TECHNICAL MEMORANDUM

Greenwood Avenue under Railroad

PREPARED FOR:	City of Bend, OR
COPY TO:	File
PREPARED BY:	John Hinman
DATE:	August 8, 2016
PROJECT NUMBER:	665109

Greenwood Avenue passes under two parallel two-span steel railroad bridges and a pair of more modern two-span prestressed precast highway bridges carrying Bend Parkway. Greenwood Avenue is a four-lane street with sidewalks on each side. Sidewalks under the railroad bridge are approximately four feet in width; the sidewalks under the Bend Parkway bridge are approximately 8 feet wide. All sidewalks are elevated above the street, and separated from the street by a chain-link fence. The existing bridge abutments constrain widening of the sidewalks away from the center of Greenwood Ave.

Project Purpose

The purpose of a project at the Greenwood Avenue Bridge is to improve pedestrian and bicyclist safety under the railroad and parkway bridges. The capacity and safety may be increased by adding width to sidewalks on each side of Greenwood Ave and by adding bike lanes.

Alternatives Considered

Alternative 1 – Widen Sidewalks Away from the Center of Greenwood Ave.

This alternative consists of leaving the configuration of Greenwood Avenue as it is, and widening the sidewalks under the railroad bridge to match the width of the sidewalks under the Bend parkway.

This alternative requires removing the existing railroad bridge and constructing a new bridge. The existing retaining wall supporting the sidewalks would remain in place, and the profile of the sidewalks would remain as is.

Replacing the railroad bridge involves removing a structure that may be eligible for the National Register of Historic Places because it is more than 50 years old, it uses relatively unusual details, and it is in comparatively original condition. Use of Federal funds for a project that has an adverse effect on a National Register-eligible bridge requires several steps, including investigation of the existing structure and the likely effects on the structure, and demonstration that no feasible alternatives will avoid or reduce adverse effects.

Replacing the railroad bridge will be quite expensive. Both the main line track bridge and the siding track bridge will require temporary bridges, called shoo-fly bridges, and relocation of a substantial amount of existing track. Railroad flagmen are required, controlling train movements and limiting access to the site by the bridge contractor.

The combination of effects on the potentially historic railroad structure and the cost of replacing a railroad bridge greatly increase the time required and the cost required to widen the sidewalks away from the centerline of Greenwood Avenue. These costs are likely to be prohibitive, as just the shoo-fly alone could be in excess of $1 million.

Alternative 2 – Widen Sidewalks toward the Center of Greenwood Ave.

This alternative consists of reducing Greenwood Ave. from four lanes to two through lanes with a Greenwood Avenue "Road Diet" between approximately NW 2nd Street and NW Harrison Street. This provides the opportunity to provide 6-foot buffered bike lanes on Greenwood Avenue and widen the sidewalks to 8 feet under the existing railroad bridge. A minimum of 20 feet clear between the faces of the barriers must be provided for emergency access along Greenwood Avenue.

The widening would include new retaining walls at the inside edge of the new sidewalks. The existing fences, sidewalks slabs, and the top one to two feet of the existing retaining walls would be removed. Fill between the new and existing retaining walls would be placed, and a new sidewalk slab and fence installed. Modifications to the existing abutment wall transitions may be included to improve sight lines and to remove potential blind spots along the sidewalks.

Pavement, signing, and striping on Greenwood Avenue would be restored. Proposed striping includes a 6-foot buffered bicycle lane between the vehicular lanes and the sidewalk retaining walls.

Traffic restrictions would be required while construction is in progress.

Cost of this alternative is approximately $829,000, including design, construction, and construction engineering and inspection.

Recommendation

The recommendation is to pursue widening the Greenwood Avenue "Road Diet" concept that allows sidewalks towards the center of Greenwood Avenue. This includes reducing Greenwood to two lanes, and striping bicycle lanes between the sidewalk and the vehicular lanes.

Basis of Costs

Cost estimates included are Class 5 estimates as defined by ASTM E2516, *Standard Classification for Cost Estimate Classification System*. Class 5 estimates can be expected to have an accuracy range of approximately +100% to -50%.

PROJECT PROSPECTUS

Part 1 — Project Request (Page 1 of 2)

Key Number:	Jurisdiction:

Section:	Region:	Area:	District:
Greenwood Ave, Railroad Bridge	4	Central Oregon	10

State Highway No.:	Highway Name:	Mile Point From:	To:	Length: (mi) (km)
	Greenwood Avenue			0.02 miles

Urban / Rural	City:	MPO:	Within UGB	County:	Road/Street Name:
☑ Urban ☐ Rural	Bend		☑ Yes ☐ No	Deschutes	Greenwood Avenue

Route No.:	NHS	HPMS:	FC:	Applicant (If other than State):
	☐ YES ☑ NO			City of Bend

US Congressional District:	State Senate District:	State Representative District:
Rep. Walden	Sen. Knopp	Rep. Whisnant

Cost Estimates (x $ 1,000)			Project Components		Right Of Way		
Preliminary Engineering		$196	Grading	x	Files	(#)	
Right Of Way		$0	Paving	x	Hectares	(#)	
Utility Reimbursement			Structures	x	Relocations	(#)	0
			Signing		Acquisitions	(#)	
Roadway	$55		Signals		Easements	(#)	
Structures	$263		Illumination		Work By: State / Consultant / Applicant		
Signals	$0				Preliminary Engineering	(S,C,A)	C
Illumination	$0				Construction Engineering	(S,C,A)	C
Temp. Protection	$0				Right of Way Descriptions	(S,C,A)	C
Const. Contingencies	$131				Right Of Way Acquisitions	(S,C,A)	C
Const. Engineering	$65		Project Categories		Constructed By		
Remove Exist Bridge	$51		Environmental Class (1, 2, 3, PCE)		☑ Contract ☐ County Force		
Other	$67		Design Category (1-7)		☐ State Force ☐ Other		
Total CE and Construction:		$632	Work Type Code (1-13)		☐ City Force		
Total Estimate:		$ 829	Primary STIP Work Type:	Bridge			
Recommended Let Date By Federal Fiscal Year (Quarter-Year):							

PE Fund:	R/W Fund:	UR Fund:	CE-CN Fund:
PE EA:	R/W EA:	UR EA:	CE-CN EA:

Item	Existing	Proposed
Travel Lanes (#)	4	2
Structures (#)	1	1
Signals (#)	0	0
Bike Way (#)	0	2
Average Daily Traffic	41000	
Year of ADT	2010	
Throughway Y/N		

Define The Problem:

Greenwood Ave is a 4-lane street with narrow (4-ft-wide) sidewalks between the bridge abutments and the fences separating the sidewalks from the traffic lanes. No bicycle lanes are present. Current sidewalk widths are hazardous for pedestrians and bicyclists. The lack of space results in a perception of personal safety issues, as users must be in very close proximity to pass each other.

Describe Proposed Solution: - Attach Sketch Map

Widen the sidewalks toward the center of Greenwood Avenue, and reduce Greenwood to two traffic lanes with bike lanes. The resulting sidewalk would be 8 feet wide at a minimum.

Prepared By:	Date:	OTC Approval Date:	Program Year:	Funding Amount:
X City of Bend	7/29/16			

(5-2003)

PROJECT PROSPECTUS

Part 1 Project Request (Page 2 of 2)

Key Number:	Jurisdiction:

Section:	Region:	Area:	District:
Greenwood Ave, Railroad Bridge	4	Central Oregon	10

Project Justification

The existing bridge does not provide sufficient width for safe bicycle and pedestrian access along Greenwood Ave. Suitable sidewalks and bike lanes are present along Greenwood leading up to the bridge at each end, inviting pedestrians and bicyclists to use the route, but users cannot safely cross under the existng railorad bridge..

Additional Information For Project Requested By Local Jurisdictions

Responsible Local Office To Be Contacted For The Following Activities:

1. **Public Hearing / Citizen Involvement** _____ **(Office)** _____ **(Phone)**
2. **Environmental / Planning** _____ **(Office)** _____ **(Phone)**
3. **Pre-Engineering** _____ **(Office)** _____ **(Phone)**

This Official Request is From:

City of: Bend **and/or** _____ **County**

By: _____ **By:** _____

By: _____ **By:** _____

By: _____

Applicable Intergovernmental Agreements:

IGA Number:	Jurisdiction Name:	Agreement Date:

Administrative Recommendation

(5-2003)

Bridge Prospectus Cost Estimate

		NBIS Bridge No.			
Applicant:	City of Bend				
Project / Section	Greenwood Ave, Railroad Bridge	Region: 4	Area: Central Oregon		District: 10

New Bridge / Roadway Configuration:			Existing Bridge:		
Left Side Rail	0	feet	Bridge Length	63	feet
Left Sidewalk	8	feet	Bridge Width	72	feet
Shoulder	6	feet	Area	500	square yds.
Lane 2	14	feet			
Lane 1	0	feet	New AC Top Width	7	feet
---CL---	2	feet	New AC Depth	5	inches
Lane 1	0	feet	New Base Depth	0	inches
Lane 2	14	feet	Project Length	235	feet
Shoulder	6	feet	Net Road Work Length	235	feet
Right Sidewalk	8	feet	X-S Side Slope	0	
Right Side Rail	0	feet	AC Avg Width	7	feet
			Base Avg Width	7	feet
Bridge Length	235	feet	Asphalt Density	2.025	tons / yd
Bridge Width	58	feet	Base Density	2.025	tons / yd
New Area	1510	square yds.	New AC Received	50	tons
			New Base Required	0	tons

COST ESTIMATE:	Quantity	Unit	Price per unit	Cost ($x1000s)
Right-of-Way	-	Acre	$ 100,000	$0
	==Roadway==			
Clear & Grub	$ -	lump sum		$0
General Excavation	626	cubic yards	$ 25.00	$16
Embankment in Place	644	cubic yards	$ 40.00	$26
Pavement Removal	4,700	square feet	$ 2.00	$9
Aggregate Base	-	tons	$ 25.00	$0
Asphalt Concrete	50	tons	$ 85.00	$4
Riprap	-	cubic yards	$ 34.00	$0
Guardrail, Type 2A	-	feet	$ 24.00	$0
Guardrail, Type 3	-	feet	$ 55.00	$0
Guardrail Trans	-	feet	$ 110.00	$0
Flared Terminals	-	each	$ 2,100.00	$0
			Subtotal Roadway	$55
Structures	3,760	square feet	$ 70.00	$263
Signals		lump sum		$0
Illumination	$ -	lump sum		$0
Temporary Protection	$ 40	lump sum		$0
Remove Existing Bridge	$ 1,880	square feet	27	$51
Stormwater	$ 20,000	lump sum		$20
Mobilization - Stage Const	47,000	lump sum		$47
			Subtotal Structures	$381
			Subtotal Construction	$436
	==Engineering==			
Construction Engineering	15	percent of construction		$65
Contingency	30	percent of construction		$131
			Subtotal Const. Eng.	$196
Preliminary Engineering				
Consultant	35	percent of construction		$153
State	5	percent of construction		$22
County	5	percent of construction		$22
			Subtotal PE	$196
			Total Estimate	$829

Bridge Project Prospectus
Additional Bridge Information

Applicant: City of Bend		**NBIS Bridge Number:** 0	
Project Name Greenwood Ave, Railroad Bridge **Section:**		**Region:** 4	**Area:** Central Oregon / **District:** 10

Funding

Preferred Source:

- ☐ OTIA III
- ☑ Federal HBRR

Acceptable Source:

- ☐ OTIA III
- ☑ Federal HBRR

Heavy Vehicle Usage

	Existing	Proposed
Truck AADT:		

Fire Truck Usage:

- ☑ YES, at least 25% of trips use bridge.
- ☐ No. Less than 25% of trips

Detour

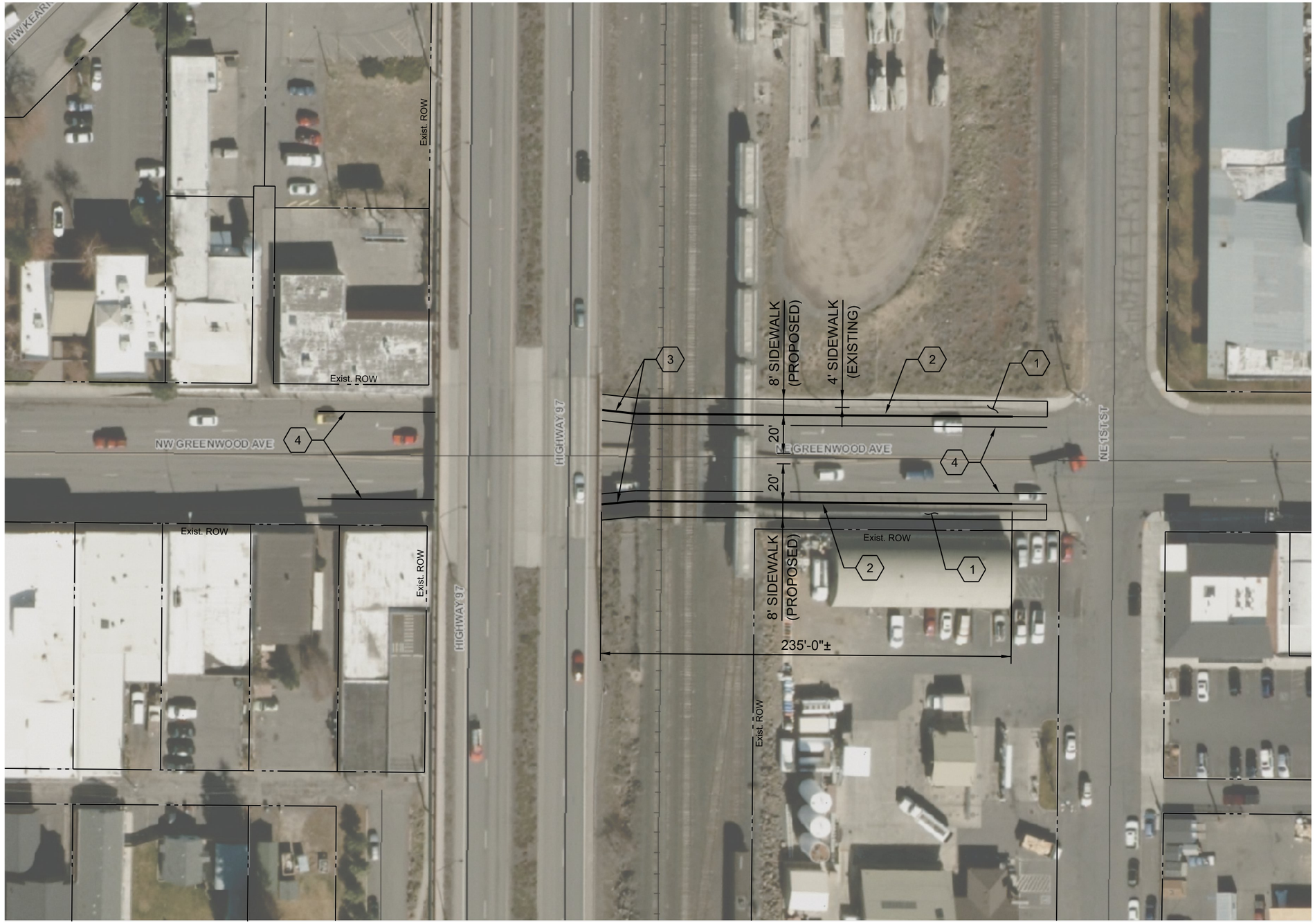
Detour Route:

Length:

Map: (Please attach map)

Regional Freight Corridor Analysis:

Special Consideration:



KEY NOTES:

1. REMOVE EXISTING 4' WIDE SIDEWALK AND CONSTRUCT 8' WIDE SIDEWALK.
2. CONSTRUCT NEW RETAINING WALL.
3. TRANSITION WALL TO EXISTING.
4. STRIPE 6' WIDE BIKE LANE.

N

PLAN
1"=60'-0"

GREENWOOD AVE, UNDER BNSF

ch2m

PLOT DATE: 2016\07\28 PLOT TIME: 10:04:25 AM