CSW | ST2

**MEMORANDUM**

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| **To:** | Wency Ng, PE - San Mateo County Department of Public Works |
| **From:** | Robert Stevens, PE, TE - CSW\|ST2 |
| **Date:** | February 21, 2021 (Versions February 5, 19, 2021) |
| **Subject:** | Option to Lengthen the Mirada Road Pedestrian Bridge |

A key element of the Mirada Road Pedestrian Bridge replacement project is preserving the existing bridge foundations which includes concrete piers that are cast in drill holes (CIDH) and concrete abutments. This is possible as the proposed prefabricated aluminum pedestrian bridge is lighter than the existing steel unit. As the new bridge weighs less, the installation conforms to the current edition of the California Building Code relating to structural design.

We have considered extending the length of the bridge to provide greater clearance from the bluff and the bridge foundation. On the bridge's north side, this is not possible as lengthening the bridge would conflict with driveways serving private properties. However, on the south side, it is possible as shown in figure 1.

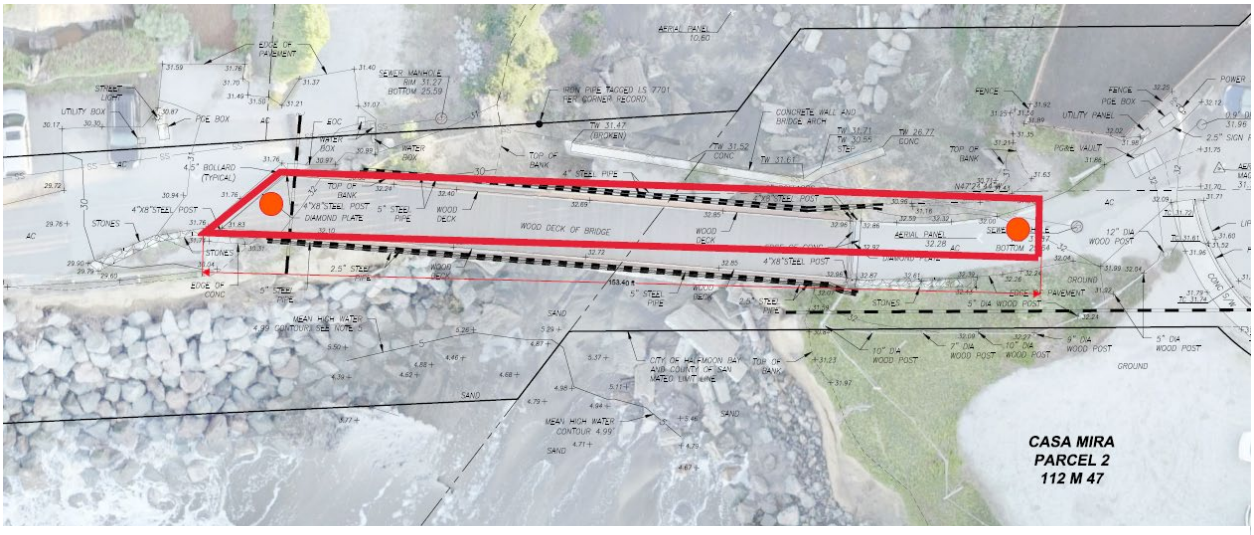


Figure 1. Lengthened bridge option.

This option shifts the south bridge abutment closer to the Mirada Road cul-de-sac lengthening the existing bridge from 120 feet to 150 feet. Lengthening of the bridge complicates the project as follows:

1. As the bridge is longer, there is an increase in both dead and live loads. To comply with the current building code, the project would need to replace both the northerly and southerly foundations that include the concrete piers and abutments. This would require a major modification to the northerly abutment and potentially require its relocation to avoid conflict with the existing piers.
2. Lengthening of the bridge will increase the load on the structure. Several bridge manufacturers we asked stated that an aluminum bridge with a free span 150 feet would require a major change to

their tooling and they may not be interested in fabricating it. In addition to larger structural members, the increased bridge length will require a deeper truss. While some of this additional depth could be added below the deck, the height of the truss will likely increase. As the County has previously responded to neighboring property owners who are concerned the bridge will create a visual impact, we recommend maintaining the bridge's height as close as possible to the existing condition.

3. Extending the bridge by 30 feet will increase construction cost not only due to materials, but also due to additional installation complexity. As currently proposed, the bridge will be delivered in several sections and joined together along Mirada Road. A crane placed in the parking area of 2 Mirada Road will lift the bridge and place it on the existing abutments. With a longer bridge, there will likely need to be two cranes located on either side of the Arroyo de en Medio to lift the entire structure. Placing a crane on the north side is likely not possible due to the narrow roadway width. Alternatively, two bridge segments could be potentially lifted from the south side and temporarily supported by falsework placed within the creek until the structure is joined together. The placement of falsework within the sand creates additional complexity and cost.

Table 1 illustrates the project's costs assuming replacing the existing bridge with an aluminum unit and installing bluff protection. Table 2 presents the cost for a lengthened pedestrian bridge as previously discussed with no bluff protection on the south side. Increasing the bridge's length costs about $300,000 more than the bridge replacement option. Note that this value does not include the costs associated with revising the design, additional public outreach, and revising both the environmental document and permits that are all almost complete. This could represent an additional cost of about $250,000 and adds a one year delay in opening the bridge to the public.

Therefore, increasing the length of the bridge adds about $550,000 in total project cost. We also note that the assumption that no bluff protection is required for the abutment if the bridge is shifted to the south may not be valid.

Figure 2 illustrates the existing southerly abutment. Once the debris and remnants of the concrete arch bridge are removed, the bluff will be exposed to the ocean. We would expect to see erosion at this location similarly to the northerly bluff. This erosion can potentially compromise the bridge, road, trail, and utility systems.

Figure 2. Southerly abutment of the existing concrete arch bridge.

Removing of the concrete arch bridge will be a benefit to the beach environment as it will open about 700 square feet of area for sand. In addition, the project proposes to remove concrete debris from the beach and the Arroyo de en Medio. In December 2020, the sand levels were extremely low exposing an exceptionally large debris field that has not been visible for many years, which is shown in Figure 3. Removal of this debris will open a large area for sand.

Figure 3 Concrete debris east of bridge.

In conclusion, increasing the bridge's length as previously noted may not be feasible due to the manufacturer's limitations. If possible, it will result in an increased bridge depth and height due to a deeper truss which will likely create significant opposition from neighboring properties and delay the project by another year. We recommend proceeding with the bridge replacement with an aluminum unit atop the existing foundations to get the trail open to users by the Fall of 2021.

Figure 4. The Mirada Road pedestrian bridge serves as a link for residents of the Miramar neighborhood to walk and bike along the coastline. While the temporary access is functional it is not ideal for the large volume of users. Pictured here is users on Sunday morning February 21, 2021. A delay of the bridge opening of 1 year creates a significant challenge for mobility within the Miramar community.

**TABLE 1: MIRADA ROAD PEDESTRIAN BRIDGE REPLACEMENT**

| ITEM | DESCRIPTION | QTY. | UNIT | UNIT COST | AMOUNT |
|---|---|---|---|---|---|
| 101 | Mobilization/ Demobilization | 1 | LS | $ 237,542.00 | $237,542 |
| 102 | Water Pollution Control | 1 | LS | $ 35,000.00 | $35,000 |
| 103 | Traffic Control | 1 | LS | $ 15,000.00 | $15,000 |
| 104 | Construction Staking (S) | 1 | LS | $ 10,000.00 | $10,000 |
| 105 | Temporary Ramp to Access Beach | 1 | LS | $ 65,000.00 | $65,000 |
| 200 | Clear and Grub Bluff | 4,770 | SF | $ 3.00 | $14,310 |
| 201 | Remove Pedestrian Bridge | 1 | LS | $ 45,000.00 | $45,000 |
| 202 | Remove Concrete Bridge | 1 | LS | $ 150,000.00 | $150,000 |
| 301 | Remedial Bluff Grading | 4,770 | SF | $ 8.00 | $38,160 |
| 302 | Rock Slope Protection | 1,700 | TON | $ 92.00 | $156,400 |
| 303 | Shotcrete Wall | 4,200 | SF | $ 350.00 | $1,470,000 |
| 304 | 18" Storm Drain Outfall | 1 | EA | $ 5,500.00 | $5,500 |
| 305 | 6" Storm Drain Outfall | 1 | EA | $ 2,500.00 | $2,500 |
| 400 | Prepare Abutments | 2 | EA | $ 3,500.00 | $7,000 |
| 401 | Provide Aluminum Bridge | 1 | LS | $ 250,000.00 | $250,000 |
| 402 | Place Aluminum Bridge | 1 | LS | $ 100,000.00 | $100,000 |
| 402 | Electrical Casing and Hangars | 110 | LF | $ 105.00 | $11,550 |
| 500 | Asphalt Pathway | 700 | SF | $ 15.00 | $10,500 |
| 501 | Hydroseeding | 1,000 | SF | $ 15.00 | $15,000 |
| 502 | Cable Rail Barrier | 200 | LF | $ 65.00 | $13,000 |
| | | | | **Total Cost:** | **$2,612,962** |
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**TABLE 2: MIRADA ROAD PEDESTRIAN BRIDGE REPLACEMENT - LONGER BRIDGE**

| ITEM | DESCRIPTION | QTY. | UNIT | UNIT COST | AMOUNT |
|---|---|---|---|---|---|
| 101 | Mobilization/ Demobilization | 1 | LS | $267,770.90 | $267,771 |
| 102 | Water Pollution Control | 1 | LS | $ 45,000.00 | $45,000 |
| 103 | Traffic Control | 1 | LS | $ 15,000.00 | $15,000 |
| 104 | Construction Staking (S) | 1 | LS | $ 20,000.00 | $20,000 |
| 105 | Temporary Ramp to Access Beach | 1 | LS | $ 65,000.00 | $65,000 |
| 200 | Clear and Grub Bluff | 3,339 | SF | $ 3.00 | $10,017 |
| 201 | Remove Pedestrian Bridge | 1 | LS | $ 45,000.00 | $45,000 |
| 202 | Remove Concrete Bridge | 1 | LS | $ 150,000.00 | $150,000 |
| 203 | Abutment Demolition | 1 | LS | $ 20,000.00 | $20,000 |
| 301 | Remedial Bluff Grading | 3,339 | SF | $ 8.00 | $26,712 |
| 302 | Rock Slope Protection | 1,190 | TON | $ 92.00 | $109,480 |
| 303 | Shotcrete Wall | 2,940 | SF | $ 350.00 | $1,029,000 |
| 304 | 18" Storm Drain Outfall (Scour Protection) | 1 | EA | $ 20,000.00 | $20,000 |
| 305 | 6" Storm Drain Outfall | 1 | EA | $ 2,500.00 | $2,500 |
| 400 | Abutment Excavation | 85 | CY | $ 250.00 | $21,250 |
| 401 | Abutment Backfill | 20 | CY | $ 200.00 | $4,000 |
| 402 | 48" Diameter CIDH | 100 | LF | $ 3,000.00 | $300,000 |
| 403 | Abutments Concrete | 50 | CY | $ 3,000.00 | $150,000 |
| 404 | Abutments Steel | 15,000 | LBS | $ 3.00 | $45,000 |
| 405 | Provide Aluminum Bridge | 1 | LS | $ 350,000.00 | $350,000 |
| 406 | Place Aluminum Bridge | 1 | LS | $ 200,000.00 | $200,000 |
| 406 | Electrical Casing and Hangars | 150 | LF | $ 105.00 | $15,750 |
| 500 | Asphalt Pathway | 400 | SF | $ 15.00 | $6,000 |
| 501 | Hydroseeding | 1,000 | SF | $ 15.00 | $15,000 |
| 502 | Cable Rail Barrier | 200 | LF | $ 65.00 | $13,000 |
| | | | | **Total Cost:** | **$2,911,480** |
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