



# Purpose and Need

## DRAFT

### US 14A/US85 – Deadwood Box

Project # NH014A(28)40, PCN 06Y6

Lawrence County, South Dakota  
November, 2020



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## 1.0 Introduction

The South Dakota Department of Transportation (SDDOT), in conjunction with the City of Deadwood (the City) and Federal Highway Administration (FHWA), is completing a corridor and environmental study for a portion of US Highway 14 Alternate (US14A)/ US Highway 85 (US85)/Pioneer Way in the City. Included in this study is the structure over Whitewood Creek, which currently is a 1,768 foot-long structure and referred to as the “Deadwood Box” (See Figure 1). This structure channels Whitewood Creek below US14A/US85/Pioneer Way and is reaching the end of its serviceable life. This study will identify potential alignment and design options, structure types, construction phasing, and detour considerations for the Deadwood Box.

This report contains the draft Purpose and Need statement for the Deadwood Box project (the Project) and is intended as part of the planning process for the Project. As part of this planning, this Purpose and Need will be reviewed by the Study Advisory Team (SAT) and approved by FHWA. Upon review and approval, this statement will be presented to the public. Public input will be incorporated into the Purpose and Need statement for inclusion in the environmental document. The document will be prepared according to the provisions of the National Environmental Policy Act (NEPA), along with regulations and guidelines of FHWA, the lead federal agency, and the requirements of SDDOT, the joint lead agency. All alternatives evaluated for the Project must satisfy the issues identified in the Purpose and Need in order to advance for further evaluation.

The Project is planned for construction in 2026.

### 1.1 Project Location

Deadwood is located within Lawrence County, South Dakota. The City lies within a narrow canyon in the northern Black Hills and is known for its rich history and as a popular tourist destination. The Deadwood Box carries US14A/US85/Pioneer Way for approximately 1,768 feet near Deadwood’s historic Main Street and conveys Whitewood Creek from approximately Pine Street to Railroad Avenue (See Figure 1).

The commercial district exists along the main roadway corridors: Main Street, US14A, US85, and Sherman Street. Residential neighborhoods begin roughly one to two blocks from the main roadways and are built up into the hillsides and gulches of Deadwood.

Development within the City is challenging due to little developable land and the surrounding steep and forested terrain. In addition, United States Forest Service (USFS) and Bureau of Land Management (BLM) manage lands surrounding the city limits. The physical and land-ownership constraints restrict traditional outward growth and have led to inward, upward, and discontinuous outward growth patterns.

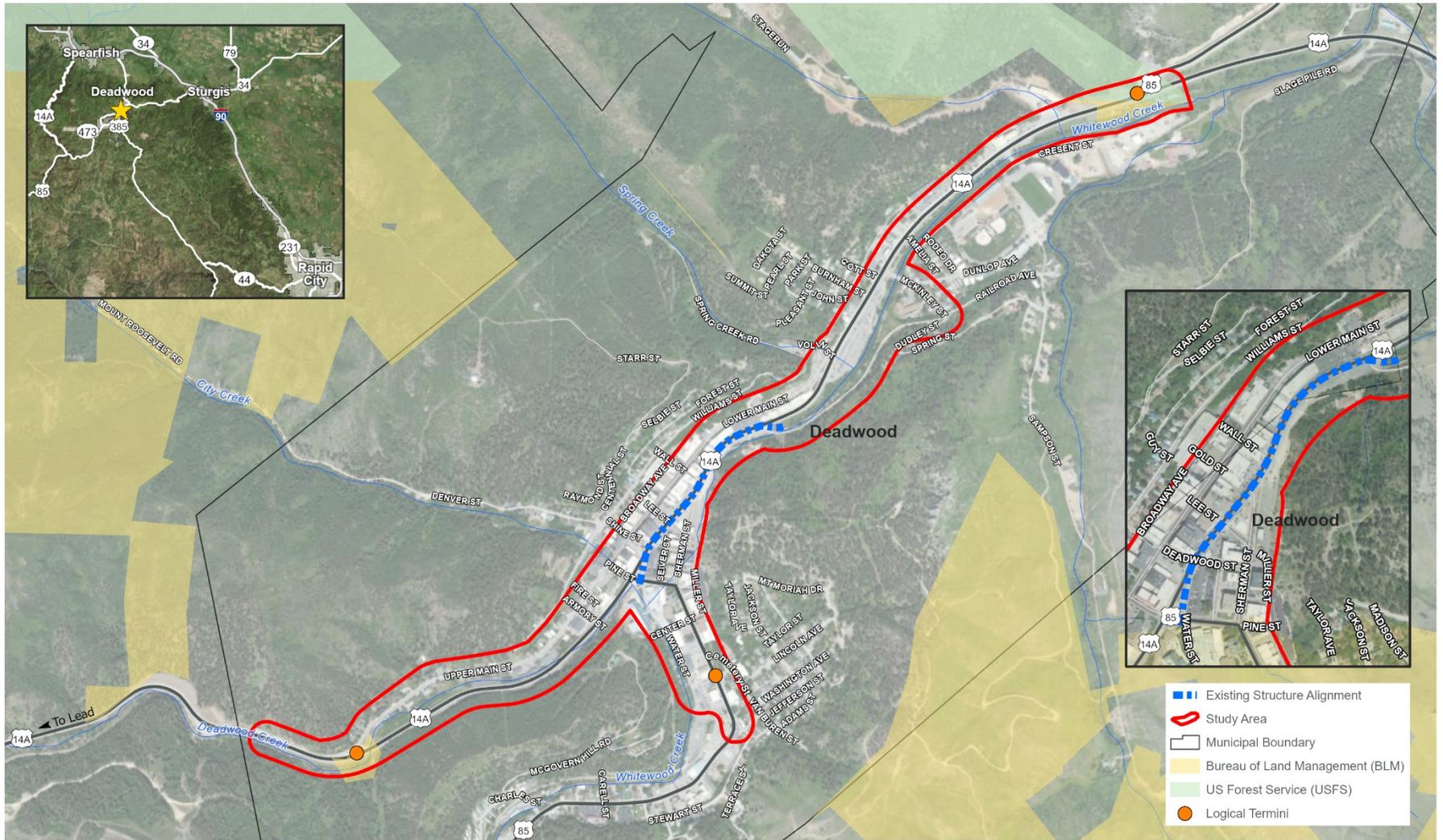


Figure 1. Project Location and Study Area

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Regionally, US14A and US85 are the primary arteries between Deadwood and Interstate 90 (I-90), which brings many travelers into the Black Hills for recreation and other tourism activities. West of Deadwood, US14A serves as the truck route to the nearby town of Lead. US85 connects the eastern part of Spearfish located on I-90 to Deadwood and eastern Wyoming. US85 also connects to US Highway 385 (US 385) south of the study area which is the main north-south route through the Black Hills. Highway 14A also serves as a recreational route through Spearfish Canyon.

Along with motor travel, bicycle and pedestrian use is important within Deadwood to support the tourism industry and recreational and healthy lifestyles. Existing and future multi-use paths and trails are shown in Figure 2.

## 1.2 Project Background

The Deadwood Box (Structure Number 41-161-156) was constructed in 1967 and underwent major rehabilitation in 1989. Other repairs have occurred during the life of the structure such as epoxy chip seal, patching of spalled concrete, and repair of delamination areas. Successive Inspection reports note additional areas of exposed rebar, spalling has expanded, and the structure deck, concrete floor, and deck joints are continuing to degrade.

Even with the rehabilitation and minor repairs, the structure is reaching the end of its serviceable life. The SDDOT Major Bridge Investment Study<sup>1</sup> noted the structure was rated “Structurally Deficient<sup>2</sup>”, from the 2012 and 2014 inspections, citing that the substructure has significant condition issues. It should be noted that based on new definitions for condition ratings, the structure is no longer considered structurally deficient and currently has a “fair condition” rating.

The City of Deadwood Comprehensive Plan<sup>3</sup> also recognized Highway 14A as an area for improvement, citing that pedestrian safety, particularly at crossings, was a concern of the City. However, few instances of pedestrian and vehicle conflicts have occurred within the study area<sup>4</sup>. Pedestrian facilities through town include curbside sidewalks of varying widths, and multi-use trails. Crosswalks also exist at signalized and unsignalized intersections. Although there have been few vehicle-pedestrian crashes, the 2008 Deadwood Pedestrian Circulation and Enhancement Study<sup>5</sup> noted that several crossings have had numerous complaints over the years regarding difficulty in crossing the roads.

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<sup>1</sup> FHU and Benesch. (2016). Report for the South Dakota Department of Transportation Major Bridge Investment Study.

<sup>2</sup> The term “Structurally Deficient” is no longer used when referring to the classification condition of a structure. Under the programs established by MAP-21 federal legislation, “structurally deficient” has been redefined as Poor in a Good/Fair/Poor condition classification system.

<sup>3</sup> City of Deadwood. (2018). *Deadwood Comprehensive Plan*. Found online at: [https://www.cityofdeadwood.com/vertical/sites/%7BECDE07BE-19F7-4F11-A017-CFDAD3EEEE69%7D/uploads/DeadwoodCompPlan\\_Draft\\_November2018.pdf](https://www.cityofdeadwood.com/vertical/sites/%7BECDE07BE-19F7-4F11-A017-CFDAD3EEEE69%7D/uploads/DeadwoodCompPlan_Draft_November2018.pdf)

<sup>4</sup> HDR. (2020) DRAFT Technical Memo: Crash History Review.

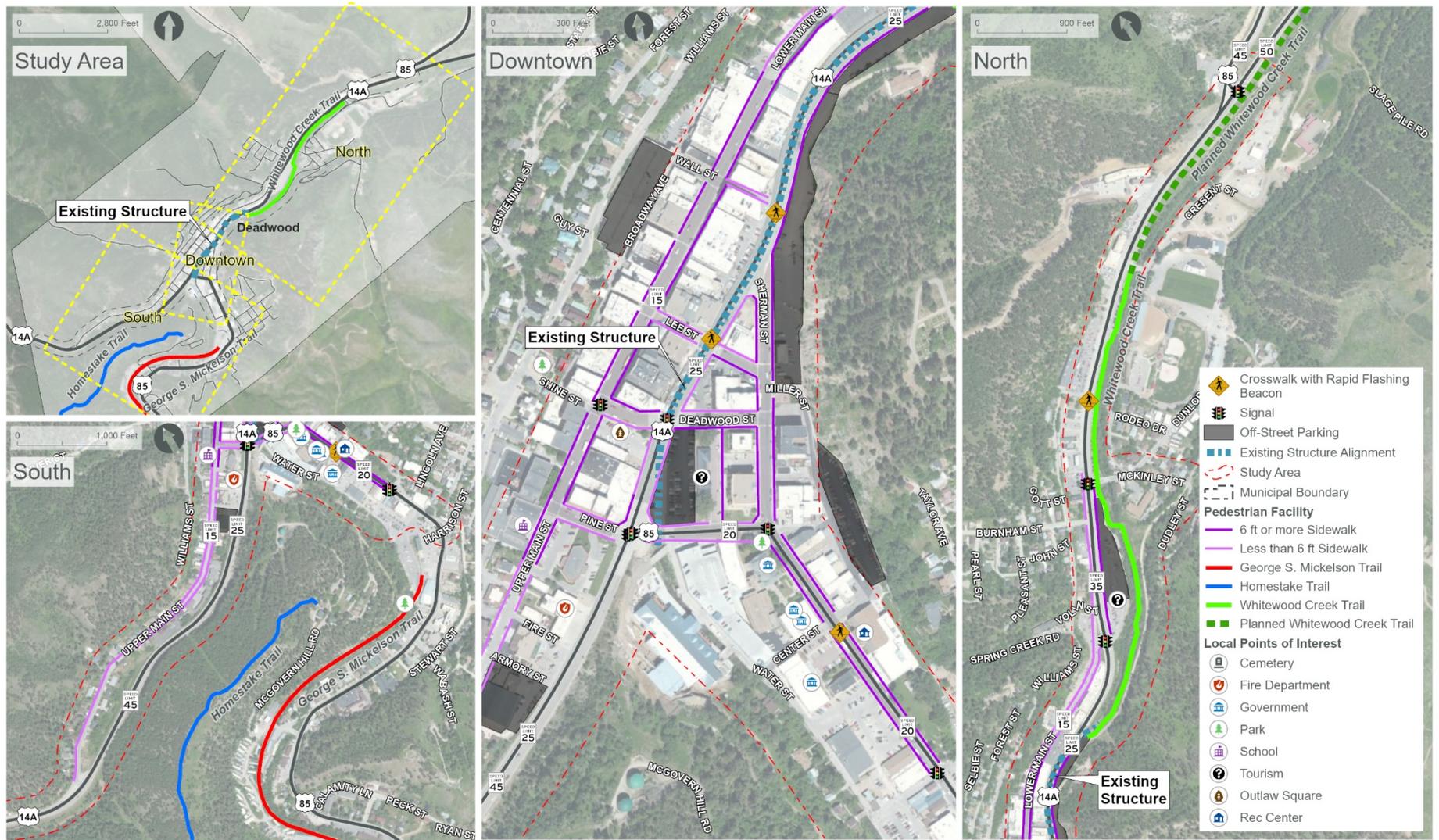


Figure 2. Pedestrian Facilities within the Study Area



Several planning studies within the City and Region identified improvement recommendations for the corridor or specifically for the Deadwood Box. Table 1 summarizes the plans and studies considered for determining the purpose, needs, and goals for this Project.

**Table 1. Planning documents published within the planning region of the Deadwood Box Project.**

Planning Document	Year Published	Document Summary
<b>Lawrence County Transportation Plan</b>	2005	Provides infrastructure and service recommendations for growth and development in Lawrence County. The study recognized Deadwood as a growth area.
<b>City of Deadwood Pedestrian Circulation and Enhancement Study</b>	2008	Provides recommendations for improving pedestrian circulation and pedestrian and bicycle crossings throughout Deadwood.
<b>SDDOT Major Bridge Investment Study</b>	2016	Makes recommendations for the Deadwood Box and Surrounding approaches
<b>2018 City of Deadwood Comprehensive Plan</b>	2018	Includes recommendations regarding Highway 14A, parking, and pedestrian infrastructure within the City.

In addition to these planning studies, the City also has issued design guidelines for the Historic District, which allows the City to remain in compliance with and enhance their standing with the National Historic Landmark designation. The guidelines were developed to help evaluate the appropriateness of alterations to the Historic District.

### 1.3 Project Limits

The study area includes the following roadway segments (See Figure 1):

- US14A / Pioneer Way from Upper Main Street to the northern junction with US85,
- Main Street from the northern intersection of US14A / Pioneer Way to the southern intersection of US14A / Pioneer Way,
- US85 / Sherman Street from Cemetery Street to Pine Street.
- US85 / Pine Street from Main Street to Sherman Street, and
- Sherman Street from Pine Street/US85 to US14A/Pioneer Way.

The study area encompasses the potential relocation of the Deadwood Box, Whitewood Creek and roadway corridor, the possible construction detour routes, and the surrounding major intersections that may be indirectly impacted by the build concepts brought forward during the concept development process.

This study area represents an area of analysis that would encompass effects that are reasonably foreseeable and are related to the Project, including improvements associated with the Deadwood Box and other potential related improvements along US14A/US85, intersections, parking areas, and pedestrian facilities.

Logical termini are defined by FHWA as (1) rational end points for a transportation improvement and (2) rational end points for a review of the environmental impacts. The environmental impact review frequently covers a broader geographic area than the strict limits of the transportation



improvements. Ground-disturbing activities for the Project would be concentrated within the Deadwood Box. These activities may have effects on a number of intersections within the study area. For this study, the logical termini are from the US85 intersection with US14A/ Pioneer Way on the north side to the intersections of Cemetery Street on US85 and Upper Main Street on US14A (See Figure 1).

## 2.0 Purpose and Need for the Project

The purpose and need provides a basis for the development and evaluation of Project alternatives. The purpose must be comprehensive enough to allow for a reasonable range of alternatives, and specific enough to limit the range of feasible alternatives. The need describes the problems to be addressed and describes the causes of those problems. The Project need also provides the factual and quantifiable basis to support the Project purpose. Each alternative must be evaluated on its ability to meet the purpose and need. During development of the NEPA document, the Project's purpose and need will be further refined with the input from stakeholders, tribes, agencies, and the public.

### 2.1 Project Purpose

The purpose of this Project is to address the deteriorating structure conditions to provide a durable structure and reduce long-term maintenance costs.

### 2.2 Project Need

#### 2.2.1 Address Deteriorating Structure

The Project is needed because of the continuing deterioration of the Deadwood Box.

FHWA's National Bridge Inventory Standards provide guidance for structure inspections and thresholds for structure conditions. These condition thresholds are determined by the lowest given rating of each structure component: the structure deck, superstructure, substructure, and culvert. If the lowest rating is greater than or equal to 7, the structure is classified as Good; if it is less than or equal to 4, the classification is Poor. Structures rated 5 or 6 are classified as Fair. The Deadwood Box continues to degrade resulting in condition ratings that are on the low end of what is considered "fair condition". Table 2 identifies the 2020 condition ratings for structural components of the Deadwood Box.

**Table 2. Component Condition Rating Based on 2020 Structure Inspection and Appraisal Report**

Condition Rating		
Item	Rating <sup>1</sup>	Description
Deck	5	Fair Condition (all primary structural elements are sound but may have minor section loss)
Superstructure	7	Good Condition (some minor problems)
Substructure	5	Fair Condition (all primary structural elements are sound but may have minor section loss)
Culvert	NA	NA

Based on the 2020 inspection, the deck and substructure are nearing "Poor Condition" and inspection reports indicate that deterioration continues. The deterioration of portions of the structure have progressed to the point where they require major repairs or replacement.

In addition, sufficiency ratings were used by FHWA to serve as a prioritization tool to allocate funds, though this method is no longer used. A sufficiency rating evaluates highway structure data to obtain a numeric value which is indicative of a structure's sufficiency to remain in service. A rating of 100 percent would represent an entirely sufficient structure and rating of 0 percent would represent an entirely insufficient structure. This rating takes into consideration the following factors:

- Structural adequacy and safety
- Serviceability and functional obsolescence
- Importance for public use

Based on the sufficiency ratings, FHWA would provide funding for rehabilitation and replacement for certain ratings. According to the 2020 Structure Inventory and Appraisal (SIA), the Deadwood Box received a sufficiency rating of 52.70. Structures with a sufficiency rating of 50 and below were eligible for replacement. Using the past method of prioritizing funding, the Deadwood Box would be considered near the threshold for eligibility for replacement under the Federal Highway Bridge Program.

The following sections provide additional information regarding the condition of the bridge components with a fair rating.

#### DECK CONDITION

The 2020 inspection noted several issues with the Deadwood Box that contribute to the deck condition rating of fair including:

- Cracking and spalls present
- Exposed rebar
- Leaking expansion joints
- Delamination
- Efflorescence
- Epoxy Chip Seal Failure

Condition data provides quantitative information about the physical condition and performance of the deck. Table 3 provides a description associated with each condition rating. Based on the description and the rating at the lower end of "Fair", the deck is nearing a point where the level of deterioration is at a "Poor" condition or moderate to severe level.

Previous inspections have identified approximately 2,000 square feet of the deck that are considered in poor condition and documented that the deck continues to develop new spalls with exposed rebar. Annual maintenance includes patching the spalls; however, spalls, cracking and exposed rebar appear to continue to occur requiring frequent repair.



**Spalls** are a depression in a concrete caused by deterioration or removal of a portion of the concrete surface.



**Delamination** occurs when layers of concrete separate at or near the outermost layer of reinforcing steel, often because of deterioration of the reinforcing steel.



**Efflorescence** is a common term used in structure inspections and refers to the white, powdery substance left behind from water seepage or leaking that indicates concrete deterioration or cracking.



**Table 3. Levels of structure element condition ratings and descriptions**

<b>Rating</b>	<b>Description</b>
<b>Good</b>	No deterioration to minor deterioration
<b>Fair</b>	Minor to moderate deterioration
<b>Poor</b>	Moderate to Severe Deterioration
<b>Severe</b>	Beyond the limits established in condition state 3 and/or warrants a structural review to determine strength or serviceability of the element or structure.

Further investigation led by SDDOT was completed in 2018 (Bridge Deck Condition Evaluation<sup>6</sup>). This deck condition study evaluated the structure using various testing methods and improved their understanding regarding the condition of the deck concrete. The testing indicated deterioration within the deck surface and subsurface, confirming delamination. Additionally, the testing indicated that moderate or high concrete deterioration has occurred in many sample areas and a moderate to high rate of deterioration will continue to occur. Lastly, there is evidence from testing indicating that the structure rebar is corroding. The structure shows outward signs of corroding rebar including spalling and delamination, which is occurring in numerous locations on the structure. Due to rebar corrosion found near rebar surfaces, cracking and spalling of currently sound concrete is likely to take place in the future. Cracks and spalls provide means of direct exposure to salts and water, so the corrosion propagation rates will likely increase.

#### **SUBSTRUCTURE CONDITION**

The 2020 inspections noted several issues with the Deadwood Box that contribute to the substructure condition rating of “Fair” including:

- Multiple utility protrusions
- Efflorescence
- Delamination
- Spalling
- Cracking
- Abutment joints with significant leakage

The 2020 SIA details that approximately 41 feet of the box abutment walls are considered in “Poor” condition and 126 feet are in “Fair” condition. Structure inspections indicate that deterioration of the substructure is ongoing and includes efflorescence, delamination, spalling and exposed rebar.

Previous inspection reports have also recorded wall movement, leakage through joints, and numerous instances of cracking. The inspection reports did not note any repair of these substructure issues in the last several years.

#### **BASIS FOR MEETING THE NEED**

To meet the purpose and need, Project alternatives must address the deteriorating elements and improve the sufficiency rating to a “Good” category.

<sup>6</sup> Infrasense, Inc. 2018. Bridge Deck Condition Evaluation. Structure No. 41-161-156 US14A over Whitewood Creek in Deadwood, South Dakota. SDDOT Project NH014A(21) PCN 04VE



### 2.2.2 Reduce Long-Term Maintenance Costs

The current structure was built in 1967 with a 50-year design life. Various maintenance and rehabilitation activities have occurred over the last several decades to repair the condition of the structure. These activities include scour protection, structure deck epoxy chip seals, re-surfacing, curb and gutter work, and a full deck replacement.

Table 4 lists major rehabilitation projects completed since the structure was built. One of the larger projects, the deck replacement, cost about \$2.7 million in 1989. As the structure continues to deteriorate, maintenance costs are anticipated to increase.

**Table 4. Major maintenance projects and costs on the Deadwood Box**

Project	Year Completed	Cost
Bridge Deck Epoxy Chip Seal	2011	\$643,990
Scour Protection	2010	\$45,525
Surfacing, Curb and Gutter, Grading	1988	\$184,531
Deck Replacement	1988	\$2,725,855
<b>Total</b>		<b>\$3,599,901.00</b>

#### BASIS FOR MEETING THE NEED

In order to meet the purpose and need, Project alternatives will need to provide a durable structure which reduces overall long-term maintenance costs over the next 50-70 years.

## 3.0 Project Goals

During Project scoping, goals were discussed and considered for inclusion in the Project. Project goals are not part of the alternative screening process; however, these goals are incorporated into the alternatives, where possible, to meet the concerns of the stakeholders and public. Failure to meet a Project goal will not necessarily eliminate an alternative from consideration. The following section describes an additional Project goal that will be considered for each alternative.

### 3.1 Improve Pedestrian and Bicycle Access and Circulation

Pedestrian and bicycle access and circulation is an important part of the overall transportation system of the City and the US14A/US85/Pioneer Way corridor as it is used by both local residents and non-residents visiting recreational and tourist attractions. Pedestrian and bicycle access and circulation are currently limited within the study area.

The Pedestrian Circulation and Enhancement Study<sup>7</sup> identified several recommendations that relate to the study corridor and pertain to limited access and circulation, including:

- *Improved pedestrian access to Main Street:* Main Street is one of the main tourist attractions in the City. Many of the parking areas as well as other tourist attractions exist on the opposite side of US14A/US85/Pioneer Way

<sup>7</sup> RPM Transportation Consulting and NJS Engineering. 2008. City of Deadwood Pedestrian Circulation and Enhancement Study.



- *Construction or reconstruction of new sidewalks:* The City of Deadwood desires to improve sidewalks to comply with Americans with Disabilities Act (ADA) standards where feasible and improve pedestrian safety
- *Improved intersections:* Intersection improvements were proposed to increase pedestrian safety and contribute to enhanced pedestrian movement. These improvements range from constructing curb ramps at intersections to constructing pedestrian refuge islands on wider crossings.
- *Upgrades to signage, striping, lighting, and signaling:* Various signals, signage, striping, and lighting enhancements were recommended within the plan, particularly along Pioneer Way.

### 3.1.1 US14A/Pioneer Way Crossings

Crosswalks exist at signalized intersections and unsignalized intersections with pedestrian-actuated rapid flashing beacons at popular crossing locations. There are two main unsignalized crosswalks across US14A: one at Wall Street and one at Lee Street (See Figure 3). The City has received several complaints about these crosswalks over the years. The 2008 Deadwood Pedestrian Circulation and Enhancement Study cited that pedestrians were unlikely to use the buttons that actuate the rapid flashing beacons at these crossings. The study also identified that crossing the four lanes of Pioneer Way/US 14A was intimidating to pedestrians. Other crossings on US14A are also long and may not be desirable for pedestrian use. The distance of the crosswalk, the speed at which traffic travels on US14A, and the volume of traffic can be daunting to pedestrians that need to cross. Adding to the demand for these crossings, several large parking areas exist on the east side of US14A, forcing many pedestrians to cross the highway to reach tourist and entertainment venues on Main Street.

### 3.1.2 Multi-use Facilities

Two popular multi-use trails within or near the study area, the Mickelson Trail and Whitewood Creek Trail, are heavily used by both residents and visitors. The Mickelson Trail begins in Deadwood and is a popular shared use recreational path that spans much of the length of the Black Hills. The Mickelson Trail also connects with the Homestake Mine Trail, which is located immediately south of the study area. The Whitewood Creek Trail begins at Railroad Avenue and currently ends at the Days of 76 rodeo grounds within the City of Deadwood. The City of Deadwood has plans to extend this trail another mile to the north with the ultimate goal of extending to the Whitewood Trail to the City of Sturgis and/or City of Whitewood. Currently, Whitewood Trail and Mickelson Trail are not connected with facilities that are wide enough to accommodate both pedestrian and bicycle traffic.

Opportunities to connect the trails via a mixed use trail are limited. The 2016 SDDOT Major Bridge Investment Study indicated that the deck geometry of the Deadwood Box had a substandard width and does not allow for adequate width for pedestrian and bicycle traffic. The structure has a 6-foot-wide sidewalk along only the east side of US14A (See Figure 3 and Figure 4). A jersey barrier exists on the west side of the highway, which does not allow for any pedestrian or bike traffic.

An alternative route to connect the trails is along Sherman Street. Sidewalk widths of 6 feet or less exist along both sides of Sherman Street. Sherman Street sidewalk and the east side of US14A/US85/Pioneer Way are currently serving as the network connections between the Whitewood Creek Trail and Mickelson Trail. Signage has been placed along this sidewalk for bicyclists to dismount due to the narrow sidewalk, light poles, and frequent pedestrian usage.

The American Association of State Highway and Transportation Officials (AASHTO) recommends that multi-use paths have a 10-foot width for multi-directional bike and pedestrian traffic (minimum 8-foot width can be used for areas that have light pedestrian traffic). The sidewalks along Sherman Street are currently striped and signed as bicycle routes, and are used by bicyclists making the connection between Mickelson Trail and Whitewood Creek Trail, even though they do not meet width requirements for a multi-use trail.

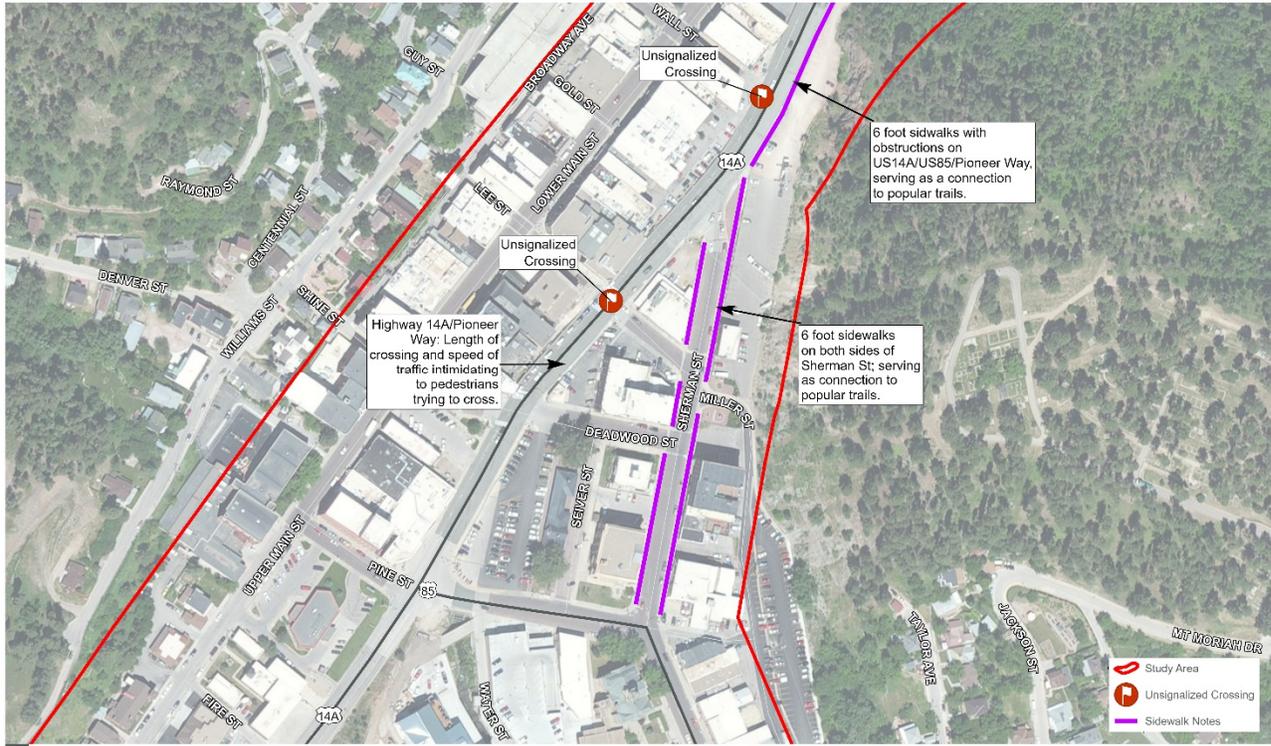


Figure 3. Pedestrian and Bicycle Circulation Issues within the Study Area.



Figure 4. Photo illustrating the Deadwood Box deck and sidewalk.



## 4.0 Conclusion

The Deadwood Box is reaching the end of its serviceable life and inspections have identified two main concerns for the structure:

- deteriorating deck and substructure
- increasing long-term maintenance costs.

The purpose of this Project is to address this deterioration, thereby providing a structure that improves or eliminates the noted issues. As alternatives are reviewed, the potential to incorporate the goal of improving pedestrian and bicycle circulation will be evaluated.

This Purpose and Need statement is being completed as part of Project planning prior to the NEPA phase of the Project. Consequently, this statement may change as stakeholder and public input is gathered and additional data is compiled. The input and additional data will be considered during development of the Environmental Scan, and later incorporated into the appropriate environmental documentation during the NEPA process. The NEPA process will also consider additional stakeholder and public input on the purpose and need for the Project, alternatives, and characterization of the environment and predicted impacts.