Midpeninsula Regional Open Space District

PLANNING AND NATURAL RESOURCES COMMITTEE

R-14-73
April 15, 2014

AGENDA ITEM 2

AGENDA ITEM

Harkins Bridge Replacement

GENERAL MANAGER'S RECOMMENDATION

Recommend to the full Board that a prefabricated truss bridge is the preferred option to replace the Harkins Bridge in Purisima Creek Redwoods Open Space Preserve.

SUMMARY

The Board has approved, as part of the FY2014-15 Action Plan, the design, engineering and permitting to replace the Harkins Bridge in Purisima Creek Open Space Preserve. Prior to contracting with Questa Engineering for the design, engineering and permitting of the bridge, staff seeks the Planning & Natural Resources Committee's (Committee) approval to pursue a prefabricated truss bridge design to replace the Harkins Bridge. A Committee recommendation to the full Board of Directors, and subsequent Board decision early in the design process about the basic type of bridge to be constructed will enable the design process to proceed more efficiently and cost effectively. Following the Committee's review of the basic type of bridge, staff will agendize approval of the Committee's recommended design option for the next available Board meeting.

DISCUSSION

The Harkins Bridge is located in the lower portion of the watershed within a minute's walk from the lower parking lot. It provides an important trail crossing at Purisima Creek that connects two halves of the preserve. It is currently not passable by emergency vehicles due to the condition of the bridge. The choice of a basic design to replace the bridge has fiscal, aesthetic and environmental considerations.

There are four basic options for replacing the Harkins vehicle bridge: railcar, concrete arch, I-beam, and prefabricated truss bridges.

<u>Railcar Bridges</u>

Pros: Rail car Bridges are a cost effective means to provide a substantial steel bridge. All the other bridges in Purisima are rail car bridges so a new bridge would have a consistent look.

Cons: Railcars are not designed as bridges. A principal shortcoming is the thickness of the structural beams (girders). When designing this type of bridge, there is a tradeoff between placing the bottom of the girders too close to the stream, causing rust or potential blockage during a storm event, or raising the bridge and importing fill to elevate the road approach. While the girders are often rated to 120,000lbs or more, the lateral cross-beams are less durable and subject to rust and failure over time. Railcars are also narrow, typically nine feet, which makes just one railcar unsuitable for new width requirements. The two railcars needed to build the minimum 14 foot wide bridge result in a bridge much wider than nesseccary. See Attachment A1, Harkins Bridge.

<u>Concrete Arch Bridges</u>

Pros: Concrete arch bridges are commonly used by Caltrans and other public works agencies for their durability and value engineering. The decreased maintenance and increased durability make concrete arches the most cost effective type of bridge over its lifespan.

Cons: Concrete bridges are the most expensive option for initial construction. A concrete arch bridge does not fit with the aesthetic of a preserve trail bridge because it has the look of urban roadway infrastructure. In addition, the shorter the span the more the walls of the arch constrain the natural flow of the creek. Permitting is more difficult because the arch tends to constrain creek flow and they are rarely the preferred alternative of regulatory agencies. Longer spans solve this problem but cost more and require additional fill to fit the road approach. See Attachments B and B1, Bridge Alternatives.

<u>“I” Beam Bridge</u>

Pros: “I” beam bridges are made of large “I” beams that are fixed to the abutments and a custom superstructure is built on top. A contractor built a bridge with an “I” beam design below the Red Barn over La Honda Creek in La Honda Creek Preserve. They are cost-effective, easy to construct, and durable.

Cons: The profile of the bridge, like a railcar, is very thick, because the entire weight rests on the girders. Since the beams are thick like a rail car it has the same issues, causing either stream blockage or an elevated design. (See Attachments B2-B5)

<u>Prefabricated Truss Bridges (Recommended)</u>

Pros: Truss bridges use the entire structure of the bridge to support the weight of the bridge. They feature an elevated structure, where the railing is normally attached, that braces the bridge for lateral and vertical loads. This minimizes the thickness of the girders and therefore reduces the height of the approach, the need for fill, and the scale of the abutments.

Cons: The downside is that the above-deck structure needs modification to meet the requirements for railings and aesthetically fit in with the look of the preserve. A good example of this type of bridge is at the El Corte de Madera Trail. (See Attachments B6-8, C, and C3 for examples for truss bridges.)

Summary of Design Options

Bridge Type	**Pros**	**Cons**
Railcar	Cost Effective	Requires Two Cars for min.14'Width
Estimated Cost: $500,000	Strong	Vegetation Removal
	Similar Aesthetics	More Imported Fill
	Any Railings	Cross-beam failure may occur in 30 years
Concrete Arch	Extremely Durable	More Imported Fill
Estimated Cost: $583,000	Strong	Not Aesthetically Pleasing
	Value Engineering	Constrains Creek
	Any Railings	Expensive
Prefabricated Truss	Durable	Above Deck Structure
Estimated Cost: $544,000	Customizable	Fewer Railing Options
	Less Imported Fill	Upfront Costs
"I" Beam Bridge	Strong	More Imported Fill
Estimated Cost: $544,000	Any Railings	Thick Profile
		Upfront Costs

Staff recommends pursuing the prefabricated truss bridge for the Harkins Bridge replacement project with Questa Engineering.

The truss style of prefabricated bridge is affordable, easy to construct, and is already used on District lands. It does have some aesthetic limitations. Standard District railing designs will have to be modified to accommodate the style and construction of the trusses. The prefabricated truss bridge has the smallest visual footprint and at this stage in the analysis seems to be the environmentally preferable alternative. For these reasons, staff recommends pursuing the prefabricated truss bridge option.

FISCAL IMPACT

Accounting for all project costs, vehicle bridges of the type under consideration may cost from $500,000 to $600,000. These costs break down into roughly 20% design/engineering, 10% permitting, and 70% construction. $110,000 is budgeted for the FY2014-15 for this project. Staff is currently in negotiations with Questa on the next contract to take the project through design, permitting, and up to construction. The remainder of costs, primarily for construction, are estimated between $390,000 and $435,000, and would be carried in FY2015-16.

PUBLIC NOTICE

Public notice was provided as required by the Brown Act. Adjoining owners within 500 feet of the Higgins Canyon Road preserve entrance were notified.

CEQA COMPLIANCE

A previous biological assessment, done in 2011 for the proposed parking lot at the same site, will form the basis of an Initial Study. Until a bridge alternative is selected and the Project under CEQA is defined, staff cannot make a CEQA recommendation. Based on what is known today, staff anticipates using a categorical exemption under section 15302 (“Replacement or Reconstruction”).

NEXT STEPS

Following the Committee’s review of the basic type of bridge, staff will agendize approval of the Committee’s recommended design option for the next available Board meeting. Once approved by the Board, staff will enter into a contract with Questa Engineering under the prior Board authorization to use their services to design, engineer and permit the bridge.

Staff and Questa will complete 30% designs, schedule pre-consultation meeting with the agency stakeholders, and apply for permits. Once the project is approved by the regulatory agencies, Questa will complete the designs and staff will take the construction out to bid. Staff will then contract with Questa to supervise the construction. The contract for construction will also go to the Board for approval. Construction is anticipated for the fall of 2015. However, the timeline is highly dependent on the permit process.

Attachments

A. Harkins Site Map and Pictures
B. Bridge Alternatives
C. Railings Alternatives

Responsible Department Head:
Michael Newburn, Acting Operations Manager

Prepared by:
Aaron Hébert, Contingent Project Manager

Exhibit A: Project Map and Picture

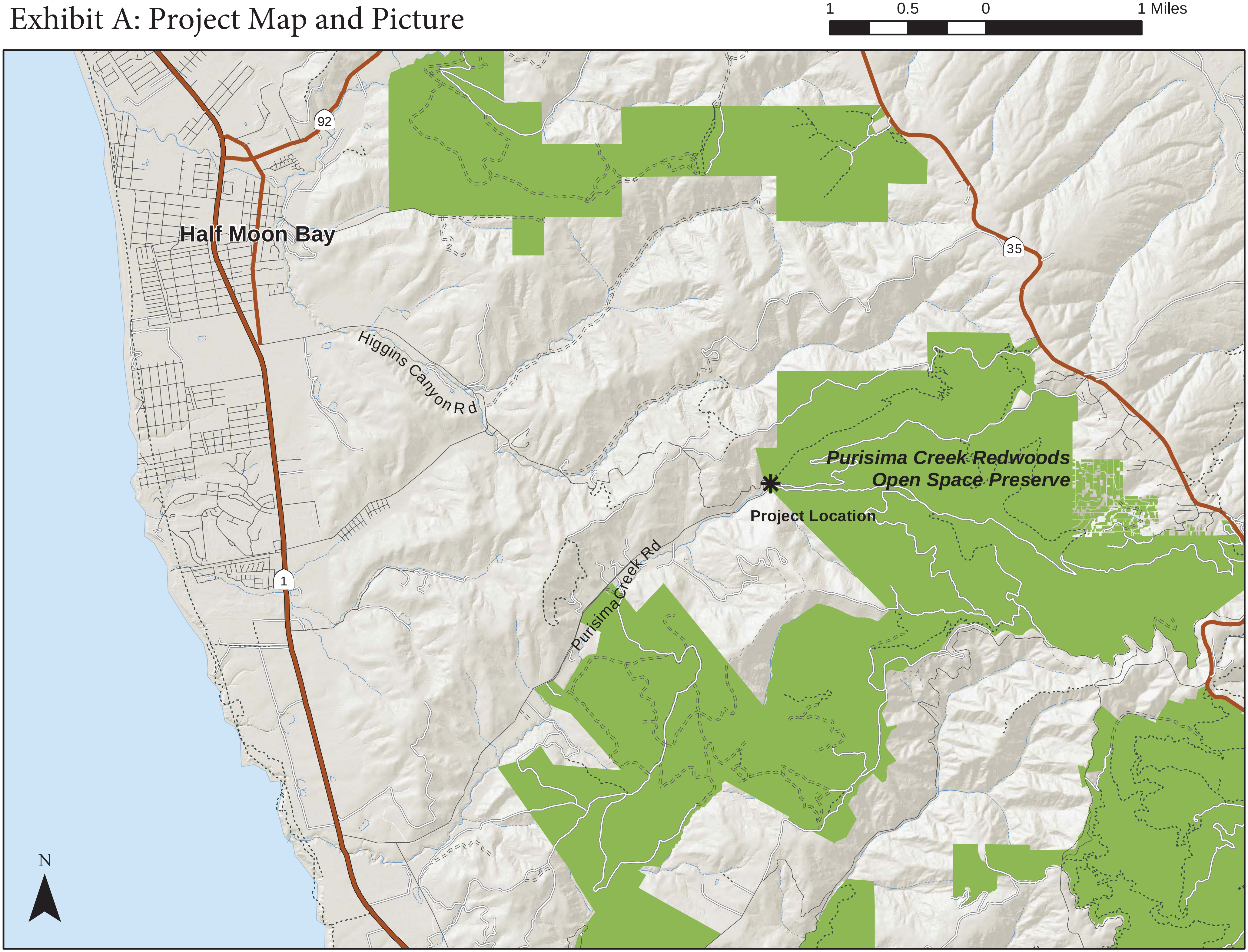
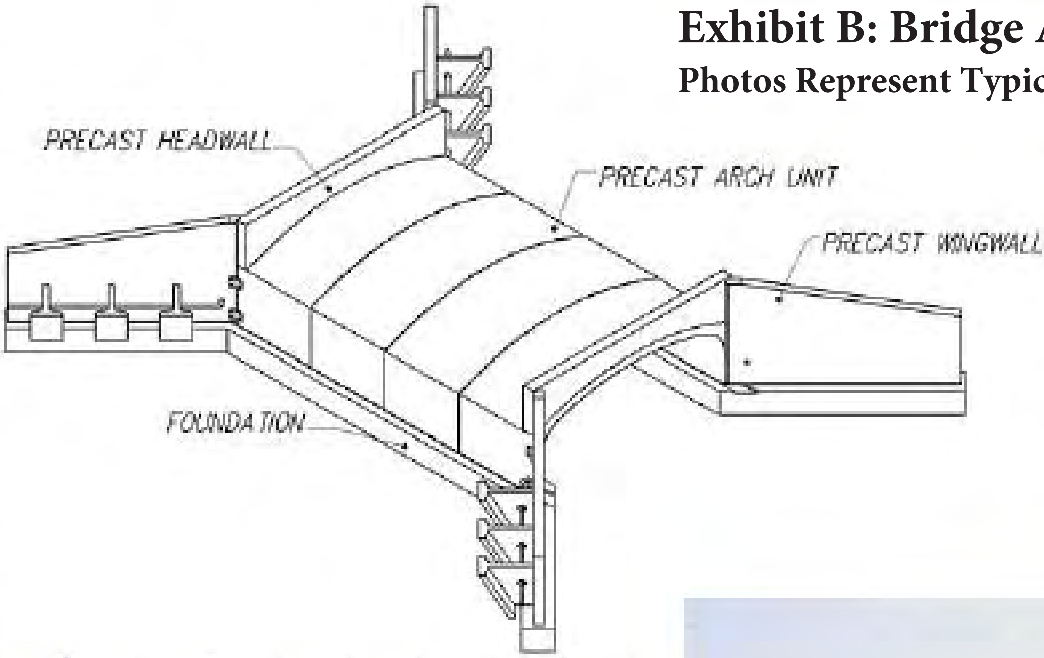


Exhibit A1: Harkins Bridge and Railcar Typical

Exhibit B: Bridge Alternatives

Photos Represent Typicals, Not Actual Site



Concrete Arch Bridge Typical

2/19/2014

Exhibit B1: County Arch Bridge 1000' downstream of Harkins

Exhibit B2: I-Beam Bridge Typical

Exhibit B3: I-Beam Bridge on Cathermole Road in Sierra Azul

Exhibit B4: MROSD 2000 I-Beam Bridge on La Honda Creek

Exhibit B5: MROSD 2000 I-Beam Bridge on La Honda Creek

Exhibit B6: Vehicle Truss Bridge Typical

Exhibit B7: Prefabriacted Vehicle Truss Bridge at Cowell-Purisima Trail (POST)

Exhibit B8: Prefabriacted Vehicle Truss Bridge at Cowell-Purisima Trail (POST)

Exhibit C: Railings Alternatives   Non-vehicle truss bridge on ECDM trail

Exhibit C1: New Redwood and Welded Wire Mesh at Alpine Pond

Exhibit C2: Welded Wire Mesh Detail

Exhibit C3: Prefabricated Truss Bridge with Manufacturer Installed Railings