



SNOHOMISH COUNTY
Public Works

M E M O R A N D U M

DATE: 4/18/2022

PREPARED BY: Tim Tipton, PE, SE – Project Manager / County Bridge Engineer
Tim Tipton

SUBJECT: Jordan Creek Br 214 Design Report Modification [RC1369 / UPI 15-0083]

The purpose of this memorandum is to document a design change for the Jordan Creek Bridge 214 Replacement Project. The recommended structure type for the Bridge 214 replacement is revised from a 60' buried concrete arch to a 120-ft long single span concrete girder bridge. The bridge type and size were revised after stakeholder discussions and additional design considerations.

Original Design Report Recommendations

The Design Report for the Jordan Creek Br 214 Replacement Project was signed May 7, 2021. The Design Report recommended a buried concrete arch as the preferred alternative bridge type. The Design Report explored three bridge types and two bridge locations. The six unique configurations were ranked based on environmental impacts, right-of-way impacts, initial cost, and future maintenance costs. The buried concrete arch placed in the existing roadway alignment was the preferred alternative. The concrete girder and steel girder bridges in the existing alignment tied for second, with the concrete girder being slightly less expensive than the steel girder option. The buried concrete arch scored higher in environmental impacts, right-of-way impacts, and future costs. The concrete arch scored lower in initial cost. The design report can be found here: S:\PW_Project_Data_Management\6-PROJECTS\UPI Year_2015\15-0083\04_DESIGN\TS&L Report\RC1369 Design Report.pdf

Field Meeting

In consultation with Tulalip Tribes, Stillaguamish Tribe, WDFW, and the Snohomish County ENVS group, a field meeting occurred on November 8th, 2021. The purpose of the meeting was to discuss environmental issues with the design. Concerns were expressed with the buried concrete arch design as it reduced the Jordan Creek hydraulic opening as well as the impacts it caused to the riparian banks of the Stillaguamish River.

Snohomish County Findings

Snohomish County staff re-evaluated the impacts of the buried concrete arch based on the discussion from the field meeting as well as a more developed design. It was determined that the buried concrete arch had more impacts to the hydraulic opening and riparian banks than the concrete girder bridge. In addition, the right-of-way impacts were determined to be the same for the girder bridges and the buried concrete arch. As shown in the design report, the concrete girder bridge has less initial cost than the buried concrete arch, and slightly less initial cost than the steel girder bridge. Based on these findings, the recommended preferred alternative is the concrete girder bridge in the existing alignment. See the original and updated decision matrix below, with changes highlighted.

	Environmental	Right of Way	Initial Cost	Future Cost	Total
1) Concrete Girder	3	3	4	3	13
2) Steel Girder	3	3	4	3	13
3) Concrete Arch	2	3	3	4	12
4) Concrete Girder Upstream	2	2	2	3	9
5) Steel Girder Upstream	2	2	2	3	9
6) Concrete Arch Upstream	2	2	2	4	10

Figure 1. Updated Decision Matrix

	Environmental	Right of Way	Initial Cost	Future Cost	Total
1) Concrete Girder	3	3	4	3	13
2) Steel Girder	3	3	4	3	13
3) Concrete Arch	4	4	3	4	15
4) Concrete Girder Upstream	2	2	2	3	9
5) Steel Girder Upstream	2	2	2	3	9
6) Concrete Arch Upstream	2	2	2	4	10

Figure 2. Original Decision Matrix

Decision Matrix Scoring Criteria

Environmental considers environmental impacts including temporary and permanent impacts. The concrete and steel girder bridges have a smaller footprint, less impact to the riparian buffer, and less impact to the hydraulic opening of Jordan Creek as compared to the buried concrete arch. Alternatives 4, 5, and 6 received the lowest ranking as they have the largest permanent impact to wetland buffers.

Right of Way considers the cost to obtain right of way and temporary easements. Alternatives 1, 2, and 3 have less costs than Alternatives 4, 5, and 6 as they require less Right of Way purchase.

Initial Cost is based on the engineers estimate of each alternative. The concrete girder bridge was the cheapest, followed closely by the steel girder bridge. The concrete arch was the most

expensive of the three existing alignment options. Alternatives 4, 5, and 6 were the most expensive.

Future Cost considers the cost to maintain the structure over its lifetime. Buried Concrete Arch structures have less maintenance associated costs than traditional girder bridges, therefore the Concrete Arch scored highest.

Conclusions

Based on a more developed design as well as input from stakeholders, Snohomish County proposes a single span concrete girder bridge for the replacement structure of Jordan Creek Bridge 214. This bridge type has the lowest initial cost and is comparable in future cost and right-of-way impacts, as well as fewer environmental impacts as compared to a buried concrete arch. Therefore, the preferred alternative has changed to a concrete girder bridge for Jordan Creek Bridge 214.