

# Gallatin County 2016 TSEP Grant Application

Alternative Analysis Options & Selection



# Introduction



- I. Summarize Nixon Bridge Deficiencies
- II. TSEP Requirements
- III. Alternative Analysis Options
- IV. Recommendation

# Nixon Bridge Primary Deficiencies

- **Weight Limit**
  - Posted weight limit prevents crossing by fire equipment, construction equipment, etc.
- **Width**
  - Narrow width only allows for one-way traffic
- **Condition of Steel Truss**
  - Areas of section loss throughout the structure
    - ✦ Structure Rating = 4
- **Condition of Concrete Abutments**
  - Minor cracking throughout. South abutment armored/repared along the bottom.
    - ✦ Scour Critical Rating = 5
    - ✦ Hydraulic Capacity



# TSEP Requirements



- Consider **all** available alternatives
  - No action
  - Rehabilitation
  - Replacement
- Explain how each alternative does or does not solve the existing safety problems
- Consider cost effectiveness of solutions



# Alternative Analysis Options



- No action
- Rehabilitation
- Replacement
  - Two Span Options
    - ✦ Prefabricated steel
    - ✦ Precast concrete
  - Single Span Options
    - ✦ Welded plate girder
    - ✦ New truss



# No Action Alternative



- Will not solve safety issues
  - Weight limitation
  - Fracture critical bridge
    - ✦ A steel bridge with a tension member whose failure would cause a portion of or the entire bridge to collapse
  - Single lane access
  - No year around detour
- Will not solve deterioration issues
  - Section loss of the steel truss
    - ✦ Bridge built in 1891, moved to existing site in 1924
    - ✦ Past the end of the expected service life
  - Cracking concrete abutments
- Estimated Cost: \$0

This does not solve the existing safety problems



# Option 1: Bridge Rehabilitation Alternative



- Will **improve** the following issues
  - Weight limit will not meet legal loading, but will improve
    - ✦ Disadvantage for grant scoring as it does not solve deficiencies
  - Steel truss condition
- Will **not improve** the following issues
  - Bridge will remain one lane
- Additional issues
  - Bridge may be closed during the rehabilitation process
- Estimated Project Cost: **\$750,000**

Not a strong option for TSEP funding as it improves but does not solve safety issues



# Two Span Bridge Alternative



- **Advantages:**
  - Shorter span beams are easier to transport/install
  - Beams are shallower to minimize road grade raise
- **Disadvantages**
  - Intermediate foundation cost
  - Intermediate foundation channel impacts



# Two Span Bridge Alternative

## Option 2: Prestressed Concrete Beam



- Advantages
  - No cast in place deck required, shorter construction time
  - Material cost is less than steel
- Disadvantages
  - Heavier materials means more expensive crane required
- Estimated Project Cost: **\$1,369,600**



Is a strong option for  
TSEP funding



# Two Span Bridge Alternative Option 2: Prestressed Concrete Beam



# Two Span Bridge Alternative Option 3: Prefabricated Modular Steel



- Advantages
  - Deck pan allows for optional deck surfaces
  - Lighter materials, less expensive to set
- Disadvantages
  - Material cost is more expensive
  - Longer construction due to deck surfacing
- Estimated Project Cost: **\$1,992,500**



Is a strong option for  
TSEP funding

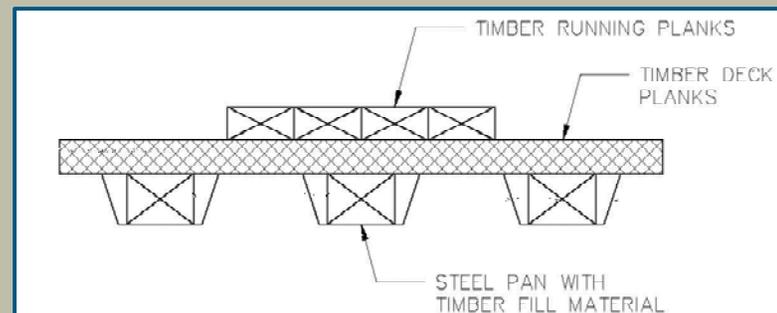
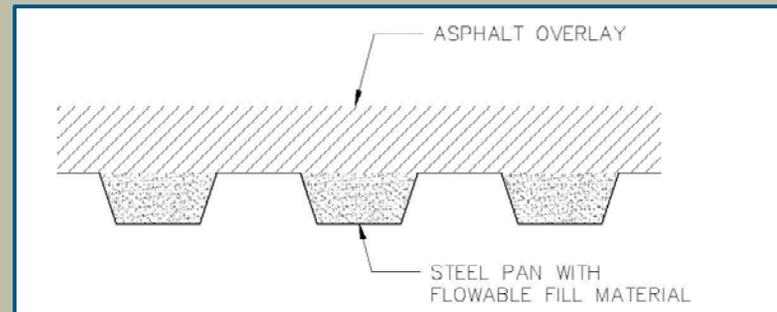
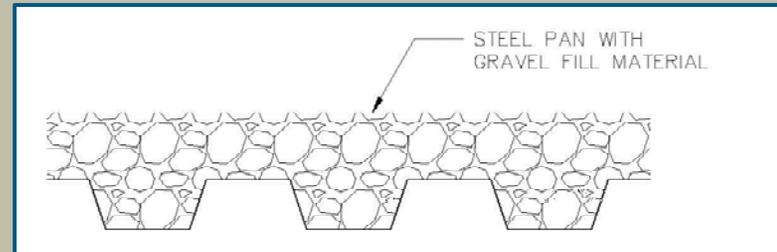


# Two Span Bridge Alternative

## Option 3: Prefabricated Modular Steel

### Deck surfacing options for steel bridge

1. **Gravel on steel pan**
  - ✦ Paved approach road, not recommended
2. **Asphalt on steel pan**
  - ✦ Least cost alternative
  - ✦ Least maintenance
  - ✦ **Recommended option**
3. **Timber on steel pan**
  - ✦ Most cost
  - ✦ Increased maintenance



# Two Span Bridge Alternative Option 3: Prefabricated Modular Steel



# Two Span Bridge Alternative Option 4: Steel Through Truss



- **Advantages**
  - Deck pan allows for optional deck surfaces
  - Lighter materials, less expensive to set
- **Disadvantages**
  - Material cost is more expensive
  - Longer construction due to deck surfacing
- **Estimated Project Cost:**  
**\$1,797,800**



Is a strong option for  
TSEP funding

# Single Span Bridge Alternative



- **Advantages:**
  - No intermediate foundation cost
  - No intermediate foundation channel impacts
- **Disadvantages**
  - Deeper girders requiring a greater road grade raise
  - Longer girders have to be field spliced



# Single Span Bridge Alternative Option 5: Welded Plate Girder



- Advantages
  - Deck pan allows for optional deck surfaces
  - Lighter materials, less expensive to set
- Disadvantages
  - Material cost is more expensive
  - Longer construction due to deck surfacing
- Estimated Project Cost: **\$2,280,600**



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# Single Span Bridge Alternative Option 5: Welded Plate Girder



# Single Span Bridge Alternative

## Option 6: New Steel Truss



- Advantages
  - Shallower superstructure means less road grade raise
  - Optional deck surfaces
- Disadvantages
  - Material costs are more expensive
- Estimated Project Cost: **\$2,563,360**



Is a strong option for  
TSEP funding



# Single Span Bridge Alternative

## Option 7: Prestressed Concrete Beam



- Advantages
  - Material cost is less than steel
- Disadvantages
  - Not feasible for site delivery – beams cannot be spliced, and cannot be delivered at 240-ft length
  - Cast in place deck required



Not an available  
replacement option

# Decision Matrix



Criteria Weight (1=Less Important, 2=More Important)	2	2	2	1	1	
Design Option	Capital Cost	Operations and Maintenance Cost	Service Life	Environmental Impact	Road Impacts (North side of bridge)	TOTAL POINTS
	Ranked from largest (1) to smallest (6)	Ranked from largest (1) to smallest (6)	Ranked from most (3) to least (1)	Ranked from most (1) to least (3)	Ranked from most (1) to least (6)	
<b>OPTION 1</b> Bridge Rehabilitation	6	1	1	3	5	<b>24</b>
<b>OPTION 2</b> Two-Span Prestressed Concrete	5	6	3	2	5	<b>35</b>
<b>OPTION 3</b> Two Span Prefabricated Modular Steel with Asphalt Deck	3	5	3	1	2	<b>25</b>
<b>OPTION 4</b> Two Span Steel Through Truss with Asphalt Deck	4	4	3	2	4	<b>28</b>
<b>OPTION 5</b> Single Span Steel Welded Plate Girder with Asphalt Deck	2	3	3	1	1	<b>18</b>
<b>OPTION 6</b> New Steel Truss	1	2	3	2	3	<b>17</b>



Recommendation is based on the lowest cost, long term option that is permissible.

# Questions and Discussion



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