Final Gardena Bridge Feasibility Study

Brownlee Road over Payette River
Gardena Bridge

Boise County, Idaho
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Acronyms and Abbreviations

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ATR	Automatic Traffic Recorder
BLM	Bureau of Land Management
CE&I	construction engineering and inspection
CMF	crash modification factors
CWA	Clean Water Act
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GIS	geographic information system
GRAB	geosynthetic reinforced abutment backfill
H:V	Horizontal: Vertical
IDL	Idaho Department of Lands
IDWR	Idaho Department of Water Resources
INPR	Idaho Northern & Pacific Railroad
IPC	Idaho Power Company
ITD	Idaho Transportation Department
LHTAC	Local Highway Technical Assistance Council
MASH	Manual for Assessing Safety Hardware
MOA	memorandum of agreement
MP	Milepost
mph	miles per hour
NEPA	National Environmental Policy Act
POR	period of record
SH-55	State Highway 55
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
vpd	vehicles per day

Executive Summary

Introduction

The Gardena Bridge Feasibility Study was developed to analyze replacement alternatives of the existing Gardena Bridge (Bridge Key 26700) crossing over the Payette River in Boise County. It is approximately 5 miles north of the City of Horseshoe Bend, Idaho, and connects Gardena to State Highway 55 (SH-55). This feasibility study investigated five alternative bridge replacement alignments with various possible structure replacement types. The estimated costs contained herein will be used to determine funding for a future bridge replacement project.

An environmental desktop scan of the study area was performed to assess potential environmental permitting requirements for the bridge replacement and identify potential environmental issues that may arise as the project develops. The scan was based on available online Geographic Information System (GIS) data and mapping as well as environmental resource information.

The Gardena Bridge needs to be replaced for several reasons. The bridge is currently restricted so that trucks exceeding 7.5 tons per axle are not permitted on it. The posted speed limit on the bridge is 15 miles per hour (mph). Over the years, several bridge deficiencies have been recorded, and it has continued deteriorating, as identified in the recent July 2022 inspection report. The existing bridge is beyond its intended design life, is functionally obsolete, and is restricted to a single lane with posted load limitations for heavy vehicles that negatively impacts logging, construction, and maintenance operations in the area.

The existing bridge also creates an unsafe Brownlee Road intersection with SH-55 as only 20 feet separate the end of the bridge and the edge of SH-55 travel way, which does not allow adequate room for side-by-side vehicles as one exits SH-55 and one waits on Brownlee Road to enter the highway. SH-55 is a two-lane road with a posted speed of 55 mph. There is no acceleration, deceleration, or turn lanes at the intersection. The intersection is situated in a low point (sag curve) along the highway with substandard sight distance, making turning movements to/from the highway difficult and unsafe. Larger trucks with trailers can sometimes get high centered as they turn onto the highway. Vehicles slowing on SH-55 to turn onto Brownlee Road and the narrow bridge create a safety hazard on SH-55 with following vehicles traveling at high speeds. The location chosen for this bridge over 100 years ago does not meet current standards for an improved river crossing.

Alternatives Analyzed

The five proposed replacement alignments consider a wider two-lane bridge with shoulders to accommodate pedestrians and cyclists. The five alignments analyzed include:

- Alternative A would construct a bridge approximately 600 feet upstream of the existing bridge.
- Alternative B would construct a bridge approximately 2,200 feet upstream of the existing bridge.
- Alternative C would construct a bridge approximately 1,600 feet upstream of the existing bridge.

- Alternative D would construct a bridge approximately 1,400 feet upstream of the existing bridge.
- Alternative E would construct a bridge just upstream of the existing bridge.

A No Action alternative is not included in this analysis. The five alternatives are presented in **Figure 1**. No alternatives south of the existing bridge were investigated because there is no good public road connection on the west side of the Payette River.

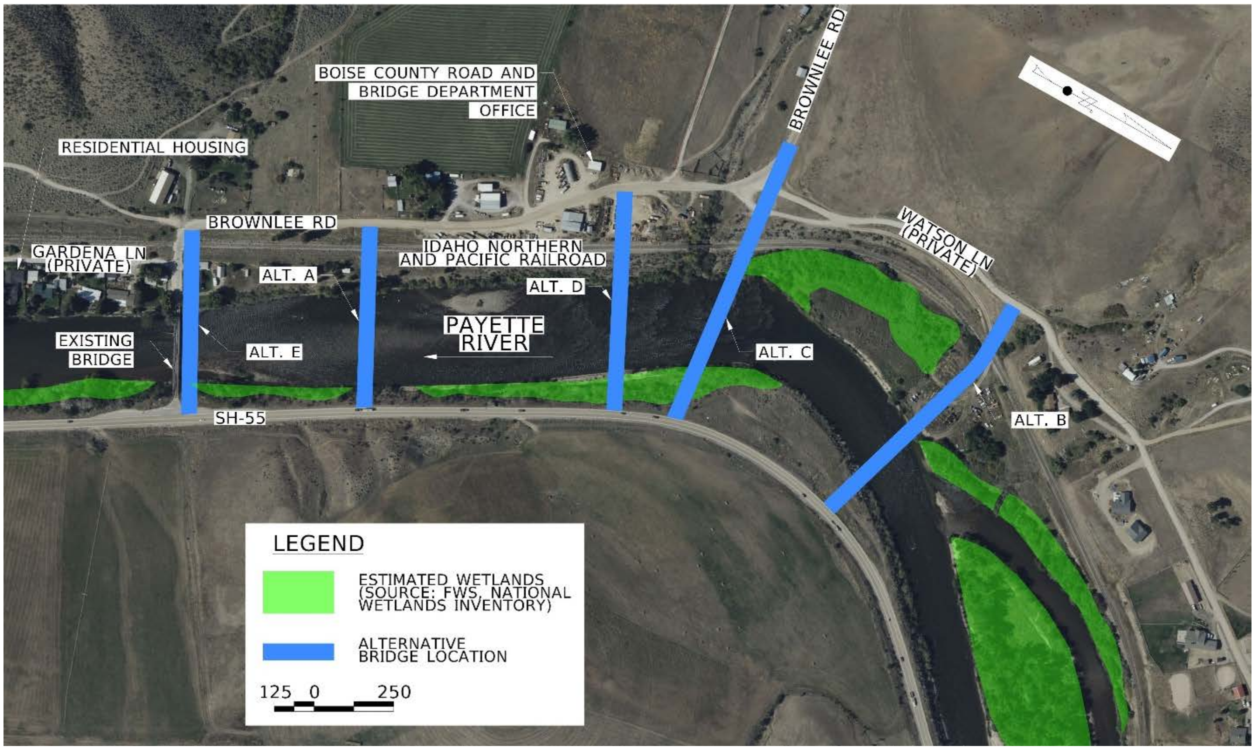

Figure 1. Bridge Alignment Alternatives

Summary of Public Comments

The study team held the first public meeting in September 2024 and the second meeting in January 2025. The study team also contacted and met with several stakeholders individually in the fall of 2024, including adjacent landowners, the Idaho Northern & Pacific Railroad (INPR), Horseshoe Bend School District #73, Horseshoe Bend Fire Department, and the Boise County Sheriff. The goal of these meetings was to provide the community and other stakeholders with the opportunity to comment on the alternatives investigated by this study.

During the September 2024 meeting attendees were presented with two proposed alternative bridge locations (Alternatives A and B). The attendees suggested two additional alternatives (Alternatives C and D). Alternatives C and D included crossing locations between the initially proposed Alternative A and Alternative B, shown on the maps. Most comments were supportive of Alternative A or one of the new alternatives identified at the meeting. Alternative B, which impacted more residents that live along the private Watson Lane, received less support. Most of the comments received at this meeting highlighted the need for turn lanes and improved sight distance at any new intersection on SH-55.

On January 23, 2025, 27 residents and stakeholders attended the second in-person meeting. During the meeting, the five alternative bridge locations were presented with concept level detail on design, benefits and impacts, costs, and staging considerations. Comment forms were provided, and 20 comment forms were filled out at the meeting. Three additional comment forms were received afterward, two via mail and one via email. The majority of comments were in favor of Alternative C with 19 selecting it as their preferred alternative. The other alternatives received fewer votes: Alternative B received 2 votes, while Alternatives A and D each received 1 vote. Alternative E did not receive any supporting comments.

Cost Estimates

The estimated cost of each alternative is presented in **Table 1**. For each alignment alternative, the least expensive bridge structure cost is used. Soft costs, including construction contingency, design engineering fees, construction engineering and inspection (CE&I), and construction administration, are based on the Local Highway Technical Assistance Council's (LHTAC) latest guidance.

Table 1. Alternative Cost Estimate Summary

	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 14,026,000	$ 9,545,000	$ 12,651,000	$ 12,640,000	$ 13,560,000
CONTINGENCY	$ 4,207,800	$ 2,863,500	$ 3,795,300	$ 3,792,000	$ 4,068,000
PROJECT SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 18,235,000	$ 12,410,000	$ 16,448,000	$ 16,433,000	$ 17,629,000
RIGHT-OF-WAY ACQUISITION	$ 195,000	$ 1,995,000	$ 457,500	$ 225,000	$ 495,000
DESIGN ENGINEERING	$ 2,504,680	$ 1,704,481	$ 2,259,152	$ 2,257,177	$ 2,421,459
CONSTRUCTION ENGINEERING	$ 4,558,750	$ 3,102,500	$ 4,112,000	$ 4,108,250	$ 4,407,250
CONSTRUCTION ADMINISTRATION	$ 626,170	$ 426,120	$ 564,788	$ 564,294	$ 605,365
ESTIMATED PRJECT TOTAL (ROUNDED UP THE NEAREST $1,000)	**$ 26,120,000**	**$ 19,639,000**	**$ 23,842,000**	**$ 23,588,000**	**$ 25,559,000**

Recommendations

Alternatives C and D are the most viable options for replacing the Gardena Bridge. Alternative C was the most preferred by stakeholders and the public. Therefore, it is recommended that project funding be obtained for at least $24 million in 2024 dollars. For every year after 2024 to the year of construction bidding, inflate the project funding at 5 percent per year.

The project must obtain a variety of approvals due to the National Environmental Policy Act (NEPA) if federal funds are used or federal permits are required. For recommendations for the future scope of work to address NEPA, see Section 4 Environmental and Permit Considerations.

1 Purpose and Need

Gardena, Idaho, is an unincorporated community in Boise County adjacent to the Payette River and State Highway 55 (SH-55), which is owned and maintained by the Idaho Transportation Department (ITD) District 3. It is approximately 5 miles north of the City of Horseshoe Bend, Idaho. The Gardena Bridge (Bridge Key 26700) is located over the Payette River, connecting Gardena to SH-55 on Brownlee Road. The Idaho Northern & Pacific Railroad (INPR) travels though Gardena on the west side of the Payette River with a passive at-grade crossing for Brownlee Road approximately 180 feet west of the bridge end. Boise County submitted a Local Highway Technical Assistance Council (LHTAC) funding application through the Local Federal-aid Program Bridge FY23 Program to fund the design and construction of a new bridge. The application was successfully funded for design, and this feasibility study analyzes bridge replacement location alternatives, including new alignments, cross sections, bridge structure types, estimated replacement costs, environmental considerations; identifies the benefits and drawbacks of each alternative; and recommends an alternative to carry into a future National Environmental Policy Act (NEPA) analysis and project development. Public involvement activities were an integral part of the study to identify the recommended replacement location.

The purpose of the Gardena Bridge Replacement is to provide a safe bridge crossing over the Payette River that is adequate for passenger vehicles and heavy vehicles, emergency vehicles, bicycles, and pedestrians. The bridge, roadway approaches, and intersections will meet current design standards for bridges, local roads, SH-55, and the INPR.

The Gardena Bridge needs to be replaced for several reasons including the following:

- Improved Bridge/Roadway Geometry – Existing bridge is a one-lane bridge with a narrow width of 16 feet and classifying the existing bridge as ‘functionally obsolete’
- Bridge Serviceability – Gardena bridge was constructed in 1920 and has exceeded the 75-year bridge design life. Additionally, previous bridge inspections have recorded scouring at the piers and other deterioration of the deck, superstructure, and substructure units.
- Increased Safety – Existing geometry at the east end near the Brownlee/SH-55 intersection does not provide adequate geometrics and sight distances per current design criteria, and multiple crashes have been reported near this intersection.

It is a one-lane bridge that is the primary access across the Payette River connecting SH-55 to more than 50 homes, a school bus route for the Horseshoe Bend School District #73, timbered Bureau of Reclamation (BLM) land, and the main Boise County Road and Bridge Department maintenance shop. It also provides emergency service access. The nearest detour is over 25 miles away through the Sweet, Idaho area. The existing Gardena Bridge is a 292-foot long, three-span, one-lane pony truss bridge that was originally bult in 1920 with a narrow width of only 16 feet. The bridge was partially reconstructed in 1960 but has only had routine maintenance since that time. The bridge is currently load restricted so that trucks exceeding 7.5 tons per axle are not permitted for use. The posted speed limit on the bridge is 15 miles per hour (mph) while Brownle Road is posted for 25 mph.

Several bridge deficiencies have been recorded over the years and the bridge has continued deteriorating, as identified by the recent July 2022 inspection report. The existing bridge is beyond its intended design life, is functionally obsolete, and is restricted to a single lane with posted load limitations for heavy vehicles that negatively impact logging and construction operations in the area. Fully loaded logging trucks cannot cross the bridge. Fully loaded Boise County trucks (including sand for snow plowing operations) leaving their main shop are routed on the 25-mile detour through the Sweet, Idaho area. The load rating of the bridge also negatively impacts emergency services since a fully loaded fire engine cannot cross the bridge.

The existing bridge also creates an unsafe Brownlee Road intersection with SH-55 as only 20 feet separate the end of the bridge and the edge of SH-55 travel way, which does not allow adequate room for side-by-side vehicles as one exits SH-55 and one waits on Brownlee Road to enter the highway. SH-55 is a two-lane road with a posted speed of 55 mph. There are no acceleration, deceleration, or turn lanes at the intersection. The intersection is situated in a low point (sag curve) along the highway with substandard sight distance, making turning movements to/from the highway difficult and unsafe. Larger trucks with trailers can sometimes get high centered as they turn onto the highway. Vehicles slowing on SH-55 to turn onto Brownlee Road and the narrow bridge create a safety hazard on SH-55 with following vehicles traveling at high speeds.

Traffic data collected and analyzed in 2014 warrant a left turn lane for northbound SH-55 at the Brownlee Road/Gardena Bridge intersection. ITD’s long-range plans include a left-turn lane and passing lane at this intersection to improve safety.

2 General Background & Existing Conditions

2.1 Location

The Gardena Bridge (Bridge Key 26700) is located over the Payette River connecting the community of Gardena to SH-55 on Brownlee Road at SH-55 milepost (MP) 69.2. It is located in Boise County, approximately five miles north of the City of Horseshoe Bend, Idaho. **Figure 2** presents the vicinity map for the bridge.

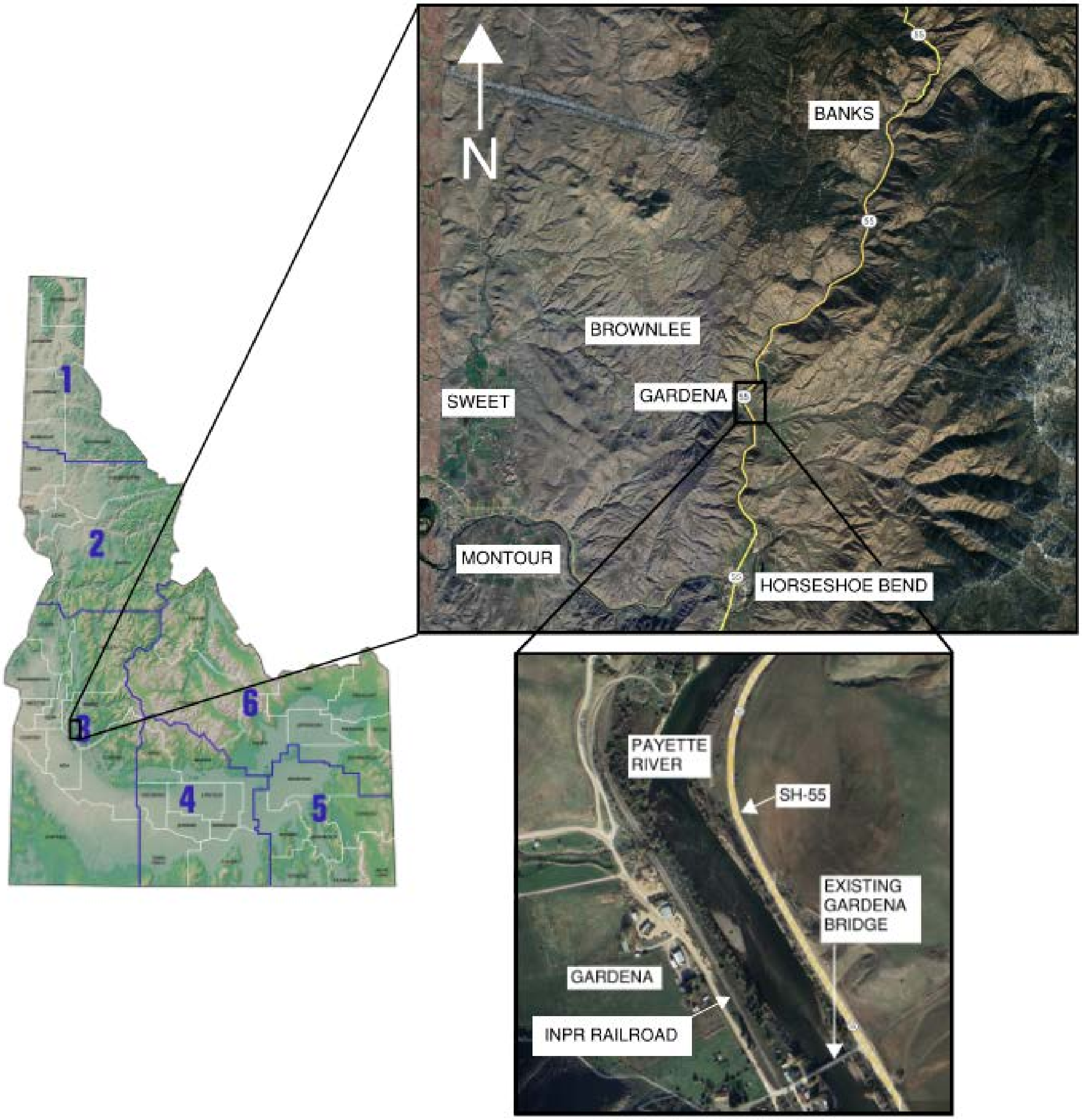

Figure 2. Vicinity Map

2.2 River Conditions

A hydraulic analysis was not performed as part of this feasibility study. However, a desktop review of the Payette River within the study vicinity and information contained within the existing bridge inspection report are summarized below.

The Payette River is a major tributary of the Snake River with headwaters located in the Payette and the Sawtooth National Forests in west central Idaho. The Gardena Bridge crosses the Payette River approximately 60 miles upstream of the confluence with the Snake River. The contributing drainage area of the Payette River at Gardena Bridge is 2,176 square miles. The Payette River through the study area is moderately entrenched, bounded by narrow floodplains and steep valley walls on each side of the river. Review of historic aerial imagery indicates that the channel has been laterally stable for at least the past 25 years. Site visits identified that streambed material at the bridge is comprised of gravel and cobbles and appears to be in satisfactory condition. There is existing riprap protection at the piers with some riprap removal noted at the nose of Pier 1. Additionally, 4 inches of undermining at the nose Pier 1 and exposure of the Pier 2 footing was noted in the 2022 inspection report. Given the documented pier scour, proposed piers will need to be designed to withstand anticipated scour conditions. Other scour components (abutment, contraction, aggradation/degradation) will need to be investigated; however, observations indicate pier scour is the primary scour component at the existing bridge.

Downstream of the Gardena Bridge, the Black Canyon Diversion Dam and Horseshoe Bend Diversion Dam regulate the Payette River. The South Fork and North Fork of the Payette River converge approximately 10 miles upstream of Gardena Bridge. The South Fork of the Payette River is free flowing. The Cascade Dam, Payette Lake Dam, and Upper Payette Lake Dam regulate the North Fork of the Payette River and are 47, 76, and 91 miles upstream of the Gardena Bridge crossing, respectively.

The study area is shown on Flood Insurance Rate Map (FIRM) panel 16015C0237B, which is in an unincorporated area (Community No. 160205). The area was mapped as part of the Flood Insurance Study (FIS) for Boise County and Incorporated Areas in 1988 and identifies the 50- and 100-year event discharges as 26,000 and 28,000 cubic feet per second, respectively. It is unclear whether the FIS discharges account for the upstream regulation or if a mixed period of record was used in the hydrologic analysis.

There is also a U.S. Geological Survey (USGS) gage station (Gage No. 13247500) approximately 2.4 miles downstream of the Gardena Bridge crossing. The contributing area to the gage is 2,220 square miles, which is 2.0 percent larger than the contributing area at the bridge. The gage has a period of record (POR) of 117 years (1906-2023), which encompasses a mixture of regulated and unregulated conditions. Given the comparable drainage area and POR of the gage, the peak discharges calculated using the regulated gage data can be used for the hydraulic assessment at the Gardena Bridge.

2.3 Drawings & Inspection Reports

The existing bridge design drawings are not available. Hughes Engineering developed field sketches of the existing bridge based on bridge inspections performed in 2016.

ITD performs bridge inspections of the Gardena Bridge. The most recent inspection report available was completed in July 2022. The 2022 bridge inspection report and field sketches are included in **Appendix A**.

2.4 Traffic Counts

According to the ITD Annual Average Daily Traffic (AADT) map, in 2023 the AADT on SH-55 near Gardena bridge was approximately 7,300 vehicles per day (vpd) with 170 commercial, or heavy vehicle, at about 2.3 percent. According to traffic counts provided by Boise County, the 2023 daily traffic volume on Brownlee Road at Gardena Bridge was 285 vpd. Counts conducted in 2024 showed the volume at 282 vpd. The 2022 bridge inspection report states the daily traffic on the bridge was 360 vpd with 17 percent heavy vehicles.

2.5 Crash Data

According to LHTAC's interactive crash map, there were seven reported crashes in the immediate vicinity of Gardena bridge between 2019 and 2023, all occurring on SH-55. One crash resulted in serious injury, three in minor injuries, and three in property damage only. Three crashes were rear end crashes with a vehicle stopped trying to make a turn onto Brownlee Road being hit by a vehicle approaching from behind. Two crashes were similar to rear end crashes, one with the approaching vehicle swerving to avoid the stopped vehicle and losing control, ending up in the adjacent ditch, and the other with the approaching vehicle swerving and sideswiping the stopped car. These crashes point to the substandard sight distance and lack of turn lanes on SH-55. The two remaining crashes included one crash with a single vehicle striking a wild animal and another running off the road negotiating the SH-55 curve south of the Brownlee Road intersection.

In addition to the seven crashes identified near the Brownlee Road intersection in the report, there were three crashes on or near the horizontal curve to the north at approximately MP 69.5. The two at the south end of the curve were property damage only single vehicle crashes with wild animals, one in 2019 and one in 2023. The one north of the curve was an injury crash with a single vehicle running off the road into the embankment in 2023.

A snapshot of LHTAC's interactive crash map is presented in **Figure 3** showing the locations of the reported crashes. The crashes (dots on Horseshoe Bend Road) are identified as follows; serious injury = red, minor injury = orange, and property damage only = white. There were no reported crashes on the local roads in the study vicinity.

Figure 3. Crash Map

2.6 Railroad

The INPR (subsidiary of the Rio Grande Pacific Corporation) travels though Gardena on the west side of the Payette River with a passive at-grade crossing for Brownlee Road at the west end of the bridge. There are two tracks at the existing crossing which converge into one track just north of the existing crossing. The railroad tracks are approximately 180 feet west of the existing west bridge abutment. All alternatives will require a new at-grade railroad crossing and that is within the single-track limits of the railroad. The study team contacted the railroad owner and the INPR general manager responded to questions and provided requirements for new railroad crossings associated with the alternatives, shared in **Appendix H**. The agreement between INPR and Boise County will need to be updated with the proposed bridge alternative and a new at-grade railroad crossing.

2.7 Utilities

A fiber optic conduit and a telephone conduit are attached to the existing bridge along the top of the south lower chord and running along Brownlee Road and SH-55 in buried conduit. Idaho Power Company (IPC) has overhead power lines running parallel to SH-55 and crosses the Payette River south of the existing bridge to serve residents in Gardena. Overhead power lines also run parallel to Brownlee Road between the road and the INPR tracks; it is anticipated relocation of this utility line will be required for all alternatives evaluated.

3 Public Involvement & Coordination

3.1 Public Outreach

The study team held a public meeting on September 19, 2024, at the Boise County Road and Bridge Department Office to provide the community with an opportunity to learn more about the feasibility study and to provide written and oral comments. The study team mailed a letter of invitation to residents and stakeholders to attend the Community Alternatives Workshop from the Boise County Commission.

The project team also contacted and met with several stakeholders individually, including adjacent landowners, the INPR, Horseshoe Bend School District #73, Horseshoe Bend Fire Department, and the Boise County Sheriff in the fall of 2024.

A second public meeting is scheduled for January 23, 2025, at the Horseshoe Bend High School. The purpose of this meeting is to provide the community with the opportunity to comment on the draft feasibility study results and recommendations.

3.1.1 Summary of Public Comments – Public Meeting #1

On September 19, 2024, 38 residents and stakeholders attended the in-person meeting. During the meeting, two alternative bridge locations were presented, and attendees identified two additional alternatives. These new alternatives included crossing locations between the initially proposed Alternative A and Alternative B, shown on **Figure 1**. Comment forms were provided; several comments were written directly on the maps presented at the meeting. A few comments were received via email. Most comments were supportive of Alternative A or one of the new alternatives identified at the meeting. Alternative B, which impacted more residents that live along the private Watson Lane and required significant right-of-way from private property, received less support. There was a consensus that a wider bridge with two full lanes and space for bikes and pedestrians was needed. Most of the comments highlighted the need for turn lanes and improved sight distance at any new intersection on SH-55. Several residents expressed the importance of retaining the existing bridge for pedestrian and recreational access. A summary of the public meeting and comments received is presented in **Appendix B**.

3.1.2 Summary of Stakeholder Interviews

The INPR general manager discussed the need to update the current INPR crossing agreement with Boise County once the preferred alternative is identified. He inquired about funding and recommended involving ITD railroad personnel to explore potential crossing funding options. After discussing crossing types with the INPR, they provided standards and guidance for necessary improvements, shown in **Appendix H**.

Both the Boise County Sheriff and Horseshoe Bend Fire Chief agreed the bridge replacement is overdue. The fire department structure engines have to cross the bridge one at a time due to the load restrictions and have difficulty turning onto the highway from Brownlee Road due to the substandard sight distance. A new improved bridge and intersection with SH-55 would improve their ability to respond to calls in the Gardena area.

The transportation director of Horseshoe Bend School District #73 expressed a concern in winter months when the buses need chains as crossing the bridge is difficult with chains due to the existing steel grate running planks. Her primary safety concern was turning from Brownlee Road onto SH-55 as the bus is often still on the bridge, making it difficult to safely enter the highway due to sight distance limitations. There is not a good turnaround area for the buses in the Gardena community after they cross the bridge to pick up the students. The buses currently use the Boise County Road and Bridge Department yard, backing in and then completing a multiple point turn to cross the bridge back to SH-55. Including a turnaround space with roadway improvements on the west side of the Payette River would be very helpful for the buses.

The property owner of all parcels along SH-55 on the east side of the Payette River, where the bridge alternatives would cross, is supportive of the project and agrees the bridge needs to be replaced. This specific property owner is a cattle rancher and farmer with five pumps and power transformers near Alternative A, which supplies water for his center pivot and lower fields along SH-55. His water intake is closer to Alternative C along the east side of the river. He indicated he could work with the contractor to relocate these features based on whichever alternative is constructed with minimal difficulty. He felt Alternative A was unsafe due to steep slopes on each side of SH-55, making it more difficult to widen for the needed turn lanes. As a retired soil and water conservation district leader, he is concerned about the impact Alternative A would have on the slopes and the Payette River. He thought that Alternative B was not a good option because of the impact on residents along Watson Lane, a private road. He had spoken with some of those residents who shared their concerns at the public meeting. He preferred Alternative C as it has fewer impacts and allows for turn lanes on SH-55.

The property owners of the parcel west and north of the Brownlee Road/private Watson Lane intersection, including Watson Lane, and a parcel south of the intersection between the INPR and the Payette River also preferred Alternative C. Alternative C aligns traffic up directly from SH-55 to Brownlee Road, keeping through traffic from passing by individual residences. Alternative C would require acquisition of a portion of their parcel between the INPR and the Payette River. Alternative A does not impact their property. This specific property owner did not like Alternative B as it would impact their property, especially along Watson Lane. They indicated it is very steep and seems unrealistic for connecting a new road to Watson Lane. They felt Alternative D was not as good as C but still an improvement over the existing bridge or Alternative B. Alternative D would also require acquisition of a portion of their parcel. They are open to a land swap with the county if it makes sense for all parties.

A property owner on the west side of the Payette River, with parcels north of the existing Gardena Bridge, had concerns with Alternative A. It would bisect one of his parcels and potentially not allow him to implement the plans he has for the parcel. He has a well on the property he plans to activate and use to develop the parcel. He asked about timing and when his property would be purchased, if Alternative A was selected as the preferred alternative. We discussed the property acquisition process, which would include negotiations and be completed before starting construction.

Contact reports of each stakeholder meeting are presented in **Appendix B**.

3.1.3 Summary of Public Comments – Public Meeting #2

On January 23, 2025, 27 residents and stakeholders attended the second in-person public meeting. During the meeting, the five alternative bridge locations were presented with concept level detail on design along benefits and impacts, costs, and staging considerations.

Comment forms were provided, and 20 comment forms were filled out at the meeting. Three additional comment forms were received afterward, two via mail and one via email. The majority of comments were in favor of Alternative C with 19 selecting it as their preferred alternative. The other alternatives received fewer votes: Alternative B received 2 votes, while Alternatives A and D each received 1 vote. Alternative E did not receive any supporting comments.

Notably, the landowner of the parcel directly west and north of the existing bridge that would be affected by Alternative E attended the January 23 meeting, provided in-person comments, and submitted additional comments via email on February 20, 2025. The landowner expressed concerns about the unknown use and access impacts to the property. A summary of the second public meeting and comments received is presented in **Appendix B**.

3.1.4 Coordination with Agencies

A review of all known state and federal agencies having jurisdiction in the area was conducted and potential permits and agreements were identified. The comments received from these agencies indicate that the permitting and agreements will be determined closer to the time of design and construction. Further discussion can be found in Section 4, Environmental & Permit Considerations.

4 Environmental & Permit Considerations

On-site environmental field work and wetland delineation were not performed as part of this study. Wetland limits have been estimated based on available online GIS information and mapping. Bridge replacement will require environmental field work to accurately delineate wetland and ordinary highwater limits within the vicinity of the proposed replacement. A desktop scan of the study area was performed to assess potential environmental permitting requirements for the bridge replacement, which are presented in **Table 2**. See **Appendix C** for the complete Environmental Scan Memo.

The desktop review conducted for this scan is not necessarily an exhaustive list of environmental evaluations and permitting that may be required for the replacement of the Gardena Bridge. Rather, it is a preliminary assessment of those that could be needed given the information currently available and level of effort put forth for this scan. The Idaho Department of Lands (IDL) lists this section of the

Payette River as navigable with restriction. As such, an easement to cross the river will be required by IDL.

In addition to permitting efforts listed in **Table 2**, a federal nexus for the project (funding or federal permit) would necessitate a NEPA review. The likely NEPA class of action for this bridge replacement project would be a categorical exclusion.

Table 2. Summary of Environmental Resources Potentially Requiring Further Review

Environmental Resource	Applicable Funding Source	Potential Further Evaluations and/or Permitting	Memo Section to Refer to for Additional Information[1]
Section 4(f)	Federal, FHWA	Section 4(f) evaluation potentially necessary if impacts to park – most likely a "Temporary Occupancy" finding. Further Section 4(f) evaluation(s) potentially necessary depending on impacts to historic and cultural resources (see below).	4.2.1
Community Features	State, Federal	Emergency services access during construction should be coordinated.	4.2.2
Socioeconomics	State, Federal	Access for businesses and residents in Gardena to SH-55 should be considered as construction traffic control is developed.	4.2.3
Historic Resources	State, Federal	Section 106 applies to projects with federal funding and/or permitting (i.e., 404 permit). The bridge may be considered historic. If impacts on cultural resources occur, a Determination of Adverse Effect, MOA, and mitigation will be required, as well as applicable Section 4(f) evaluation(s), if applicable.	4.3.1
Wetlands and Waters of the U.S.	State, Federal	Impacts to wetland and waters in the Project Area will likely be under USACE jurisdiction. Delineation and CWA Section 404 permitting will be required. Avoidance and minimization of impacts are recommended to avoid exceeding mitigation thresholds. A Joint Permit Application will also cover stream alteration permitting under IDWR.	4.5.1
Floodplain	State, Federal	A floodplain development permit will likely be required from Boise County.	4.5.2
Federally listed ESA species	State, Federal	Consultation with USFWS will likely be required for listed wolverine and possibly for listed monarch butterfly. (Monarch butterfly is currently a "candidate" species – some agencies assess impacts to these species like that of listed "endangered" and "threatened" species. The approach on candidate species will depend on funding source of the project.)	4.6.1
Migratory Birds	State, Federal	Conservation measures will likely be needed, and possibly permits if impacts to bird nests and/or trees would occur	4.6.2

Abbreviations: FHWA=Federal Highway Administration; MOA=memorandum of agreement; USACE=U.S. Army Corps of Engineers; CWA=Clean Water Act; IDWR-Idaho Department of Water Resources; ESA=Endangered Species Act; USFWS=U.S. Fish and Wildlife Service

[1] See Environmental Scan Memorandum in Appendix C for section references specified in Table 2.

5 Alignments, Typical Section, and Bridge Layouts

5.1 Alternative Alignment Development

Through discussion with Boise County, ITD, LHTAC, and public involvement outreach, five alignment alternatives were developed. The proposed bridge will be constructed while the existing bridge remains in service to avoid a lengthy detour. Widening the existing structure was not evaluated due to lack of information and plans, the age of the bridge, and challenges associated with it, including needing a temporary bridge, the long detour required for bridge closure, widening the piers/abutments to accommodate proposed typical section not being feasible, remaining scour concerns, and an unknown foundation system. The location chosen for this bridge over 100 years ago does not meet current standards for an improved river crossing. Additionally, many stakeholders expressed interest in keeping the existing bridge for recreational use.

After the proposed bridge construction, the existing bridge may either be removed or remain in place. For the purposes of this feasibility study, the existing bridge is assumed to remain in place.

Discussion with stakeholders and residents focused the alternatives to avoid impacting private property, so Alternatives C and D were added after the first public meeting. Alternative B has significant right-of-way impacts that were not supported by the majority of stakeholders and also has some challenging geometric issues that make it less feasible than other alternatives, as described below.

Alternative E was added after reviewing with ITD to investigate constructing a bridge on (or as close as practical) to the existing alignment, just upstream of the existing bridge. The purpose for this alternative is to evaluate the existing SH-55 tie-in compared to Alternatives A-D.

No alternatives south of the existing bridge were investigated because there is no good public road connection on the west side of the Payette River.

5.2 General Criteria & Assumptions

5.2.1 Roadway

SH-55 improvements are assumed to be similar for all alternative evaluations. Improvements will include a new northbound left-turn lane from SH-55 to the new intersection with the new road with adequate deceleration length, stopping sight distance and accompanying horizontal and vertical geometry updates. A southbound right-turn lane from SH-55 onto the new road is also recommended and included in the alternatives. Each SH-55 approach will be widened to provide an acceleration lane for vehicles turning from the new road onto SH-55 in both the northbound and southbound directions. Cut and fill side slopes on the SH-55 highway widening will be set at 2:1 horizontal: vertical (H:V) ratio to reduce the area of impact.

A best fit existing alignment for each alternative along SH-55 is used to show the new intersection with the new road. Alignment alternatives developed are based on the proposed SH-55 alignment being on a similar alignment/centerline as the existing roadway. Plan and profile drawings of each alignment are shown in **Appendix D**. For the purposes of alternative alignment and roadway design, the proposed new road design speed is assumed to be 35 mph.

Sight distance evaluations were conducted for vehicles turning onto SH-55 from the new road intersection to determine if adequate sight distance exists or if improvements along SH-55 are anticipated to provide adequate sight distance. Sight distance was evaluated for both the posted speed of 55 mph and a design speed of 65 mph, assuming many vehicles travel over the posted speed limit along SH-55. Sight distance evaluations are presented in **Appendix D**.

A new at-grade crossing of the INPR railroad track will be required for the selected alternative. Railroad track reconstruction and crossing panel construction are anticipated to be performed by the INPR as part of an updated agreement with Boise County. Minor adjustments and track reconstruction is anticipated for the alternatives evaluated. INPR shared standards and guidance for new at-grade rail crossings that is found in **Appendix H**.

5.2.2 Turn Lane Warrants

The existing traffic counts and data from the ITD automatic traffic recorder (ATR) 184 at MP 78.748 near the Banks-Lowman Road intersection were used to develop turning movements at the existing Brownlee Road intersection with SH-55. A turn lane treatment analysis was conducted and found that the northbound left turn lane from SH-55 to Brownlee Road is warranted based on American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets, 7th Edition* with existing traffic volumes, especially in the summer months when volumes are highest. The southbound right turn lane does not meet the warrants in the ITD *Traffic Manual: Idaho Supplementary Guidance to the MUTCD.* However, with volumes expected to continue to increase as more vehicles access Brownlee Road with more development, the warrant may be met in the near future. Turn lanes are recommended to be installed on SH-55 for the Brownlee Road intersection with each alternative to improve safety. Example crash modification factors (CMF) for safety benefits with added turn lanes include CMF 7852, Install Left Turn Lane with a 3-star rating and estimated 27% crash reduction for all crashes and CMF 3948, Install Left-Turn Lane with a 3-star rating and estimated 21% crash reduction for all crashes. Volume and warrant calculations are presented in **Appendix E**.

5.2.3 SH-55 Horizontal Curve at MP 69.5

The horizontal curve on SH-55 north of the existing Brownlee Road intersection at approximately MP 69.5 is shown as being updated with Alternatives B, C, and D. It has a spiral transition of 200 feet on each end, is a 6-degree curve, and has a radius of 954.93 feet. It Is hard to verify the superelevation of the curve from the as built plans, but it is anticipated to be between 8% and 9% to meet AASHTO standards for 55 mph. These values do meet AASHTO design standards for spiral transitions to horizontal curves for 55 mph, but not 65 mph, which may be the design speed other portions of the highway meet. This curve is signed with a curve advisory sign and advisory speed plaque at 55-mph for northbound traffic. The same signs are posted for southbound traffic but with a 50-mph advisory plaque, which needs to be corrected to be consistent. The next horizontal curve to the north on the highway is identical to this one from a horizontal geometric perspective and is signed with a curve advisory sign and advisory speed plaque at 55 mph for northbound traffic with no separate sign for southbound traffic.

At 55 mph, a simple curve radius with no spiral transitions should be 1,060 feet minimum at a 6% superelevation per AASHTO standards. At 65 mph, the minimum curve radius at 6% superelevation is 1,660 feet. **Figure 4** below shows a simple 1,060-foot radius curve laid out to match into the SH-55 tangents on either end of the existing curve. This increased radius shifts the centerline for the SH-55 approximately 18-feet to the east at the widest point. The existing right-of-way for SH-55 through the curve is approximately 100-feet wide but the highway is not centered in the right-of-way. If the curve is adjusted to the simple curve radius, right-of-way may be required to accommodate it. Retaining walls could be used to avoid acquiring additional right-of-way as well. With Alternatives B, C, and D, turn lane and acceleration lane improvements as shown conceptually would potentially require additional right-of-way and/or more expensive retaining walls.

Figure 4. Simple 55-mph Radius Conceptual Layout

5.2.4 Bridge

Prestressed concrete girders and steel plate girders with cast-in-place concrete deck superstructure types were evaluated for each alternative. Prestressed concrete girders provide comparatively low maintenance bridges and generally result in lower project costs; typically have shorter construction durations; and are common throughout Idaho. Steel plate girders offer comparatively lighter superstructures, potentially reducing foundation costs; provide flexibility to match crest vertical curves, minimizing camber depths; and provide greater flexibility to optimize vertical clearance. In general, proposed roadway profiles over the Payette River appear to provide ample vertical clearance based on available data. Therefore, minimizing the proposed superstructure depth was not a priority in bridge type selection.

Bridge lengths were evaluated based on the following criteria:

- Keeping wetland and ordinary highwater impacts below 0.10 and 0.03 acres, respectively, to reduce impacts and streamline the environmental permitting process as design develops. Where applicable, approximate ordinary highwater and wetland limits are shown in the Situation & Layout drawings included in **Appendix F**.
- Providing an allowance for scouring countermeasures (e.g., riprap) in front of bridge abutments. Where riprap impacts are anticipated to exceed ordinary highwater thresholds, sheet pile walls are anticipated and included to mitigate impacts.
- Minimizing impacts to the proposed at-grade crossing of the INPR railroad tracks
- Minimizing impacts to the proposed intersection at SH-55
- Allowing standard construction methods and bridge elements (e.g., girder shapes/size) to be used

5.2.5 Construction

A temporary work bridge is anticipated to facilitate the construction of the proposed bridge over the Payette River. If the existing bridge is removed, an additional temporary work bridge may be needed to perform this work. As previously mentioned, this feasibility report assumes that the existing bridge is to remain in place. Additionally, the existing bridge is preferred to stay in service during construction to avoid local traffic being directed on detour routes. Therefore, the decision to remove or maintain the existing bridge does not have any differentiating significance on the alternative recommendation.

No lane closures on SH-55 will be allowed during construction.

A construction staging area would likely be needed on the east side of the Payette River during the temporary work bridge construction for easy access and avoid equipment/materials needing to use the detour route since the existing bridge is weight restricted for heavy construction vehicles and equipment. Potential construction staging areas will depend on the selected alternative and are shown in the figure below.

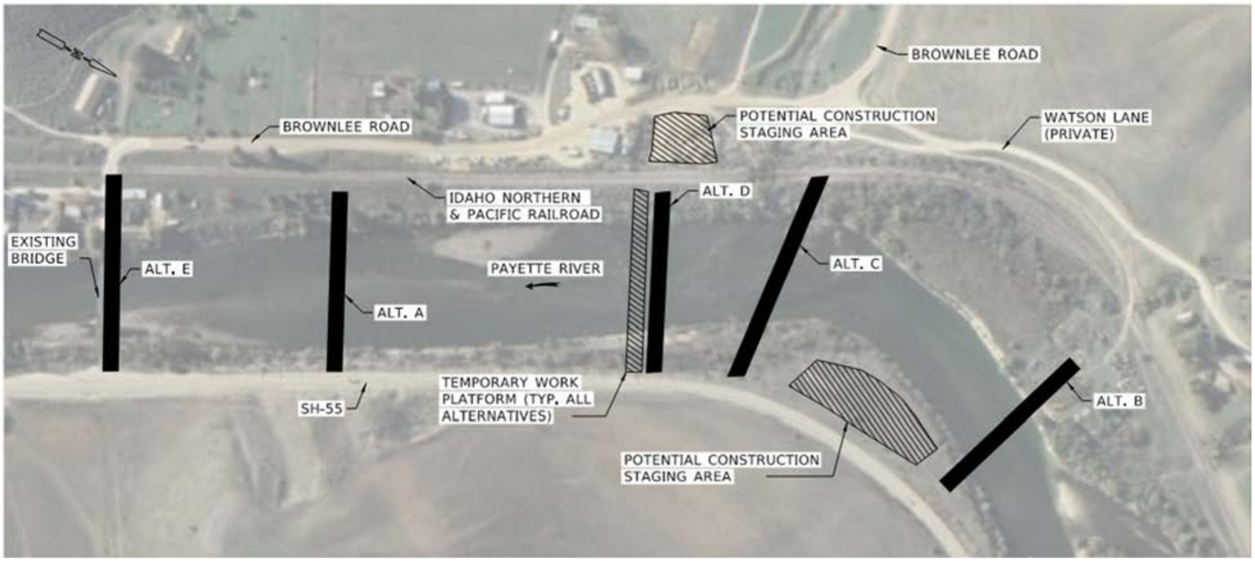

Figure 5. Construction Staging Areas

5.3 Alternative Alignment Summary

Five alignment alternatives were developed and evaluated for this feasibility study and include:

- Alternative A is located approximately 600 feet upstream from the existing bridge
- Alternative B is located approximately 2,200 feet upstream from the existing bridge
- Alternative C is located approximately 1,600 feet upstream from the existing bridge
- Alternative D is located approximately 1,400 feet upstream from the existing bridge
- Alternative E is located approximately 43 feet upstream from the existing bridge.

Alternative alignments are labeled based on their respective offset from the existing bridge and are shown in **Figure 6**.

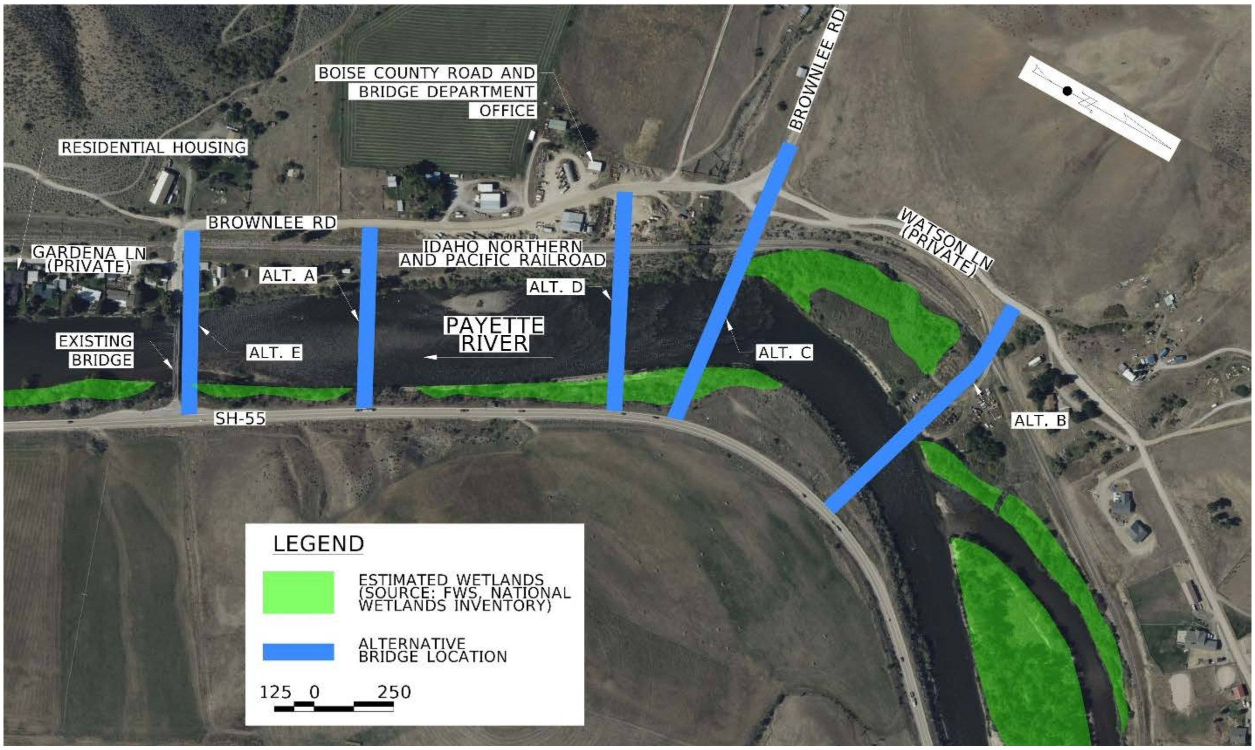

Figure 6. Bridge Alignment Alternatives

Alternatives A and B were developed prior to the first public involvement meeting on September 19, 2024, based on previous work by Boise County and ITD. Alternative B crosses property owned by Boise County on the west side of the Payette River. Based on input from the property owners at the first public meeting and in separate individual meetings, Alternatives C, D, and E were developed to avoid impacting the private Watson Lane and its residents.

5.4 Bridge Typical Section

The proposed bridge and approach roadways will have two, 12-foot travel lanes with 6-foot shoulders on both sides. The typical section provides additional shoulder width for pedestrian and bicyclist access as desired and discussed with Boise County. Proposed bridge alternatives assume three-tube, curb-mount railings on either side of the travel way. The resulting curb-to-curb travel way will be 36 feet wide. The resulting out-to-out bridge width will be 39 feet 6 inches. The proposed bridge typical section is shown in **Figure 7** and applies to each alternative presented below.

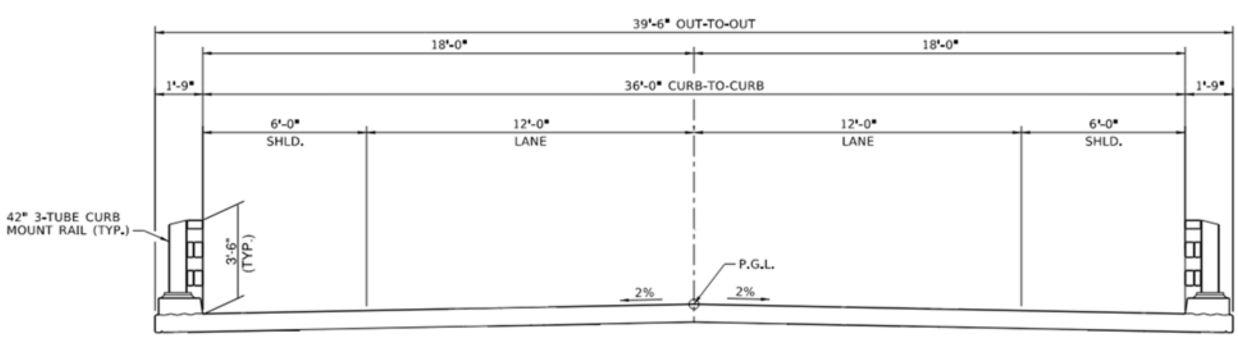

Figure 7. Proposed Typical Section

5.5 Alternative A – Approximately 600-feet Upstream

5.5.1 Alignment

The Alternative A alignment is located approximately 600-feet upstream from the existing crossing and on a similar bearing and river crossing skew to the existing bridge. The new roadway will connect into Brownlee Road on the west end of the new bridge. A conceptual rendering of Alternative A is presented in **Figure 8**.

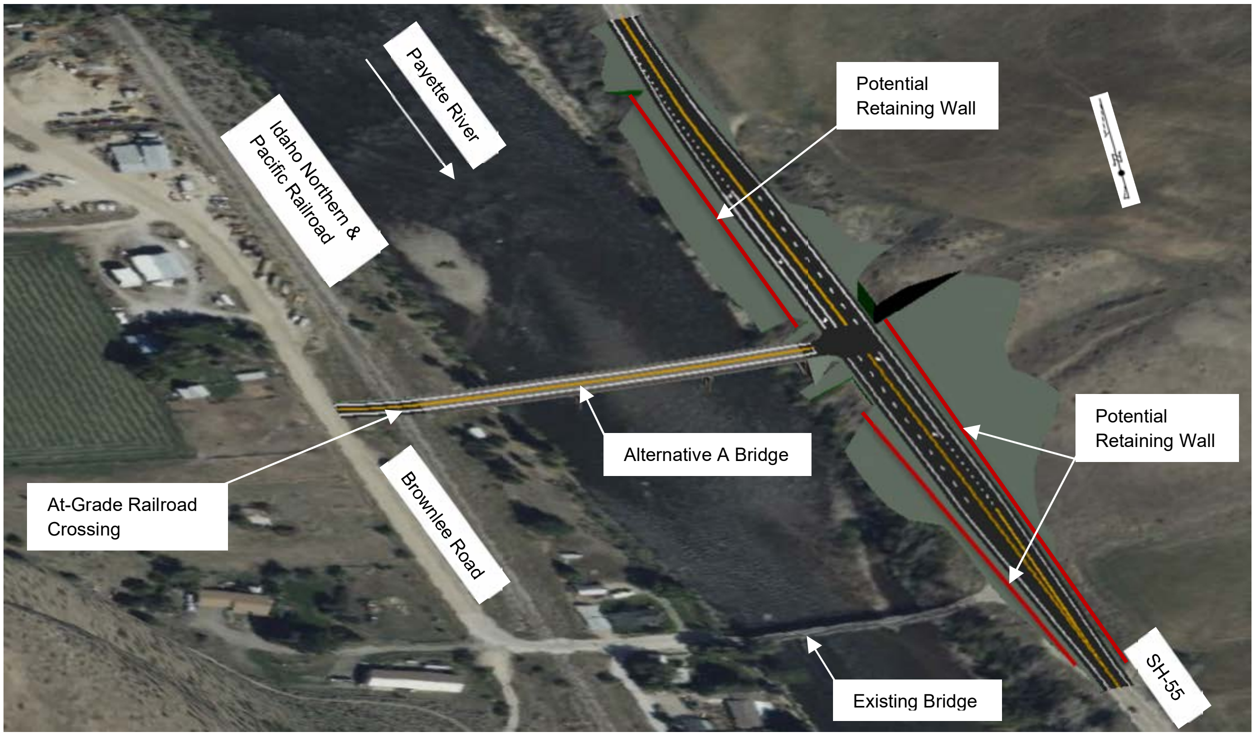

Figure 8. Alternative A Conceptual Layout

West Approach

The Alternative A alignment would connect to Brownlee Road as a perpendicular T-intersection at the existing profile grade with traffic on the new road stopping at the intersection. The proposed road would continue east, crossing the existing INPR railroad tracks with an at-grade crossing and via a sag vertical curve with a 13 percent grade down to the tracks. Due the elevation difference between the existing Brownlee Road and INPR railroad tracks, the vertical curve does not meet the minimum K-value of 49 required for sag vertical curves with a design speed of 35 mph, nor does it meet the minimum K-value of 10 needed if a design speed of 15-mph was used.

Right-of-way would be required from one private property owner between the railroad and the Payette River to develop/construct the proposed project.

East Approach

The Alternative A alignment would connect to SH-55 with a perpendicular intersection. The alternative profile would tie into SH-55 approximately 4 feet below existing grade in order to meet the minimum K-value (49) required for sag vertical curves for the design speed. The existing SH-55 profile would either need to be lowered or the profile grade of the new road increased to meet existing highway elevations. Lowering the existing SH-55 profile is the recommended solution as increasing the profile grade on the new roadway exceeds the minimum K-value and would create a similar condition of the existing bridge, where the approach to SH-55 is too steep for larger vehicles and the space between the end of the bridge and SH-55 is very tight (less than 30 feet).

Right-of-way would be required from one private property owner between the Payette River and SH-55 to construct the new road and intersection.

Retaining walls may be needed along SH-55, two south of the proposed SH-55/Brownlee Road intersection and one north of the intersection. Walls would be placed along the Payette River north and south of the proposed intersection to mitigate potential environmental impacts. The other wall south of the intersection and along the east edge of SH-55 would reduce potential cuts on the uphill side of SH-55 and reduce the right-of-way needed. Roadway retaining wall limits are shown in **Figure 8**. Right-of-way would need to be acquired on the east side of SH-55 if retaining walls are not used. The same owner owns the property on both sides of SH-55 in this area.

Adequate sight distance is provided for Alternative A and no geometric improvements are needed along SH-55 based on this assessment.

5.5.2 Bridge Layout

The bridge layout for Alternative A is controlled on the west by avoiding ordinary highwater impacts due to abutment scour countermeasures (riprap). The east abutment is located near SH-55 along a relatively steep embankment. Due to the close proximity of SH-55 to the bridge end, the east abutment may require a flared approach slab and/or moment slabs to tie into guard railing along SH-55. Assuming a 2:1 embankment slope ratio, a sheet pile wall is anticipated to retain riprap outside of the ordinary highwater limits. Temporary shoring may be needed along SH-55 to construct the east bridge abutment.

A flared approach slab may be beneficial at the west abutment to locate bridge railings outside of the clear zone. By avoiding a hazard in the clear zone, guard railing could be eliminated, which may improve connectivity with the at-grade railroad crossing to the west of the proposed bridge.

Table 3 summarizes superstructure types and span configurations evaluated for Alternative A. Features producing significant differentiating costs (girder, deck, and piers) are compared for the purposes of bridge type selection. For the ease of comparison, all foundation types are assumed to be the same; however, there may be additional/varying costs associated with larger foundations and fewer spans but assumed to be minimal to the overall bridge costs. Only bridge items producing significant differentiating costs are presented in **Table 3**.

Table 3. Alternative A Bridge Options

ALTERNATIVE A; 400-FT BRIDGE											
Super Type (-)	No. Span (-)	Span Configuration (FT)	Super Depth (FT)	No. Girder (-)	Girder Spa. (FT)	Overhang (FT)	Girder Cost ($1000)	Deck & Reinf. Cost ($1000)	No. Pier (-)	Pier Cost ($1000)	Total Cost ($1000)
Steel	2	200 - 200	7.87	4	10.83	3.50	$2,848	$771	1	$725	$4,344
PS; BT-72	3	133.3 - 133.3 - 133.3	7.29	6	7.00	2.25	$ 1,560	$708	2	$1,450	$3,718
PS; WF66G			6.79	6	7.00	2.25	$1,740	$724			$3,914
PS; WF74G			7.45	5	8.50	2.75	$1,600	$713			$3,763
PS; WF83G			8.19	4	10.83	3.50	$1,360	$702			$3,512
Steel		123 - 154 - 123	6.49	4	10.83	3.50	$2,088	$771			$4,309
PS; BT-54	4	100 - 100 - 100 - 100	5.79	6	7.00	2.25	$1,380	$708	3	$2,175	$4,263
PS; BT- 60			6.28	5	8.50	2.75	$1,200	$699			$4,074
PS; BT-72			7.32	4	10.83	3.50	$1,040	$727			$3,942
PS; WF50G			5.45	5	8.50	2.75	$1,300	$713			$4,188
PS; WF58G			6.11	4	10.83	3.50	$1,104	$702			$3,981
Steel		90 - 110 - 110 - 90	5.07	4	10.83	3.50	$1,467	$771			$4,412

Recommended bridge type for Alternative A:

- Total Length (center line (CL) abutment to CL abutment): 400 feet
- Number of Spans: 3
- Span Configuration: 133.3 – 133.3 – 133.3 feet
- Girder Type: Prestressed Concrete Girder (WF83G)
- Number Girder Lines: 4
- Skew = 0°
- Integral abutments

5.5.3 Environmental

There are potential wetland impacts with the SH-55 widening. Roadway retaining walls may be needed to mitigate potential wetland impacts between SH-55 and the Payette River.

Anticipated bridge impacts are as follows (assuming retaining walls are included to keep impact area outside wetland impacts):

- Wetland Impacts: 0.00 acres
- Ordinary Highwater Impacts: 0.005 acres

5.6 Alternative B – Approximately 2,200-feet Upstream

5.6.1 Alignment

The Alternative B alignment is located approximately 2,200 feet upstream from the existing crossing. The new bridge will cross the river on a skew and tie into Watson Lane (private road) on the west and into SH-55 on the east near the middle of the existing horizontal curve on SH-55. A conceptual rendering of Alternative B is presented in **Figure 9**.

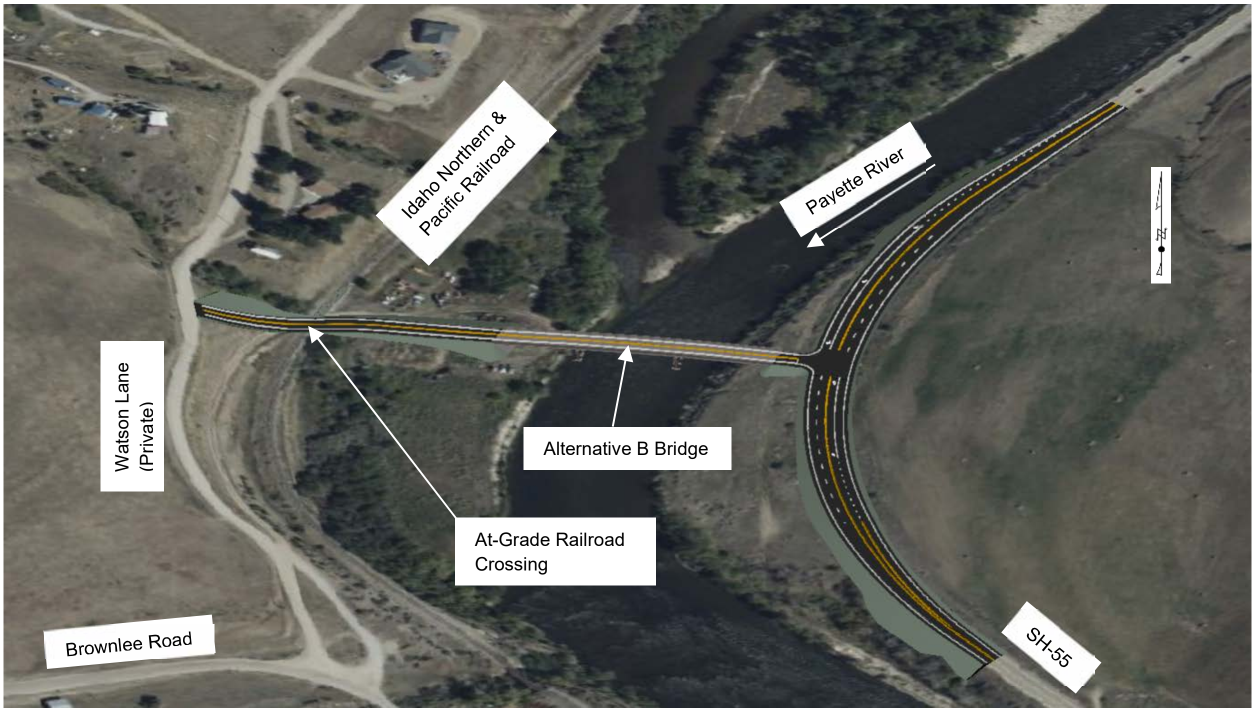

Figure 9. Alternative B Conceptual Layout

West Approach

The Alternative B alignment would connect to Watson Lane as a perpendicular T-intersection with traffic on the new road stopping at the intersection and tie into the existing road profile. The new road would continue to the east to cross the existing INPR tracks with an at-grade crossing and follow a sag vertical curve with a 37 percent grade down to the tracks. Due to the elevation difference between the existing Watson Lane and tracks, the vertical curve does not meet the minimum K-value of 49 required for sag vertical curves with a design speed of 35 mph.

Right-of-way would be required along Watson Lane from one property owner since the road is currently private. Boise County owns the land between the railroad and the Payette River where this alternative crosses.

East Approach

The Alternative B alignment would connect to SH-55 with a perpendicular intersection. This alternative profile would tie to SH-55 at existing elevations meeting current design standards for the proposed design speed.

A significant amount of right-of-way would be required from one parcel between the Payette River and SH-55 to develop the new road and intersection because Watson Lane is private and not owned by the county.

There is adequate sight distance to the south of this intersection. However, the slope above the highway to the north blocks adequate sight of approaching vehicles for a vehicle stopped at the intersection to safely enter the highway. There is a potential need for retaining walls or laying the cut slope lower on the east side of SH-55 to provide adequate sight distance for vehicles turning onto SH-55. Right-of-way or an easement would need to be obtained from private property on the east side of the highway to provide the retaining wall or slope flattening. The same owner owns the property on both sides of SH-55 in this area. Sight distance evaluation layouts are presented in **Appendix D**.

5.6.2 Bridge Layout

Two bridge lengths were evaluated for this alternative, a 330-foot (long bridge) option and a 254-foot (short bridge) option. Situation and Layout drawings for each option are presented in **Appendix F**. The long bridge option was developed to avoid retaining walls along the river and locate scour countermeasures outside of the ordinary highwater limits. The short bridge option considers placing soldier pile walls near the ordinary highwater limits to minimize the structure length. Due to potential scour susceptibility, soldier pile walls would need to be designed for scour. Soldier piles may need to be placed in concrete drilled shafts and tiebacks may be necessary to support the exposed wall height for a scoured condition. As a result, this wall type would be comparatively expensive. When comparing overall bridge costs between the long and short bridge options, the cost is comparatively similar. The long bridge option is recommended because it provides a larger hydraulic opening, better mitigates risk for scour (e.g., abutments are located further from Payette River) and provides improved constructability. Both long and short bridge costs are presented in **Appendix G**.

Table 4 summarizes superstructure types and span configurations evaluated for Alternative B (Long Bridge Alternative). Features producing significant differentiating costs were compared for the purposes of bridge type selection. For the ease of comparison, all foundation types are assumed the same; however, there may be additional/varying costs associated with larger foundations and fewer spans but are assumed to be minimal to the overall bridge costs. Only bridge items producing significant differentiating costs are presented in the table below.

Table 4. Alternative B Bridge Options

ALTERNATIVE B (LONG); 330-FT BRIDGE											
Super Type (-)	No. Span (-)	Span Configuration (FT)	Super Depth (FT)	No. Girder (-)	Girder Spa. (FT)	Overhang (FT)	Girder Cost ($1000)	Deck & Reinf. Cost ($1000)	No. Pier (-)	Pier Cost ($1000)	Total Cost ($1000)
Steel	2	165 - 165	6.83	4	10.83	3.50	$2,050	$649	1	$725	$3,424
PS; BT60	3	110 - 110 - 110	6.27	6	7.00	2.25	$1,069	$596	2	$1,450	$3,115
PS; BT66			6.76	5	8.50	2.75	$957	$589			$2,996
PS; WF50G			5.43	6	7.00	2.25	$1,287	$609			$3,346
PS; WF58G			6.09	5	8.50	2.75	$1,139	$600			$3,189
PS; WF66G			6.74	4	10.83	3.50	$957	$591			$2,998
Steel		102 - 126 - 102	5.58	4	10.83	3.50	$1,708	$649			$3,807
PS; BT54	4	82.5 - 82.5 - 82.5 - 82.5	5.78	4	10.83	3.50	$660	$612	3	$2,175	$3,447
Steel		73 - 92 - 92 - 73	4.49	4	10.83	3.50	$1,411	$649			$4,234

Recommended bridge type for Alternative B:

- Total Length (CL abutment to CL abutment): 330 feet
- Number of Spans: 3
- Span Configuration: 110 – 110 – 110 feet
- Girder Type: Prestressed Concrete Girder (WF66G)
- Number Girder Lines: 4
- Skew = 13°
- Integral abutments

5.6.3 Environmental

Roadway improvements are not anticipated to produce any wetland or ordinary highwater impacts with this alternative.

Anticipated bridge impacts are as follows:

- Wetland Impacts: 0.00 acres
- Ordinary Highwater Impacts: 0.005 acres

5.7 Alternative C – Approximately 1,600-feet Upstream

5.7.1 Alignment

The Alternative C alignment is located approximately 1,600 feet upstream from the existing crossing. The new bridge will cross the river on a skew and tie into Brownlee Road at the existing bend/turn in Brownlee Rd and intersection with Watson Lane (private road). A conceptual rendering of Alternative C is presented in **Figure 10**.

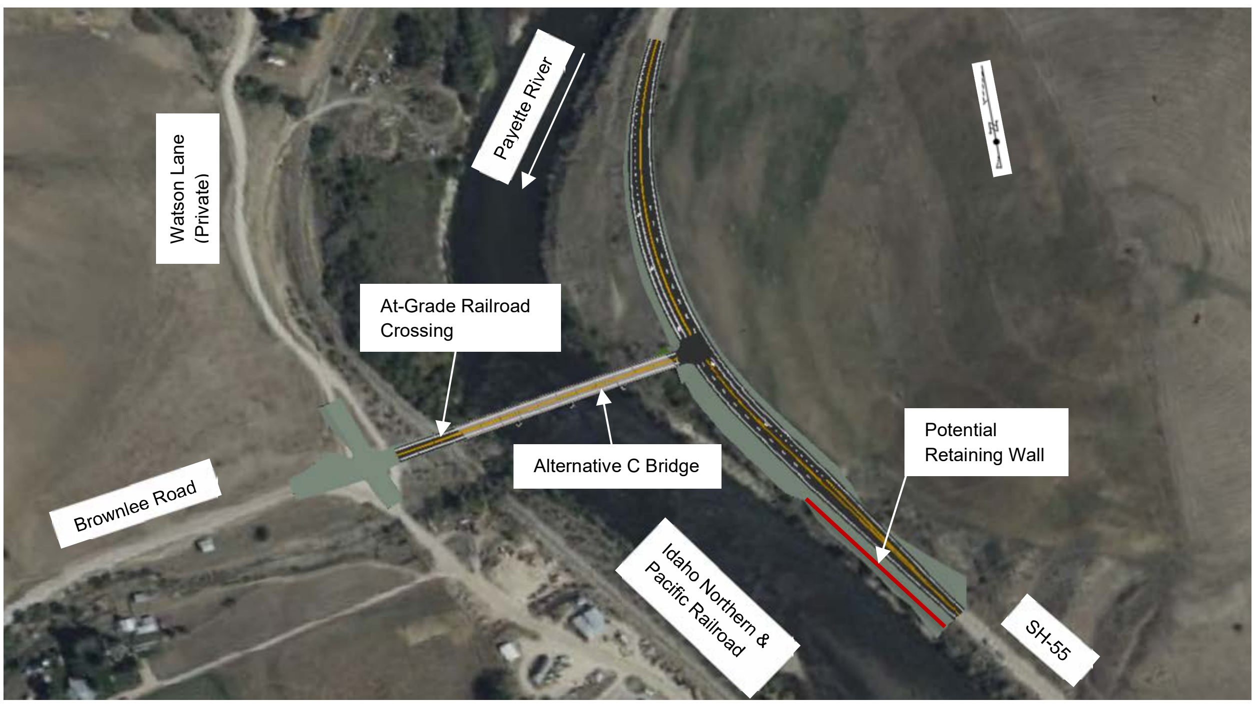

Figure 10. Alternative C Conceptual Layout

West Approach

Alternative C would extend Brownlee Road east over the Payette River to connect to SH-55 approximately 1,600 feet upstream from the existing bridge. The Brownlee Road/Watson Lane intersection would be reconstructed as a four-way intersection with stop control likely on the north and south approaches. The grades along the updated and extended Brownlee Road through the new intersection, east over the existing INPR tracks/proposed at-grade crossing, and across the bridge would meet design standards with a design speed of 35 mph.

Right-of-way would be required from one private property owner who owns both parcels between Watson Lane and INPR and the parcel between the Payette River and SH-55 to develop the new road and intersections.

East Approach

The Alternative C Brownlee Road alignment would connect to SH-55 with a perpendicular intersection. This alternative profile would tie to SH-55 at existing elevations, requiring minimal profile adjustments on SH-55.

Right-of-way would need to be obtained between the Payette River and SH-55 to develop the new road and intersection.

The south leg of the Brownlee Road/SH-55 intersection would potentially need a retaining wall to keep fill out of the Payette River and wetlands, as shown in **Figure 10**.

There is adequate sight distance to the south of this intersection. The slope above the highway to the north slightly blocks adequate sight of approaching vehicles for a vehicle stopped at the intersection to safely enter the highway. Laying the cut slope lower on the east side of SH-55 to provide adequate sight distance for vehicles turning onto SH-55 would be relatively simple and cost effective to make sure adequate sight distance is provided. Right-of-way or an easement would be required from the private property on the east side of the highway to provide the slope flattening. The same owner owns the property on both sides of SH-55 in this area. Sight distance evaluation layouts are presented in **Appendix D**.

5.7.2 Bridge Layout

The bridge layout for Alternative C would be controlled by limiting wetland impacts at both east and west abutments due to riprap. The proposed at-grade railroad crossing to the west of the bridge is approximately 44 feet from the beginning of bridge; therefore, skewed approach slabs are recommended to better facilitate the at-grade crossing design. A flared approach slab may be beneficial at the west abutment to locate bridge railings outside of the clear zone. By avoiding a hazard in the clear zone, guard railing could be eliminated, which may improve connectivity with the at-grade railroad crossing to the west of the proposed bridge.

Table 5 summarizes superstructure types and span configurations evaluated for Alternative C. Features producing significant differentiating costs were compared for the purposes of bridge type selection. For the ease of comparison, all foundation types are assumed the same; however, there may be additional/varying costs associated with larger foundations and fewer spans but assumed to be minimal to the overall bridge costs. Only bridge items producing significant differentiating costs are presented in the table below.

Table 5. Alternative C Bridge Options

ALTERNATIVE C; 490-FT BRIDGE											
Super Type (-)	No. Span (-)	Span Configuration (FT)	Super Depth (FT)	No. Girder (-)	Girder Spa. (FT)	Overhang (FT)	Girder Cost ($1000)	Deck & Reinf. Cost ($1000)	No. Pier (-)	Pier Cost ($1000)	Total Cost ($1000)
Steel	2	245 - 245	9.41	4	10.83	3.50	$4,445	$904	1	$725	$6,075
PS; WF83G	3	163.3 - 163.3 - 163.3	8.18	6	7.00	2.25	$2,499	$868	2	$1,450	$4,817
Steel		151 - 188 - 151	7.58	4	10.83	3.50	$2,728	$924			$5,102
PS; BT72	4	122.5 - 122.5 - 122.5 - 122.5	7.27	6	7.00	2.25	$1,911	$849	3	$2,175	$4,935
PS; WF66G			6.76	5	8.50	2.75	$1,776	$855			$4,806
PS; WF74G			7.41	4	10.83	3.50	$1,568	$842			$4,585
Steel		109 - 136 - 136 - 109	5.91	4	10.83	3.50	$2,531	$924			$5,630

Recommended bridge type for Alternative C:

- Total Length (CL abutment to CL abutment): 490 feet
- Number of Spans: 4
- Span Configuration: 122.5 – 122.5 – 122.5 – 122.5 feet
- Girder Type: Prestressed Concrete Girder (WF74G)
- Number Girder Lines: 4
- Skew = 27°
- Semi-integral abutments

5.7.3 Environmental

There are potential wetland impacts on both sides of the Payette River with the SH-55 widening and the Brownlee Road extension and a retaining wall would likely be needed along SH-55 to avoid impacts. This is shown with a redline in **Figure 10**.

Anticipated bridge impacts are as follows:

- Wetland Impacts: 0.07 acres
- Ordinary Highwater Impacts: 0.007 acres

5.8 Alternative D – Approximately 1,400-feet Upstream

5.8.1 Alignment

The Alternative D alignment is located approximately 1,400 feet upstream from the existing crossing. The new bridge will cross the river on a minor skew and tie into Brownlee Road, adjacent to the Boise County Road and Bridge Department Office. A conceptual rendering of Alternative D is presented in **Figure 11**.

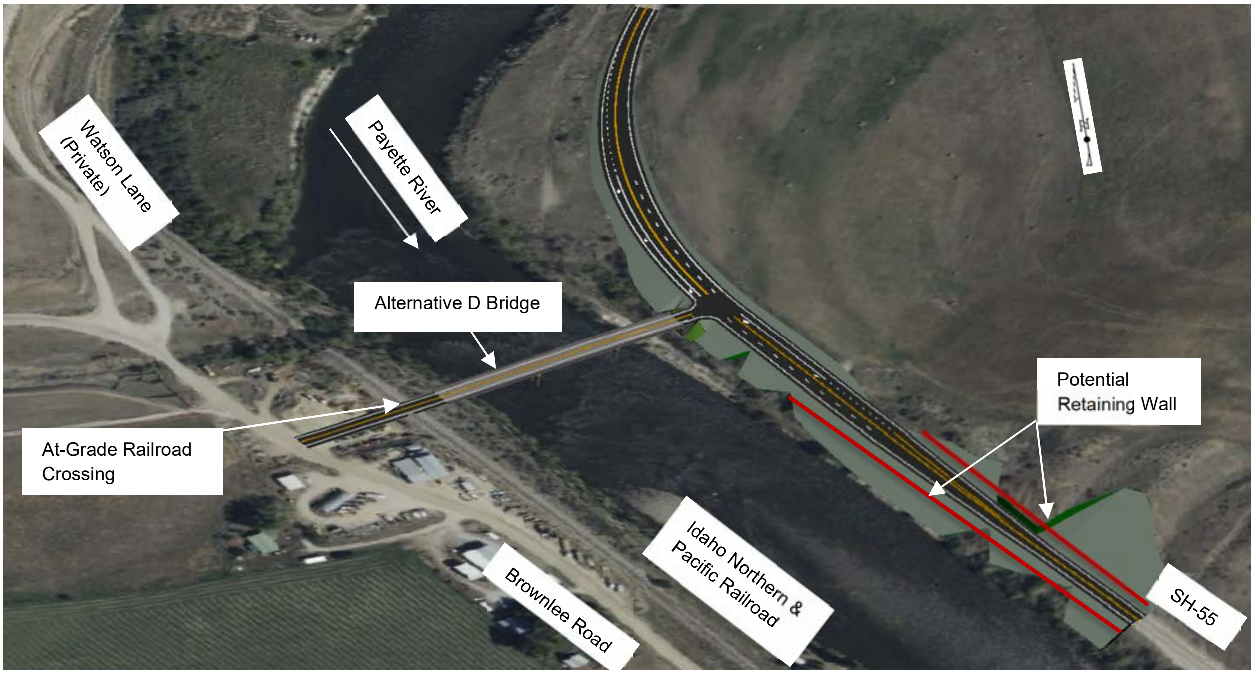

Figure 11. Alternative D Conceptual Layout

West Approach

The Alternative D alignment would connect to Brownlee Road as a perpendicular T-intersection with traffic on the new road stopping at the intersection and connect into the existing road profile. The grades along the new road developed to the east over the existing INPR tracks and across the new bridge would meet design standards with a design speed of 35 mph.

Right-of-way would be required from one private property owner between the railroad and the Payette River to construct the new road.

East Approach

The Alternative D alignment would connect to SH-55 with a perpendicular intersection. This alternative profile would tie to SH-55 at existing elevations, requiring minimal profile adjustments on SH-55.

Right-of-way would be required between the Payette River and SH-55 to construct the new road and intersection.

The south leg of the SH-55 intersection would potentially need retaining walls to keep fill out of the Payette River and wetlands and to reduce cut on the uphill side, as shown in **Figure 11**. Right-of-way would be required on the east side of SH-55 if retaining walls are not used. The same owner owns the property on both sides of SH-55 in this area.

Adequate sight distance is provided to the south. However, the slope above the highway to the north blocks adequate sight of approaching vehicles for a vehicle stopped at the intersection to safely enter the highway. Either retaining walls or significant side slope cuts along the east side of SH-55 would be required in order to provide adequate sight distance for vehicles turning onto SH-55. Right-of-way or an easement would be required from the private property on the east side of the highway to provide the retaining wall or slope flattening. The same owner owns the property on both sides of SH-55 in this area. Sight distance evaluation layouts are presented in **Appendix D**.

5.8.2 Bridge Layout

Alternative D is very similar to Alternative A in terms of out-out bridge length and span configuration. The bridge layout for Alternative D would be controlled on the west by minimizing ordinary highwater impacts and the proximity to the proposed at-grade railroad crossing. The railroad tracks are approximately 72 feet from the beginning of the proposed bridge; therefore, skewed approach slabs are recommended to better facilitate the at-grade crossing design. A flared approach slab may be beneficial at the west abutment to locate bridge railings outside of the clear zone. By avoiding a hazard in the clear zone, guard railing could be eliminated, which may improve connectivity with the at-grade railroad crossing to the west of the proposed bridge.

The east abutment is located near SH-55 on relatively steep embankment. The east abutment may require a flared approach slab and/or moment slabs to tie into guard railing along SH-55. Assuming a 2:1 embankment slope ratio, a sheet pile wall is anticipated to retain riprap outside of the ordinary highwater limits and reduce wetland impacts. Temporary shoring may be needed along SH-55 to construct the east bridge abutment.

Recommended bridge type for Alternative D:

- Total Length (CL abutment to CL abutment): 400 feet
- Number of Spans: 3
- Span Configuration: 133.3 – 133.3 – 133.3 feet
- Girder Type: Prestressed Concrete Girder (WF83G)
- Number Girder Lines: 4
- Skew = 8°
- Integral abutments

5.8.3 Environmental

There are potential wetland impacts on the east side of the Payette River with the SH-55 widening. A retaining wall would likely be needed along SH-55 to reduce both wetland and ordinary highwater impacts.

Anticipated bridge impacts are as follows:

- Wetland Impacts: 0.02 acres
- Ordinary Highwater Impacts: 0.01 acres

5.9 Alternative E – Approximately 43-feet Upstream

5.9.1 Alignment

The Alternative E alignment is located near the existing bridge alignment and on a similar bearing and river crossing skew as the existing bridge. The new roadway will connect to Brownlee Road on the west end of the new bridge with a new at-grade railroad crossing and will connect to SH-55 with a new intersection. A conceptual rendering of Alternative E is presented in **Figure 12**.

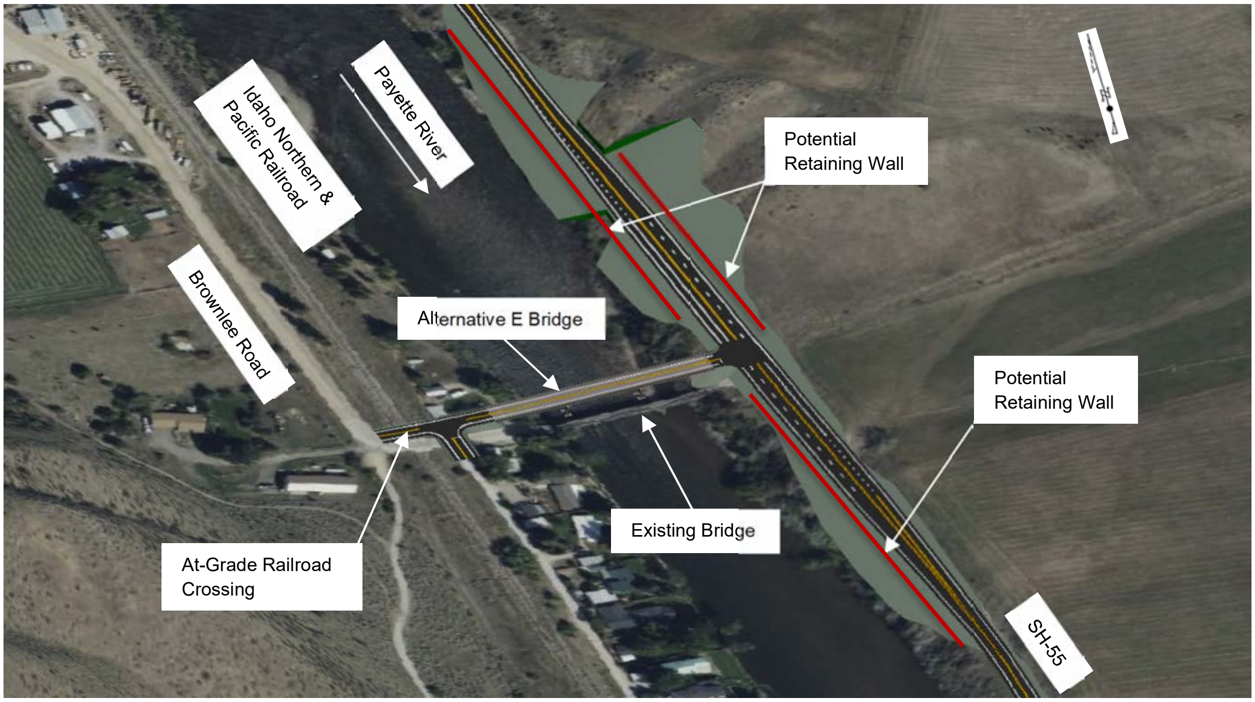

Figure 12. Alternative E Conceptual Layout

Phasing the proposed bridge at this site was investigated to minimize impacts to the property north of Brownlee Road near the west end of the bridge and utilize the existing at-grade railroad crossing; however, impacts could not be minimized such that a full acquisition could be avoided. Additionally, the proposed road would not satisfy design requirements to tie into the existing at-grade railroad crossing from the offset alignment due to the limited horizontal distance between the west end of the bridge and at-grade crossing. In the phased construction scenario, the existing bridge would be removed, the proposed Brownlee Road centerline would match the existing alignment, and the proposed bridge width would be 49'-10" (approximately 10-feet wider than typical alternative bridge sections) to facilitate phased construction and allow one travel lane throughout construction. Since a full acquisition of the parcel north of Brownlee Road would be required in either scenario, the offset alignment is preferred over matching the existing alignment. This reduces proposed bridge costs, allows the option for the existing bridge to either remain in place or be removed (similar to other alternatives), and allows the road alignment to tie into Brownlee Road to satisfy design requirements.

Offsetting the proposed alignment south of the existing bridge was considered. Impacts to the parcel south of Brownlee Road would be similar to the north alignment offset. The proposed roadway would require a new at-grade railroad crossing, similar to the north alignment offset. However, the proposed road would intersect a private roadway, requiring additional right-of-way acquisition to extend Brownlee Road to the new southern T-intersection. Because of the additional right-of-way required for the south alignment offset, the north alignment offset is preferred for Alternative E.

West Approach

The Alternative E alignment would connect to Brownlee Road as a perpendicular T-intersection at the existing profile grade with traffic on the new road stopping at the intersection. The proposed road would continue east via a sag vertical curve with 5.8 percent grade down to the existing INPR railroad tracks and cross the tracks with a new at-grade crossing, which is similar to existing conditions. The existing at-grade crossing would be removed. Due to the elevation difference between the existing Brownlee Road and INPR railroad tracks, the vertical curve does not meet the minimum K-value of 49 required for sag vertical curves for a design speed of 35 mph at 34.98 but does meet the standard for a 25-mph design speed. The connection from the new Brownlee Road to the private Gardena Lane will be maintained east of the railroad tracks.

A full property acquisition would be required from the neighboring property owner on the west side of the Payette River and north side of Brownlee Road to accommodate the new bridge and roadway.

East Approach

The Alternative E alignment would connect to SH-55 with a perpendicular intersection. The alternative profile would tie to SH-55 approximately 6 feet above existing grade in order to provide the needed sight distance along SH-55. The existing SH-55 profile would need to be raised to make the existing crest and sag vertical curves along SH-55 meet K-values for a 55-mph design speed (115 for the sag curve and 114 for the crest curves). The proposed vertical geometry for SH-55 for Alternative E is shown in **Appendix D**. Raising the existing SH-55 profile is the recommended solution as it would avoid the existing condition where the approach to SH-55 is too steep for larger vehicles and the space between the end of the bridge and SH-55 is very tight (less than 30 feet). Improving the vertical grades also provides adequate sight distance for vehicles at the intersection. Raising the profile of the bridge would also reduce the slope of the existing east approach thus reducing the risk of buses and trucks bottoming out on the bridge.

Right-of-way would be required from one private property owner between the Payette River and SH-55 to construct the new road and intersection. Retaining walls may be needed along SH-55, one south of the proposed SH-55/Brownlee Road intersection and one north of the intersection. Walls would be placed along the Payette River north and south of the proposed intersection to mitigate potential environmental impacts. Roadway retaining wall limits are shown in **Figure 12**. The same owner owns the property on both sides of SH-55 in this area.

5.9.2 Bridge Layout

Alternative E follows the existing bridge alignment and provides approximately 13-feet clearance between proposed and existing bridges. This allows space for construction of the proposed bridge without impacting the existing bridge. Traffic will be maintained on the existing bridge throughout construction.

The west bridge abutment is located to minimize impacts below ordinary highwater. A retaining wall is anticipated in front of the abutment to minimize environmental impacts and reduce the bridge length. The ordinary highwater limits are referenced from the national wetlands inventory available online through the USFWS Website and appear to be shown conservatively close to existing buildings on the west riverbank. During design, wetland and ordinary highwater delineations may allow for the removal of retaining walls or moving the west bridge abutment closer to the river.

The east abutment is located near SH-55 on a relatively steep embankment. The east abutment may require a flared approach slab and/or moment slabs to tie into guard railing along SH-55. Temporary shoring may be needed along SH-55 to construct the east bridge abutment without impacting traffic.

Table 6 summarizes superstructure types and span configurations evaluated for Alternative E. Features producing significant differentiating costs were compared for the purposes of bridge type selection. For the ease of comparison, all foundation types are assumed the same; however, there may be additional/varying costs associated with larger foundations and fewer spans but assumed to be minimal to the overall bridge costs. Only bridge items producing significant differentiating costs are presented in the table below.

Table 6. Alternative E Bridge Options

ALTERNATIVE E; 335-FT BRIDGE											
Super Type (-)	No. Span (-)	Span Configuration (FT)	Super Depth (FT)	No. Girder (-)	Girder Spa. (FT)	Overhang (FT)	Girder Cost ($1000)	Deck & Reinf. Cost ($1000)	No. Pier (-)	Pier Cost ($1000)	Total Cost ($1000)
Steel	2	167.5-167.5	6.91	4	10.83	3.50	$2,093	$657	1	$725	$3,475
PS; BT60	3	111.7 - 111.7 - 111.7	6.28	6	6.75	2.88	$1,085	$604	2	$1,450	$3,139
PS; BT66			6.78	5	8.25	3.25	$972	$596			$3,018
PS; WF50G			5.46	6	7.00	2.25	$1,307	$612			$3,368
PS; WF58G			6.12	5	8.50	2.75	$1,156	$603			$3,209
PS; WF66G			6.78	4	10.83	3.50	$972	$595			$3,016
Steel		104 - 127 - 104	5.57	4	10.83	3.50	$1,745	$657			$3,852
PS; BT54	4	83.8 - 83.8 - 83.8 - 83.8	5.82	4	10.83	3.50	$670	$630	3	$2,175	$3,475
Steel		81.5 - 86 - 86 - 81.5	4.32	4	10.83	3.50	$1,457	$657			$4,289

Recommended bridge type for Alternative E:

- Total Length (CL abutment to CL abutment): 335 feet
- Number of Spans: 3
- Span Configuration: 111.67 – 111.67 – 111.67 feet
- Girder Type: Prestressed Concrete Girder (WF66G)
- Number Girder Lines: 4
- Skew = 0°
- Integral Abutments

5.9.3 Environmental

There are potential wetland impacts on the east side of the Payette River with the SH-55 widening. Retaining walls are anticipated along SH-55 to reduce both wetland and ordinary highwater impacts.

Anticipated bridge impacts are as follows:

- Wetland Impacts: 0.0 acres
- Ordinary Highwater Impacts: 0.0 acres

6 Bridge Foundation Type & Structures

Geotechnical field reconnaissance and lab analysis were not performed as part of this study. Foundation recommendations are based on engineering judgement and similar river crossing projects. Foundation recommendations will need to be confirmed during the design phase of this project.

Per the ITD Bridge Hydraulic Manual (Article 2.2), the bridge must be designed to withstand the Scour Design Flood (100-year event) at the Service Limit State and withstand the Scour Check Flood (500-year event) at the Extreme Event Limit State. The bridge must be stable for total scour for design and check flood events without accounting for scour countermeasures. Additionally, scour countermeasures should be designed to protect the structure from scouring in a 100-year flood event.

6.1 Abutment Considerations

Due to the potential for scour, deep foundations are anticipated to support bridge abutments. Given the bridge lengths and prestressed girder superstructure types, integral abutments supported on pile foundations are a feasible foundation type. Alternatively, drilled shafts may be used to support bridge abutments as another feasible option. If drilled shafts are selected, semi-integral abutments are recommended. For the anticipated bridge lengths in this study, semi-integral abutments are suitable for both prestressed and steel superstructure types. For estimating alternative costs, integral abutments supported on a single row of 18-inch diameter shell piles have been assumed.

Approach slabs are recommended to provide a smooth riding surface between bridge and roadway approaches. Geosynthetic reinforced abutment backfill (GRAB) may be used to prevent settlement of the roadway approach fill; however, for the bridge lengths considered (greater than 330 feet long), thermal expansion/contraction is anticipated to create a bump in riding surface. Approach slabs will perform better than GRAB where the bridge may be susceptible to thermal expansion /contraction.

Abutment scour countermeasures are assumed to be riprap. Scour countermeasures must follow guidance from the Federal Highway Administration (FHWA) tech brief for deep foundations and the ITD Bridge Hydraulics Manual. For the purpose of assessing potential environmental impacts, the abutment riprap footprint has been assumed to extend 25 feet in all directions from the limits of bridge abutments. Where wetland or ordinary highwater impacts exceed environmental permit thresholds, sheet pile walls are assumed to retain riprap. Where used, sheet pile or soldier pile walls must be designed for the anticipated scour to retain riprap and protect abutments from scour.

Hydraulic analysis was not performed as part of this study; therefore, scour countermeasure design will be required in a subsequent design phase of this project.

6.2 Pier Considerations

To minimize environmental impacts below ordinary highwater and resist potential for scour, large diameter drilled shafts are proposed that would be integral with pier columns. In-water construction is anticipated for pier construction.

Driven piles would require a pile cap within the river and would involve cofferdams and dewatering to construct. An equivalent pile cap with drilled shafts would require similar construction effort. Both options have a larger environmental footprint when placed within the river flowline. Therefore, drilled shafts with integral columns are recommended as the most cost-effective and environmentally sensitive foundation option.

6.3 Bridge Railing Considerations

The design speed of 35 mph allows the use of a MASH TL-3 rated barrier. An ITD standard three-tube, curb-mounted railing is assumed (MASH TL-4). This barrier type provides better visibility over the bridge and is considered aesthetically pleasing. Other railing options may be acceptable and require evaluation during the design phase.

6.4 Prestressed Concrete Girder Superstructure Type

Prestressed concrete girders provide a less expensive alternative to steel but also impart a larger dead load on the substructure. For a given span length, prestressed concrete girder types are typically larger in section depth than their steel girder counterparts. This increase in superstructure depth increases loads to the substructure by requiring large concrete diaphragms at bearing and intermediate locations.

Field splicing is not required with prestressed girders, but cast-in-place concrete diaphragms will be necessary. This requires an additional over-water pour sequence in comparison to a steel girder superstructure.

Selection of alternative prestressed concrete girders for this study is based on Article A5.4 of the ITD Bridge Design LRFD Manual (December 2024).

6.5 Steel Plate Girder Superstructure Type

Steel plate girders can provide a shallower superstructure depth with fewer girder lines than prestressed concrete girders. Steel plate girder sections can be cambered or uniform to achieve the most efficient and cost-effective steel shape while also providing additional vertical clearance over the Payette River. Steel plate girders provide the option to reduce the number of spans at each alternative. While fewer spans at a longer length may increase the superstructure depth and overall bridge cost, removing a span may also reduce environmental impacts within the river channel.

Hydraulic analysis is needed to assess water surface elevations and evaluate long-term maintenance susceptibility. Weathering steel is recommended where 8 feet of clearance is provided over running water, such as the Payette River. Otherwise, painted girders would be recommended. From a long-term maintenance perspective, weathering steel is more cost-effective compared to painted girders. Based on the proposed roadway profile and available topographic data, weathering steel is an appropriate steel type to improve long term maintenance of the bridge.

7 Cost Estimates

In general, each alternative cost estimate is divided into three categories:

- Roadway west of proposed bridge (nearest Gardena)
- Proposed bridge
- Roadway east of proposed bridge (nearest SH-55)

The concept roadway and highway design criteria are presented in **Appendix H**. These values provide a design basis for alternative features and project limits. The following bridge and roadway features are common to all alternatives:

- Two, 12-foot lanes
- Two, 6-foot shoulders
- 3-tube, curb-mount railing (bridge)
- Drilled shafts (bridge piers)
- Pile foundations (bridge abutments)
- Temporary work bridge
- Guardrail (roadway)
- 2:1 cut/fill slope ratios (as needed)
- New at-grade railroad crossing

The existing bridge is assumed to remain in place; therefore, removal of the existing bridge is not included in alternative cost estimates.

See **Appendix G** for an itemized cost estimate for each alternative.

7.1 Alternative A – Approximately 600 feet Upstream

Table 7 summarizes the cost estimate for Alternative A.

Table 7. Alternative A Cost Estimate

ALTERNATIVE A	WEST OF BRIDGE	BRIDGE	EAST OF BRIDGE	TOTAL
SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 631,000	$ 7,762,000	$ 5,633,000	$ 14,026,000
CONTINGENCY (30%)	$ 189,300	$ 2,328,600	$ 1,689,900	$ 4,207,800
PROJECT SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 821,000	$ 10,091,000	$ 7,323,000	$ 18,235,000
RIGHT-OF-WAY ACQUISITION	$ 127,500	$ -	$ 67,500	$ 195,000
DESIGN ENGINEERING				$ 2,504,680
CONSTRUCTION ENGINEERING				$ 4,558,750
CONSTRUCTION ADMINISTRATION				$ 626,170
ESTIMATED PRJECT TOTAL (ROUNDED UP THE NEAREST $1,000)				**$ 26,120,000**

7.2 Alternative B – Approximately 2,200 feet Upstream

Table 8 summarizes the cost estimate for Alternative B.

Table 8. Alternative B Cost Estimate

ALTERNATIVE B	WEST OF BRIDGE	BRIDGE	EAST OF BRIDGE	TOTAL
SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 884,000	$ 6,320,000	$ 2,341,000	$ 9,545,000
CONTINGENCY (30%)	$ 265,200	$ 1,896,000	$ 702,300	$ 2,863,500
PROJECT SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 1,150,000	$ 8,216,000	$ 3,044,000	$ 12,410,000
RIGHT-OF-WAY ACQUISITION	$ 1,792,500	$ -	$ 202,500	$ 1,995,000
DESIGN ENGINEERING				$ 426,120
CONSTRUCTION ENGINEERING				$ 3,102,500
CONSTRUCTION ADMINISTRATION				$ 426,120
ESTIMATED PRJECT TOTAL (ROUNDED UP THE NEAREST $1,000)				**$ 19,639,000**

7.3 Alternative C – Approximately 1,600 feet Upstream

Table 9 summarizes the cost estimate for Alternative C.

Table 9. Alternative C Cost Estimate

ALTERNATIVE C	WEST OF BRIDGE	BRIDGE	EAST OF BRIDGE	TOTAL
SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 934,000	$ 9,215,000	$ 2,502,000	$ 12,651,000
CONTINGENCY (30%)	$ 280,200	$ 2,764,500	$ 750,600	$ 3,795,300
PROJECT SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 1,215,000	$ 11,980,000	$ 3,253,000	$ 16,448,000
RIGHT-OF-WAY ACQUISITION	$ 337,500	$ -	$ 120,000	$ 457,500
DESIGN ENGINEERING				$ 2,259,152
CONSTRUCTION ENGINEERING				$ 4,112,000
CONSTRUCTION ADMINISTRATION				$ 564,788
ESTIMATED PRJECT TOTAL (ROUNDED UP THE NEAREST $1,000)				**$ 23,842,000**

7.4 Alternative D – Approximately 1,400 feet Upstream

Table 10 summarizes the cost estimate for Alternative D.

Table 10. Alternative D Cost Estimate

ALTERNATIVE D	WEST OF BRIDGE	BRIDGE	EAST OF BRIDGE	TOTAL
SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 747,000	$ 7,730,000	$ 4,163,000	$ 12,640,000
CONTINGENCY (30%)	$ 224,100	$ 2,319,000	$ 1,248,900	$ 3,792,000
PROJECT SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 972,000	$ 10,049,000	$ 5,412,000	$ 16,433,000
RIGHT-OF-WAY ACQUISITION	$ 120,000	$ -	$ 105,000	$ 225,000
DESIGN ENGINEERING				$ 2,257,177
CONSTRUCTION ENGINEERING				$ 4,108,250
CONSTRUCTION ADMINISTRATION				$ 564,294
ESTIMATED PRJECT TOTAL (ROUNDED UP THE NEAREST $1,000)				**$ 23,588,000**

7.5 Alternative E – Approximately 43 feet Upstream

Table 11 summarizes the cost estimate for Alternative E.

Table 11. Alternative E Cost Estimate

ALTERNATIVE E	WEST OF BRIDGE	BRIDGE	EAST OF BRIDGE	TOTAL
SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 906,000	$ 6,721,000	$ 5,933,000	$ 13,560,000
CONTINGENCY (30%)	$ 271,800	$ 2,016,300	$ 1,779,900	$ 4,068,000
PROJECT SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 1,178,000	$ 8,738,000	$ 7,713,000	$ 17,629,000
RIGHT-OF-WAY ACQUISITION	$ 480,000	$ -	$ 15,000	$ 495,000
DESIGN ENGINEERING				$ 2,421,459
CONSTRUCTION ENGINEERING				$ 4,407,250
CONSTRUCTION ADMINISTRATION				$ 605,365
ESTIMATED PRJECT TOTAL (ROUNDED UP THE NEAREST $1,000)				**$ 25,559,000**

7.6 Total Estimated Cost Comparison

Table 12 summarizes the total costs associated with each of the alternatives, including contingency, right-of-way costs, design engineering, CE&I, and project administration.

Table 12. Alternative Cost Estimate Summary

	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C	ALTERNATIVE D	ALTERNATIVE E
SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 14,026,000	$ 9,545,000	$ 12,651,000	$ 12,640,000	$ 13,560,000
CONTINGENCY	$ 4,207,800	$ 2,863,500	$ 3,795,300	$ 3,792,000	$ 4,068,000
PROJECT SUBTOTAL (ROUNDED UP TO THE NEAREST $1,000)	$ 18,235,000	$ 12,410,000	$ 16,448,000	$ 16,433,000	$ 17,629,000
RIGHT-OF-WAY ACQUISITION	$ 195,000	$ 1,995,000	$ 457,500	$ 225,000	$ 495,000
DESIGN ENGINEERING	$ 2,504,680	$ 1,704,481	$ 2,259,152	$ 2,257,177	$ 2,421,459
CONSTRUCTION ENGINEERING	$ 4,558,750	$ 3,102,500	$ 4,112,000	$ 4,108,250	$ 4,407,250
CONSTRUCTION ADMINISTRATION	$ 626,170	$ 426,120	$ 564,788	$ 564,294	$ 605,365
ESTIMATED PRJECT TOTAL (ROUNDED UP THE NEAREST $1,000)	**$ 26,120,000**	**$ 19,639,000**	**$ 23,842,000**	**$ 23,588,000**	**$ 25,559,000**

The cost to keep the bridge and maintain it or to remove the existing bridge are not included in **Table 12**. There are several maintenance and repair activities associated with keeping the existing bridge in place. Note that inspections are not required for pedestrian-only bridges per the National Bridge Inspection Standards; however, it is strongly encouraged to inspect regularly for public safety and are included herein. The cost and frequency of these activities is presented in **Table 13**. Significant inspection and maintenance items are listed in the table; minor, routine repair costs (e.g., bolt replacement, etc.) is not included in the maintenance cost summary.

Table 13. Existing Bridge Maintenance Cost Summary

MAINTENANCE ACTIVITY	COST ($)	FREQUENCY (YEAR)
ROUTINE BRIDGE INSPECTION	$12,000	2
UNDERWATER BRIDGE INSPECTION	$15,000	5
PAINTING	$1,019,000	20
INSTALL PEDESTRIAN RAILING	$210,000	(-)
INSTALL RIPRAP AT PIER 1	$14,000	(-)
INSTALL VEHICULAR BARRIERS AT BRIDGE ENDS	$17,000	(-)

The cost to remove the existing bridge is estimated to be $500,000.

8 Alternative Comparisons & Recommendations

Alternative A would not provide adequate roadway geometrics at the Brownlee Road, INPR tracks, and SH-55 connections with and profile grades exceeding the minimum per current design standards. Retaining walls would be necessary to avoid river impacts and excessive right-of-way impacts.

Alternative B has similar roadway geometric issues and the largest impacts on private property with having to purchase Watson Lane and adjacent parcels to connect the new road to Brownlee Road. It was the least popular alternative among the public and stakeholders. Sight distance from the SH-55/new road intersection would not be provided without substantial slope flattening and/or retaining wall installation, which would require additional right-of-way acquisition.

Alternative C would match into Brownlee Road, the INPR tracks, and SH-55 with adequate grades. Sight distance along SH-55 can be provided with minor slope flattening. It was the most popular alternative among the public and stakeholders because it would keep recreational and other traffic mostly off local roads that connect directly to private property.

Alternative D would match into Brownlee Road, the INPR tracks, and SH-55 with adequate grades. Sight distance from the SH-55/new road intersection would not be provided without substantial slope flattening and/or retaining wall installation, which would require significantly more right-of-way. It was the second most popular alternative among the public and stakeholders. Retaining walls would be necessary to avoid river impacts and excessive right-of-way impacts.

Alternative E parallels the existing bridge and is offset approximately 43-feet upstream. The proposed road requires a new at-grade INPR railroad crossing and intersects Brownlee Road and SH-55 with adequate grades. Sight distance along SH-55 is adequate in both directions. This alternative allows traffic to utilize the existing bridge throughout construction, similar to Alternatives A-D. It also allows the existing bridge to either remain in place or be removed, similar to the other alternatives. Alternative E would require the acquisition of right-of-way on the east side of the Payette River including one or both neighboring parcels. Alternative C was the most preferred by stakeholders and the public.

Alternatives C and D are the most viable options for replacing the Gardena Bridge. Alternative C was the most preferred by stakeholders and the public. Therefore, it is recommended that project funding be obtained for at least $24 million in 2024 dollars. For every year after 2024 to the year of construction bidding, inflate the project funding at 5 percent per year.

The project will have a variety of approvals to obtain due to the NEPA process depending on the funding source for construction. For recommendations for the future scope of work to address NEPA, see Section 5 Environmental and Permit Considerations.