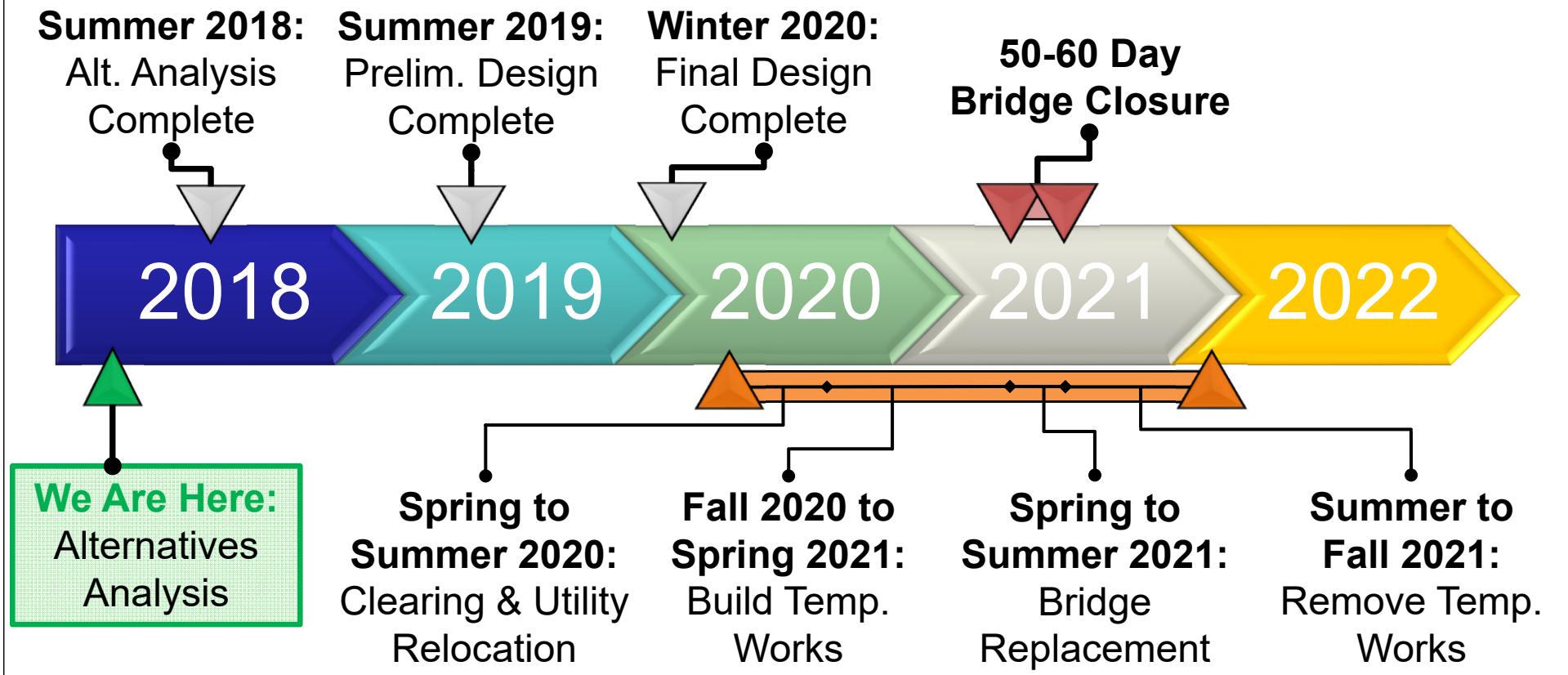
- Phase 1 – Clear Trees & Relocate Overhead
  - Clearing is ideally performed during winter months to minimize bat environmental impacts and will be performed in its entirety at the onset of project construction.
- Phase 2 – Construct Temporary Embankments & Trestles
- Phase 3 – Complete Portions of Substructure Rehabilitation
  - ***Close Bridge to Traffic***
- Phase 4 – Accelerated Bridge Construction
  - Demolish Existing Bridge
  - Substructure Rehabilitation (Precast Abutment Cap)
  - Superstructure Replacement (Precast Girders & Deck)
  - ***Open Bridge to Traffic***
- Phase 5 – Final Cleanup and Site Restoration



# Construction Approach & Schedule

## Estimated ABC Prefabricated Bridge Elements Schedule

- Approximately 12-18 months of construction, bridge closure of 50-60 days
  - Assumes November to March in-water work windows with no winter shutdown
  - Schedule does not account for archeological remediation which may be required
  - All durations and dates are conceptual and are subject to change





# Construction Approach & Schedule

## ABC – Lateral Slide

- New bridge constructed west of existing bridge, leaving existing bridge open to traffic.
  - Prefabricated bridge elements could be used as part of this approach.
- ABC methods require more labor, crews may be required to work 24-7.
- Eliminates need for temporary bridge with a short duration road closure.



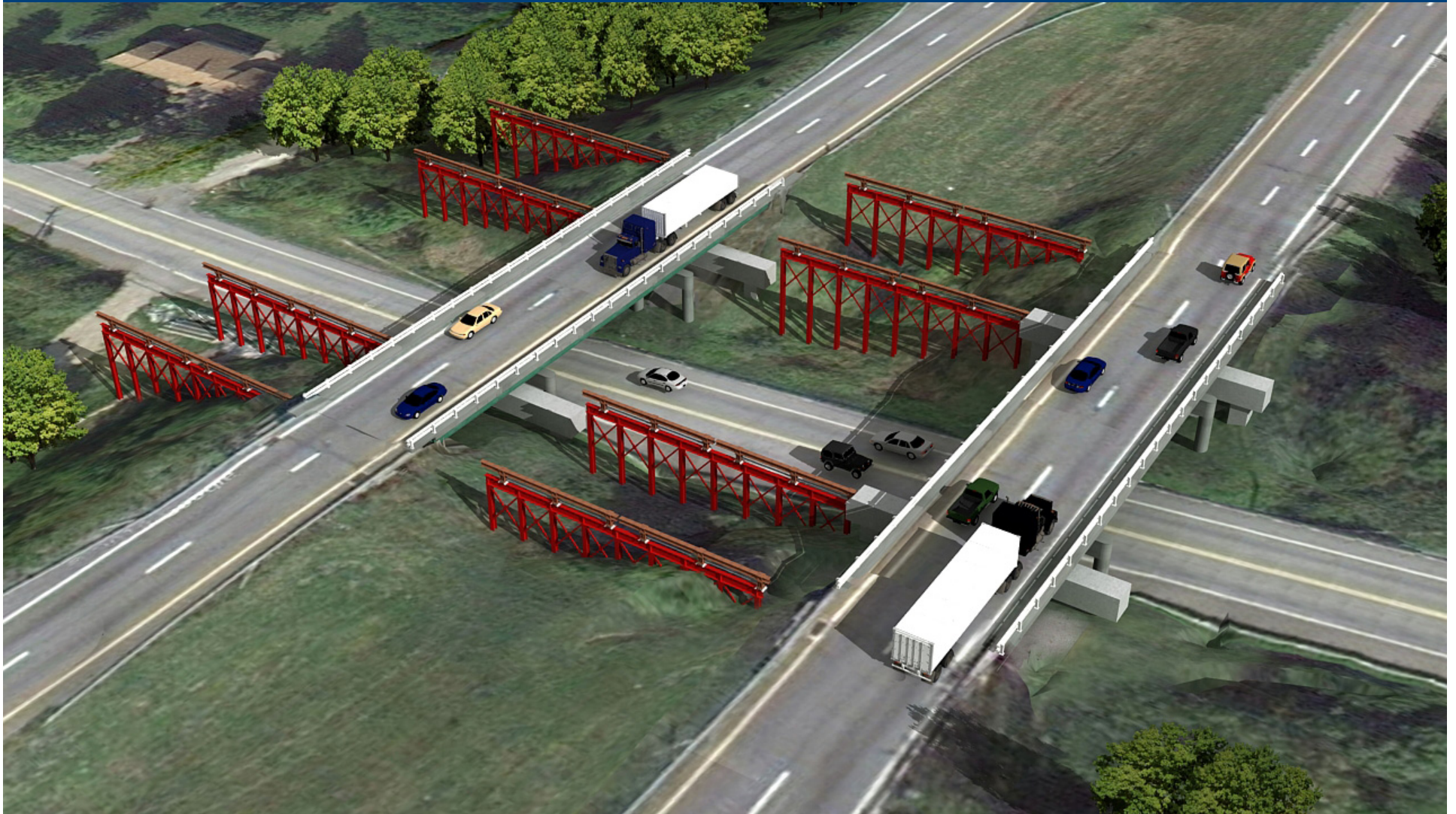
# Construction Approach & Schedule

## Example Lateral Slide Construction Sequence



# Construction Approach & Schedule

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# Construction Approach & Schedule

## Example Lateral Slide Construction Sequence



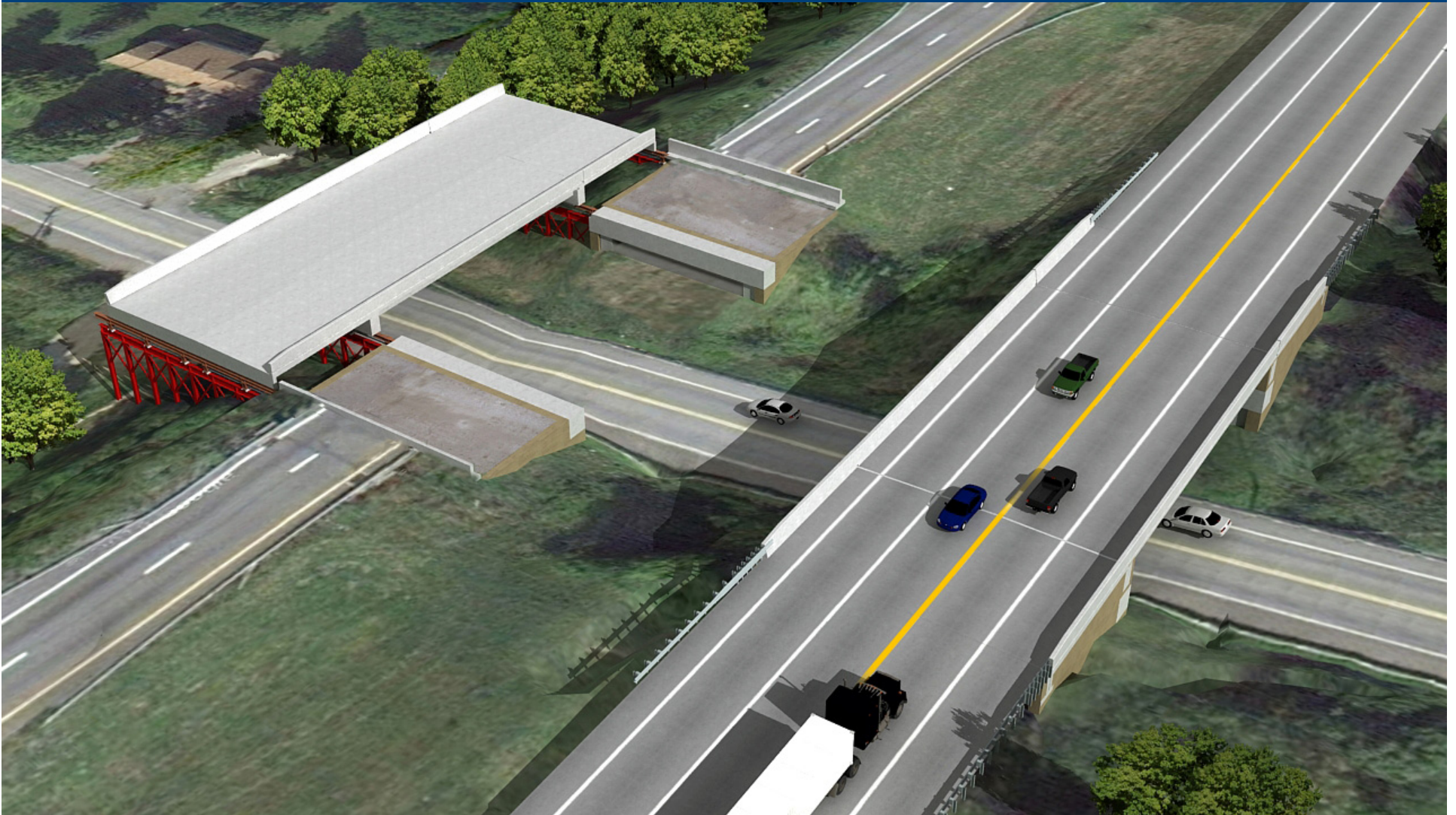
# Construction Approach & Schedule

## Example Lateral Slide Construction Sequence



# Construction Approach & Schedule

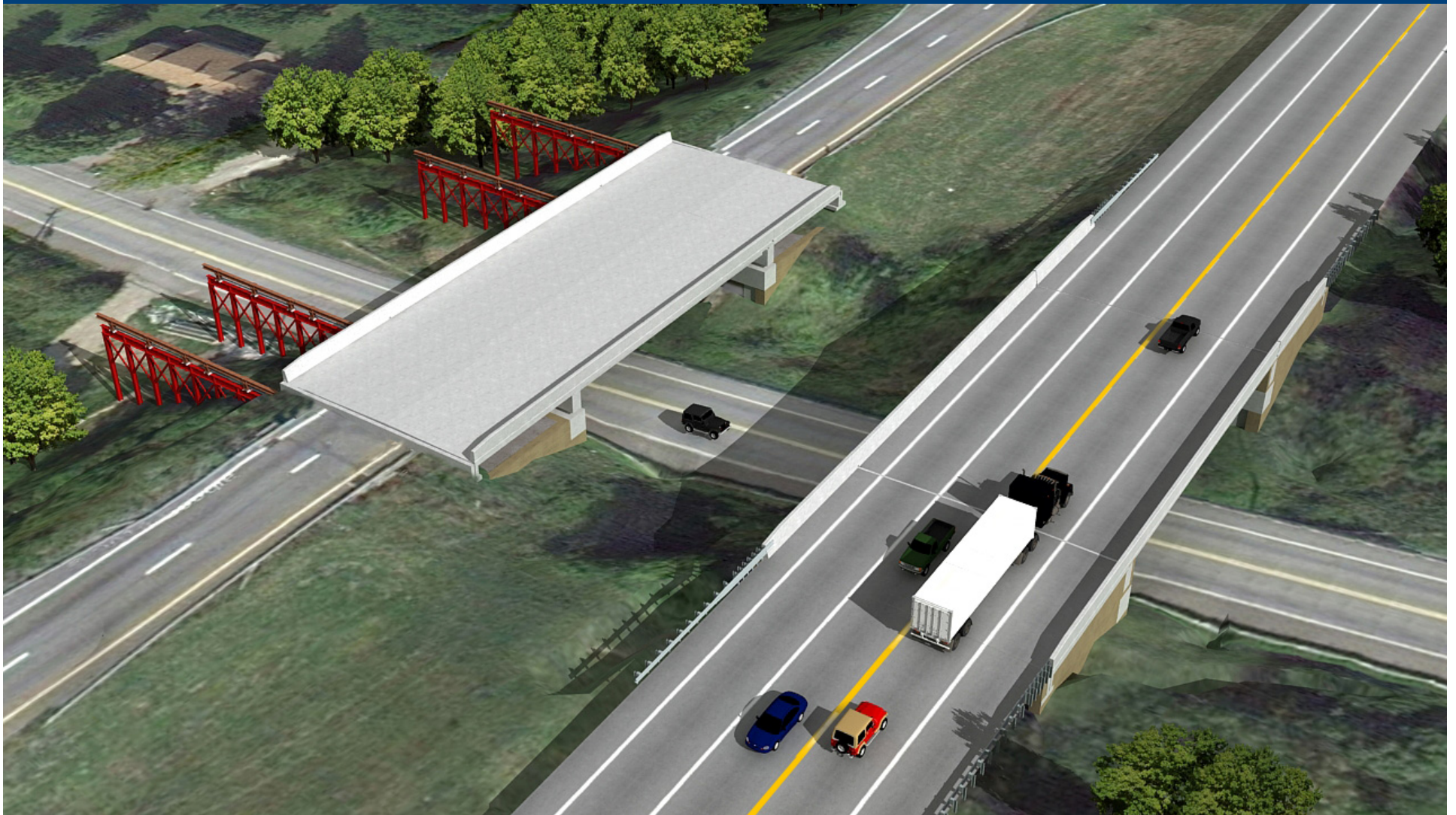
## Example Lateral Slide Construction Sequence





# Construction Approach & Schedule

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# Construction Approach & Schedule

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# Construction Approach & Schedule

## ABC Lateral Slide Construction Sequence

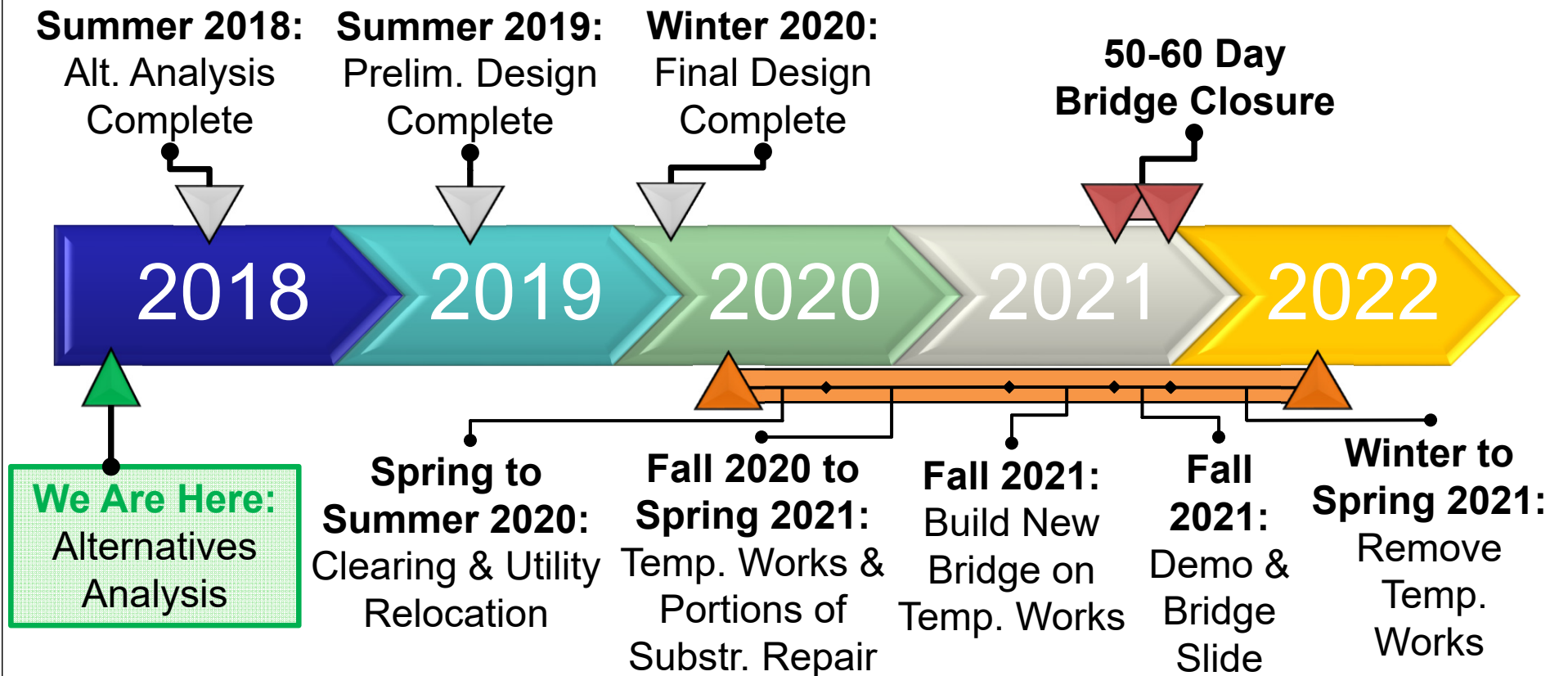
- Phase 1 – Clear Trees & Relocate Overhead Utilities
  - Clearing is ideally performed during winter months to minimize bat environmental impacts and will be performed in its entirety at the onset of project construction.
- Phase 2 – Construct Temporary Embankments & Trestles
- Phase 3 – Construct New Bridge West of Existing, Begin Substructure Rehab.
  - **Close Bridge to Traffic**
- Phase 4 – Bridge Demo & Lateral Slide
  - Demolish Existing Bridge
  - Complete Substructure Rehabilitation
  - Lateral Slide of New Superstructure
  - **Open Bridge to Traffic**
- Phase 5 – Final Cleanup and Site Restoration



# Construction Approach & Schedule

## Estimated ABC Lateral Slide Schedule

- Approximately 18-24 months of construction, bridge closure of 50-60 days
  - Assumes November to March in-water work windows with no winter shutdown
  - Schedule does not account for archeological remediation which may be required
  - All durations and dates are conceptual and are subject to change



# Construction Approach & Schedule

## Construction Schedule Comparison

- Schedule Notes:
  - Duration for all superstructure alternatives is roughly similar
  - All construction durations are approximate and subject to change
  - ABC construction may include extensive night-work

### APPROXIMATE PROJECT SCHEDULE

Schedule Item	Conventional Construction		Accelerated Bridge Construction	
	Off-Site Detour	Temporary Bridge	Prefab. Bridge Elements	Lateral Slide
Detour / Bridge Closure (Days)	270 +/-	270 +/-	50 to 60 +/-	50 to 60 +/-
Construction Duration (Months)	18 +/-	24 +/-	12 to 18 +/-	18 to 24 +/-

# Construction Cost Summary

## APPROXIMATE PROJECT COSTS

COST COMPONENT	CONVENTIONAL CONSTRUCTION			ACCELERATED BRIDGE CONSTRUCTION		
	Prefabricated Standard Girder	Prefabricated Arched Girder	Tied Arch	Prefabricated Standard Girder	Prefabricated Arched Girder	Tied Arch
Construction	\$4,700,000	\$5,325,000	\$5,650,000	\$5,700,000	\$6,300,000	\$6,450,000
Temporary Bridge / Off-Site Detour Cost	\$800,000	\$800,000	\$800,000	\$50,000	\$50,000	\$50,000
User Costs	Minimal	Minimal	Minimal	\$330,000	\$330,000	\$330,000
On-Time Completion Incentive	\$0	\$0	\$0	\$250,000	\$250,000	\$250,000
<b>GRAND TOTAL</b>	<b>\$5,300,000 to \$5,800,000</b>	<b>\$5,600,000 to \$6,500,000</b>	<b>\$6,200,000 to \$6,800,000</b>	<b>\$5,400,000 to \$7,000,000</b>	<b>\$5,700,000 to \$7,900,000</b>	<b>\$6,700,000 to \$7,200,000</b>

### NOTES:

1. All costs represent approximate conceptual project costs based on current available information. Costs are subject to change.
2. User costs are based on \$5,500 per calendar day of bridge closure. User costs on an on-site temporary bridge are considered minor.
3. Project costs presented herein exclude preliminary or construction engineering, ROW or archeological investigation/recovery.
4. Tied Arch cost is based on construction using a concrete tie girder with a steel arch rib. Construction of a fully cast-in-place tied arch would add approximately \$800,000 to the cost of this alternative.

# Questions on Bridge Replacement?



# Update on Temporary Bridge Layout

## Additional Evaluations Completed

- Temporary roadway profile developed to:
  - Assess roadway geometrics
  - Identify requirements for excavation
  - Better understand potential environmental and property impacts
  - Update potential construction costs

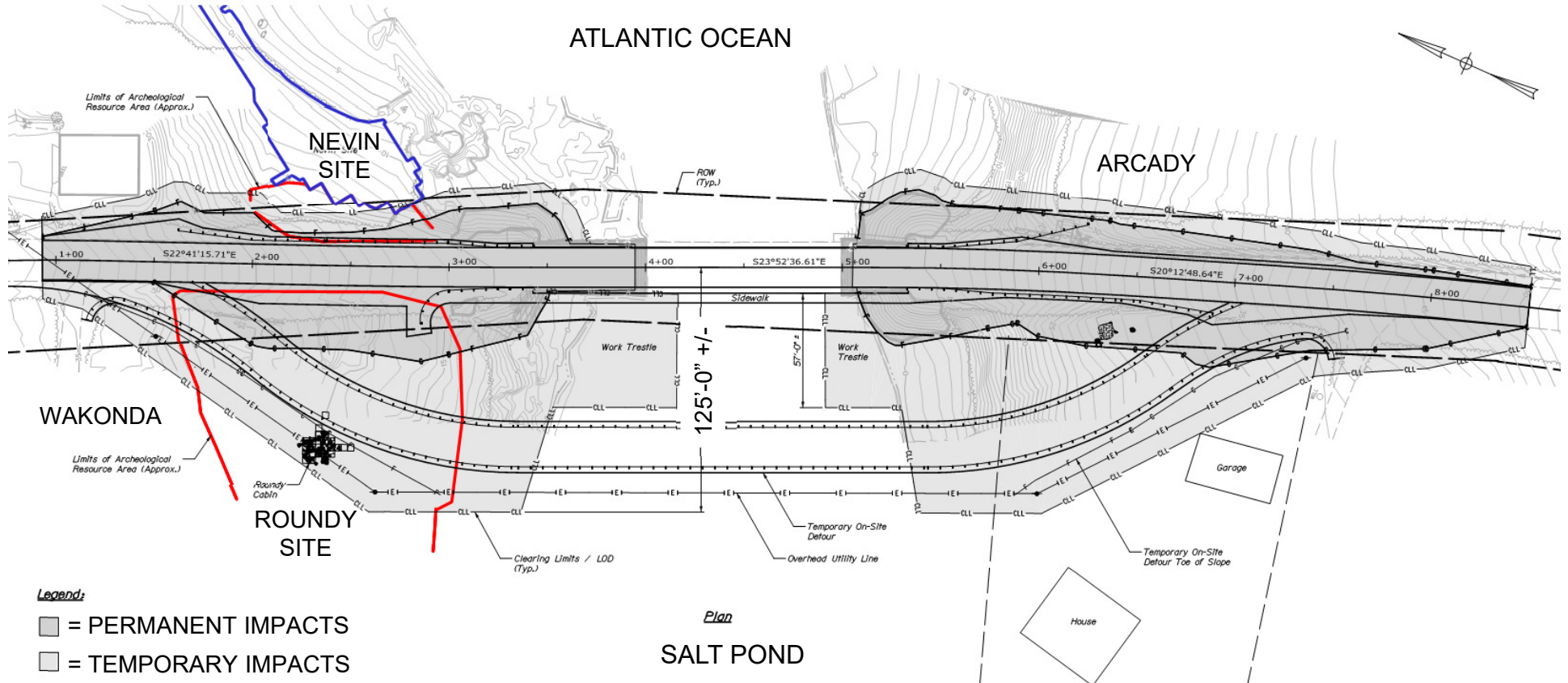
## Temporary Bridge Considerations

- Horizontal & Vertical Geometry are less than desirable to minimize impacts
- Depth to bedrock at south approach is unknown
- Additional survey & evaluations will be required if this option is advanced



# Update on Temporary Bridge

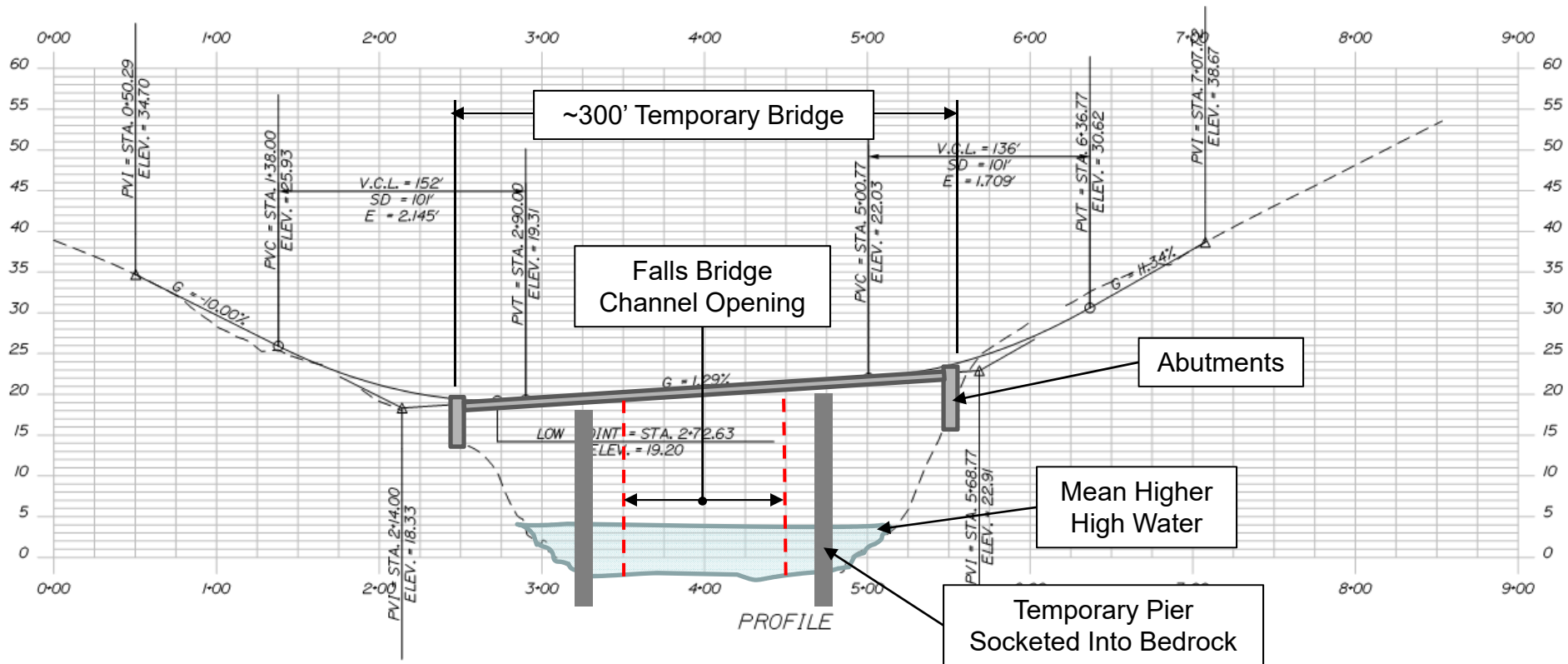
## Temporary Bridge (Rehab or Replacement)



Note: Layout and substructure locations are approximate and subject to change as more information about the site becomes available.

# Update on Temporary Bridge

## Temporary Bridge (Rehab or Replacement)



Note: Layout and bridge foundation locations are conceptual and subject to change as more information about the site becomes available.

# Questions on Temporary Bridge?

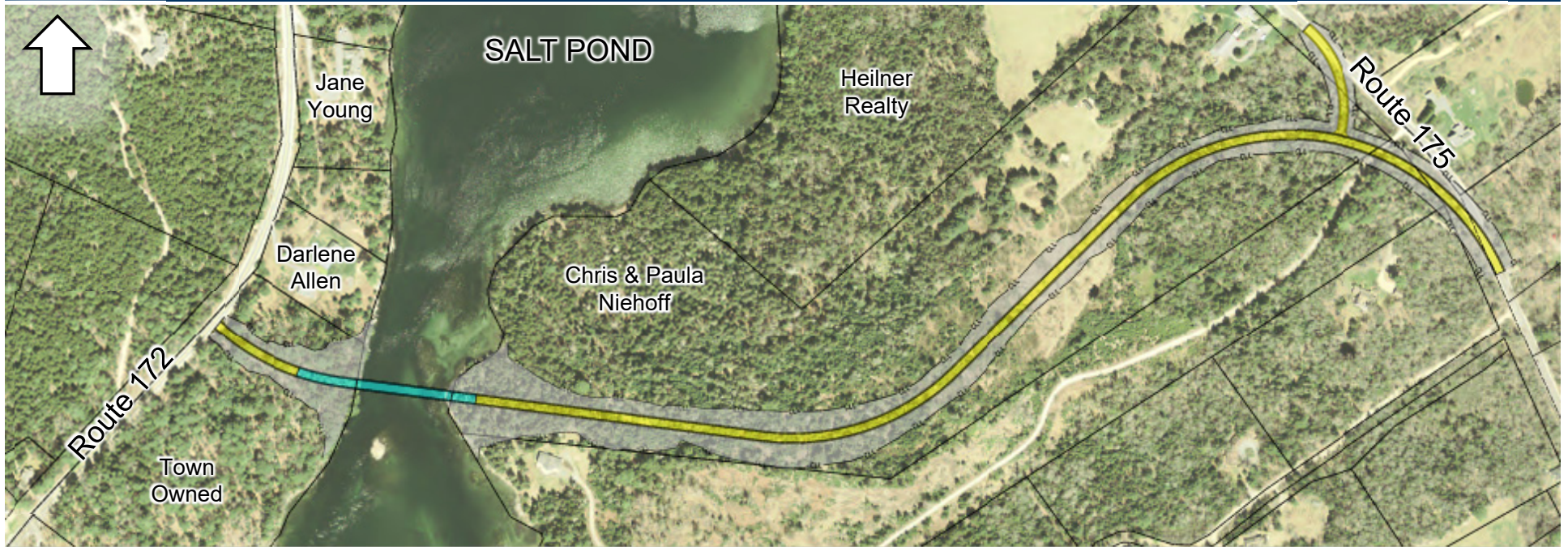


# Update on Alternate Route

## Refinement of This Alternative is Ongoing

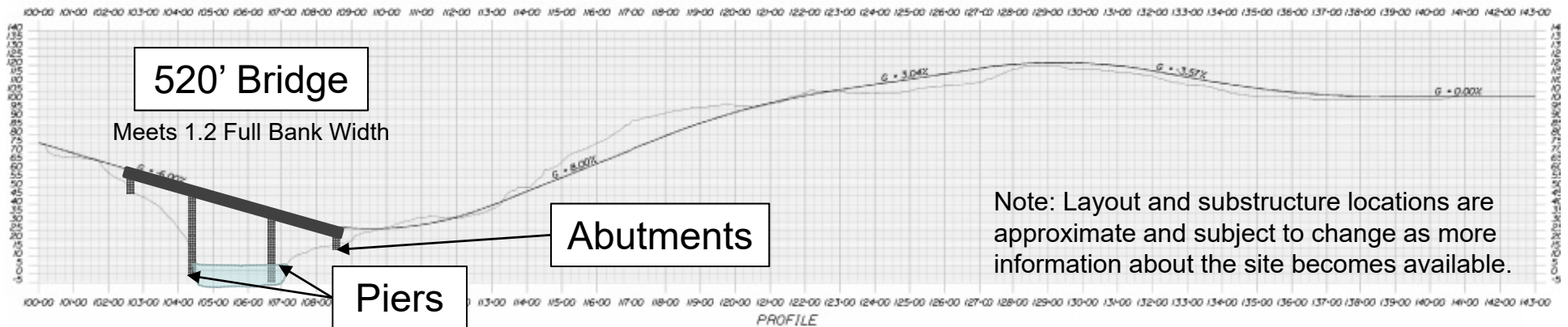
- Roadway & Bridge Typical Section:
  - Two 12 foot lanes with two 4 foot shoulders
- Initial Design Concept Has Been Refined to:
  - Provide horizontal roadway geometry suitable for a 45 mph roadway
  - Show tee intersections at all roadway intersections
  - Increase roadway grades to minimize embankment height at the Salt Pond
  - Locate the required bridge piers out of the primary channel
  - Move fill slopes away from the Salt Pond to minimize environmental impact

# Update on Alternate Route



← Route 172

Route 175 →



# Alternate Route Concept

## Design Unknowns:

- Wetland Limits (only limited GIS data available, site evaluation will be scheduled)
- Archeological Considerations (initial site evaluation will be scheduled)
- The results of the above evaluations could significantly influence this alternative

## Many additional items require consideration:

- Falls Bridge will be closed to all vehicle traffic. Turnarounds required. Cost?
- Bridge condition of bridge at time of transfer? Are repairs required? Cost?
- Requires additional maintenance by the Town (not included in project costs)
  - Future Falls Bridge maintenance will be the responsibility of the Town.
  - Portions of Route 175 will likely become a Town road.
  - The small strut/bridge north of the Falls Bridge on Route 175 will likely become a Town-owned structure.

# Questions on Alternate Route?



# Discussion



*Integrity - Competence - Service*

